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Appendix – I

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women

Deemed to be University Under category 'A' By MHRD, (Estd. u/s 3 of UGC Act 1956)

Re Accredited with 'A' Grade By NAAC, Recognised by UGC Under Section 12 B

Coimbatore - 641043, Tamil Nadu, India

Seek and Ye Shall Find

16th August 2018

To
Mrs. Sandhya Kumar
Department of Education
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore – 641 043

Dear Madam,

Ref: Your presentation of the proposal No. IHEC/17-18/EDU/03 entitled "Effect of Experiential Pedagogy on Science Achievement and Scientific Attitude among Tribal and Non-Tribal Students at Secondary Level in Kerala" to the IHEC on 13th August 2018

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC/17-18/EDU/03 entitled "Effect of Experiential Pedagogy on Science Achievement and Scientific Attitude among Tribal and Non-Tribal Students at Secondary Level in Kerala" submitted and presented by you. The Approval number for the same is AUW/IHEC-17-18/EDU/FHP-08.

We wish you all the best in your research endeavours.

Regards,

V. Uma Mageshwari

Dr.S.Uma Mageshwari
Member Secretary

Institutional Human Ethics Committee

Appendix – II

OFFICE OF THE DIRECTOR OF SCHEDULED TRIBE DEV. DEPARTMENT
4th Floor Vikas Bhavan, Thiruvananthapuram Pin: 695 033

Ph:0471-2303229,0471-2304594.Fax:0471-2302990.E-mail:keralatribes@gmail.com

D3-17656/18 28.08.2018

The Director

To

Smt. Sandhya Kumar

Research Scholar in Education
Reg No:16PHEDP001, Dept.of Education
Avinashilingam Institute for Home Science&
Higher Education for Women University, Coimbatore

Sir,

Sub: - STDD- Permission to research work in Asramam School Malampuzha &Model Residential School Attappady p.o Palakkad Dist

Ref: 1. Your Lr. Dtd. 31/08/2018

With reference to above, consent of the Scheduled Tribes Development Department ,Government of Kerala is granted for research about " EFFECT OF EXPERIENTAL PEDAGOGY ON SCIENCE ACHIEVEMENT AND SCIENTIFIC ATTITUDE AMONG TRIBAL AND NON TRIBAL STUDENTS AT SECONDARY LEVEL IN KERALA" for a period of 1st October to 31st October 2018 subject to the following conditions.

1. The proposed visit should only be conducted as a part of the Research work and thus obtained data, knowledge and reports should not in any way be used for other purposes other than the study of the scholar.
2. The visit should be conducted with the knowledge of the Tribal Development Officer Palakkad and Project Officer ITDP, Attappady
3. The visit should not in any way hurt the cultural and habitual life of the students in the Model Residential School.
4. A copy of the thesis/study report should be furnished to the Director of Scheduled Tribes Development Department, Vikas Bhavan, IVth Floor,Thiruvananthapurm 33.

5. An agreement should be executed before the P.O ITDP Attappady and TDO, Palakkad by the Scholar agreeing the above conditions.

6. Special instruction: - Objection if any from the concerned students should be duly considered; the research stopped and be reported to the P.O ITDP Attappady and TDO, Palakkad
7. This sanction will cease at the written notice of P.O ITDP Attappady and TDO Palakkad.
8. The applicant should leave the area by 4 pm. You are not permitted to stay overnight in the schools.

Yours faithfully,
Sd/-
DIRECTOR

Ranya
01.10.18

COPY: The Project Officer Attappady and
TDO, Palakkad

G. Anil Kumar
Senior Superintendent

OFFICE OF THE DIRECTOR OF SCHEDULED TRIBE DEV. DEPARTMENT

4th Floor Vikas Bhavan, Thiruvananthapuram Pin:695033

Ph:0471-2303229,0471-2304594.Fax:0471-2302990.E-mail:keralatribes@gmail.com

D3-12106/19. 2.08.2019

The Director

Sandhya Kumar
Research Scholar in Education
Department of Education
16PHEDP001
Avinashilingam Institute for Home Science &
Higher Education for Women University
Coimbatore

Sir,

Sub:- STDD- Permission for research and fieldwork at IGMRS Nilambur reg
Ref: Your Ltr dated 16/07/2019

With reference to above, consent of the Scheduled Tribes Development Department ,Government of Kerala is granted for research and field work about ***"Effect of Experimental Pedagogy on Science Achievement and Scientific Attitude of Tribal Students at Secondary level in Kerala"*** in IGMRS Nilambur, under this department, Malappuram District from August 2019 to October 2019 to subject to the following conditions.

1. The proposed visit shall only be conducted as a part of the research work and thus obtained data, knowledge and reports shall not in any way be used for purposes other than the study of the scholar/institution.

2. The visit shall be conducted with the knowledge of PO ITDP Nilambur

3. The visit shall not in any way hurt the cultural and habitual life of the tribal people in the institute

4. A copy of the thesis/study report shall be furnished to the Director of Scheduled Tribes Development Department, Vikas Bhavan, IVth Floor,Thiruvananthapurm 695033.

5. An agreement shall be executed before PO ITDP Nilambur

6. Any infringement on the rights of the tribal people in the settlement shall attract penal proceedings under Prevention of Atrocities Act .1989.

7. Special instruction:- Objection if any from the concerned tribal people shall be duly considered; the research stopped and reported to the Director .

8. This sanction will cease at the written notice of PO ITDP Nilambur

9. The applicant shall leave the institute latest by 4 pm.No overnight stay in the colony shall be permitted.

Yours faithfully.

Sd/-
DIRECTOR

Forwarded by Order

V Saseendran
Deputy Director(Education)
For Director

COPY: 1. PO ITDP Nilambur
2. S S IGMRS Nilambur

Appendix – III

राष्ट्रीय शैक्षिक अनुसंधान
और प्रशिक्षण परिषद्

विद्यया ऽमृतमश्नुते
एन सी ई आर टी
NCERT

NATIONAL COUNCIL OF EDUCATIONAL
RESEARCH AND TRAINING

Speed Post

F.No.4-353/NDF(SK)/DER/2019/19
DIVISION OF EDUCATIONAL RESEARCH

May 6, 2019

Dr. Anjum Sibia
Professor & Head
E- mail : ncertder@gmail.com
Tel.: 011-26563980

Dear Ms. Sandhya,

This is in regard to your application for NCERT Doctoral Fellowship 2018 and subsequent interaction during the Interview-cum-Presentation held on March 12, 2019 at NCERT, New Delhi. I am pleased to inform you that you have been provisionally selected for the award of NCERT Doctoral Fellowship 2018. The fellowship will also be subject to fulfillment of the terms and conditions enclosed herewith (Annexure-I).

The fellowship is meant for pursuing doctoral work in a recognized university/research institution on a regular basis. The Doctoral Fellow will not accept any other remunerative assignment during the period of fellowship. The fellowship will commence from the date of joining and will terminate at the end of three years or with the submission of doctoral thesis, whichever is earlier. Quarterly progress report is to be sent to NCERT after three months of joining the fellowship (Annexure III).

The Fellow will receive a fellowship of Rs.23,000/- (Non-NET) or Rs.25,000/- (NET qualified) per month for a period of maximum three years and also contingency grant of Rs.10,000/- per annum during the period.

You are requested to communicate your acceptance of the fellowship within a period of 15 days, failing which it will be assumed that you are not interested in the fellowship. You are required to send (i) duly signed copy of the terms and conditions (Annexure-I) (ii) joining report (Annexure-II) immediately.

With best wishes,

Yours sincerely,

(Anjum Sibia)

Encl. : As above

Ms. Sandhya Kumar
'Souparnika' Karath Compound,
Sengupta Road,
Ottapalam P.O, Lalakkad-679101
Kerala

श्री अरविन्द मार्ग, नई दिल्ली-110016
दूरभाष : 26560620, 26566360 फैक्स : 91-11-26868419
तार : शिक्षाशोध

SRI AUROBINDO MARG, NEW DELHI-110016
PHONE : 26560620, 26566360 FAX : 91-11-26868419
GRAMS : EDUSEARCH

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University under Category A by MHRD, Estd. u/s 3 of UGC Act 1956)
Re-accredited with A+ Grade by NAAC. Recognised by UGC Under Section 12 B
Coimbatore - 641 043, Tamil Nadu, India

Dr. (Mrs.) S. Kowsalya
M.Sc., M.Phil., Ph.D.
Registrar

Date : 27.05.2019

To Whomsoever it may concern

This is inform that the Ph.D Research Scholar, Sandhya Kumar (Roll No: 16PHEDP001) in Education has got her Ph.D Programme status converted from Part time to Full time with effect from June 1st 2019.

S. Kowsalya
Registrar

Office : 2440241 ✣ Registrar : 2451252 ✣ Fax : +91- 422 - 2441252 ✣ E-Mail : registrar@avinuty.ac.in

Annexure II

NCERT Doctoral Fellowship 2018

The Head
Division of Educational Research
NCERT, Sri AurobindoMarg
New Delhi-110016

Subject : Joining report for NCERT Doctoral Fellowship - 2018.

Sir,

With reference to your letter no F.No.4-353/NDF(SK)/DER/2019/119 dated MAY 6, 2019,
I do hereby join the NCERT Doctoral Fellowship in the FN/~~AN~~ of JUNE 1, 2019
in the Department of EDUCATION, in the
University/Institute AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN
I hereby declare that I do not have/ will not accept any other remunerative assignment during the period of fellowship.

Thanking you,

Yours faithfully,

Place : COIMBATORE

Date : 28/05/2019

Signature Sandhya K
Name and Address SANDHYA KUM
Ph.D Schola
Dept. of Educat
Avinashilingam Institute

Countersigned by:

28/5/19.

Supervisor with seal

Dr. INDU .H.
M.Sc., M.Ed., M.Phil., Ph.D., M.B.A., Dip in Multimedia.,
Associate Professor & Head
Department of Education
Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore 641 108

28/5/19

Head of the Department
SEAL

Dr. INDU .H.
M.Sc., M.Ed., M.Phil., Ph.D., M.B.A., Dip in Multimedia.,
Associate Professor & Head
Department of Education
Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore 641 108

Head of the Institution/University
SEAL

Registrar
Avinashilingam Institute for Home Science and Higher Education for Women
(University Estd.u/s. 3 of UGC Act.1956)
Coimbatore - 641 043

28/5/19

APPENDIX IV

Item Analysis of Science Achievement Test, Scientific Attitude Scale, Science Process Skill Test and Previous Knowledge Test in Science

a. Result of the item Analysis of the Test of Previous Knowledge Test

Q No:	*T*	Q No:	*T*
Item 01	1.948	Item 31	1.209*
Item 02	7.663	Item 32	1.121*
Item 03	1.01*	Item 33	14.162
Item 04	7.403	Item 34	1.003*
Item 05	5.459	Item 35	0.893*
Item 06	8.580	Item 36	13.217
Item 07	10.732	Item 37	14.621
Item 08	10.620	Item 38	11.251
Item 09	12.159	Item 39	11.964
Item 10	1.09*	Item 40	8.824
Item 11	1.93	Item 41	10.308
Item 12	16.838	Item 42	1.927
Item 13	1.988	Item 43	1.868*
Item 14	2.074	Item 44	2.262
Item 15	3.295	Item 45	3.355
Item 16	6.622	Item 46	2.773
Item 17	9.060	Item 47	15.768
Item 18	8.150	Item 48	1.903
Item 19	8.215	Item 49	12.966
Item 20	1.982	Item 50	8.572
Item 21	10.768	Item 51	6.799
Item 22	2.668	Item 52	1.660
Item 23	1.974	Item 53	9.923
Item 24	4.938	Item 54	1.986
Item 25	1.936	Item 55	5.717
Item 26	1.965	Item 56	2.461
Item 27	6.693	Item 57	1.563*
Item 28	15.264	Item 58	9.561
Item 29	0.397*	Item 59	1.916
Item 30	9.444	Item 60	1.611*

* indicates omitted item

b. Result of the item Analysis of the Test of Science Process Skills

Q No:	*T*	Q No:	*T*
Item 01	1.348*	Item 41	6.356
Item 02	7.663	Item 42	0.309*
Item 03	1.091*	Item 43	13.300
Item 04	7.403	Item 44	12.874
Item 05	0.459*	Item 45	1.867*
Item 06	8.580	Item 46	1.682*
Item 07	10.732	Item 47	1.798*
Item 08	10.620	Item 48	12.742
Item 09	12.159	Item 49	13.353
Item 10	1.048*	Item 50	15.546
Item 11	1.273*	Item 51	1.492*
Item 12	16.838	Item 52	13.483
Item 13	1.588*	Item 53	12.005
Item 14	0.074*	Item 54	0.069*
Item 15	0.295*	Item 55	7.058
Item 16	0.622*	Item 56	14.680
Item 17	9.060	Item 57	7.130
Item 18	8.150	Item 58	7.646
Item 19	8.215	Item 59	1.321*
Item 20	0.882*	Item 60	1.273*
Item 21	10.768	Item 61	0.799*
Item 22	1.668*	Item 62	1.660*
Item 23	1.074*	Item 63	9.923
Item 24	0.438*	Item 64	1.886*
Item 25	0.936*	Item 65	0.717*
Item 26	1.665*	Item 66	1.461*
Item 27	6.693	Item 67	6.563
Item 28	15.264	Item 68	9.561
Item 29	0.397*	Item 69	1.116*
Item 30	9.444	Item 70	16.611
Item 31	1.209*	Item 71	11.209
Item 32	1.121*	Item 72	9.121
Item 33	14.162	Item 73	1.162*
Item 34	1.003*	Item 74	19.003
Item 35	0.893*	Item 75	8.893
Item 36	13.217	Item 76	1.217*
Item 37	14.621	Item 77	14.621
Item 38	11.251	Item 78	11.251
Item 39	11.964	Item 79	11.964
Item 40	8.824	Item 80	8.824

* indicates omitted item

c. Result of the item Analysis of the Scale of Scientific Attitude

Q No:	*T*	Q No:	*T*
Item 01	2.348	Item 31	10.308
Item 02	7.663	Item 32	7.927
Item 03	6.091	Item 33	8.868
Item 04	7.403	Item 34	15.262
Item 05	10.459	Item 35	13.355
Item 06	8.580	Item 36	2.773
Item 07	10.732	Item 37	15.768
Item 08	10.620	Item 38	14.103
Item 09	12.159	Item 39	12.966
Item 10	15.048	Item 40	13.572
Item 11	11.273	Item 41	6.356
Item 12	16.838	Item 42	10.309
Item 13	12.588	Item 43	13.300
Item 14	10.074	Item 44	12.874
Item 15	5.295	Item 45	12.867
Item 16	9.622	Item 46	11.682
Item 17	9.060	Item 47	14.798
Item 18	8.150	Item 48	12.742
Item 19	8.215	Item 49	13.353
Item 20	9.882	Item 50	15.546
Item 21	10.768	Item 51	11.492
Item 22	12.668	Item 52	13.483
Item 23	14.074	Item 53	12.005
Item 24	10.438	Item 54	10.069
Item 25	6.936	Item 55	7.058
Item 26	14.665	Item 56	14.680
Item 27	6.693	Item 57	7.130
Item 28	15.264	Item 58	7.646
Item 29	7.397	Item 59	15.321
Item 30	9.444	Item 60	13.273

d. Result of the item Analysis of the Test of Science Achievement test

Top group				Bottom group			Joint Difficulty Index		Discriminating Power		Question Selected (S) or Not Selected (N.S)
Item No:	No: of right responses R_T	Difficulty Index R_T		No: of right responses R_B	Difficulty Index R_B		(R_T+R_B)	$(R_T+R_B)/2$	(R_T-R_B)	Degree	S/N.S
1	25	25/25	1	23	23/25	.92	1.92	.96	+2	Ordinary	S
2	25	25/25	1	24	22/25	.88	1.88	.94	+3	Good	S
3	25	25/25	1	20	20/25	.80	1.80	.90	+5	Best	S
4	25	25/25	1	16	16/25	.64	1.64	.82	+9	Best	S
5	25	25/25	1	21	21/25	.84	1.84	.92	+4	Very good	S
6	24	24/25	.96	20	20/25	.80	1.76	.88	+4	Very good	S
7	23	23/25	.92	19	19/25	.76	1.68	.84	+4	Very good	S
8	22	22/25	.88	22	22/25	.88	1.76	.88	0	Very bad	N.S*
9	25	25/25	1	22	22/25	.88	1.88	.94	+3	Good	S
10	20	20/25	.80	15	15/25	.60	1.40	.70	+5	Best	S
11	24	24/25	.96	20	20/25	.80	1.76	.88	+4	Very good	S
12	25	25/25	1	23	23/25	.92	1.92	.96	+2	Ordinary	S
13	23	23/25	.92	22	22/25	.88	1.80	.90	-1	Negative	N.S*
14	24	24/25	.96	20	20/25	.80	1.76	.88	+4	Very good	S
15	23	23/25	.92	20	20/25	.80	1.72	.86	+3	Good	S
16	25	25/25	1	23	23/25	.92	1.92	.96	+2	Ordinary	S
17	19	19/25	.76	16	16/25	.64	1.40	.70	3	Good	S
18	24	24/25	.96	21	21/25	.84	1.80	.90	+3	Good	S
19	20	20/25	.80	18	18/25	.72	1.52	.76	+2	Ordinary	S
20	24	24/25	.96	22	22/25	.88	1.84	.92	+2	Ordinary	S
21	25	25/25	1	20	20/25	.80	1.80	.90	+5	Best	S
22	18	18/25	.72	15	15/25	.60	1.32	.66	+3	Good	S
23	23	23/25	.92	21	21/25	.84	1.76	.88	+2	Ordinary	S
24	21	21/25	.84	18	18/25	.72	1.56	.78	+3	Good	S
25	25	25/25	1	23	23/25	.92	1.92	.96	+2	Ordinary	S
26	24	24/25	.96	21	21/25	.84	1.80	.90	+3	Good	S
27	25	25/25	1	24	24/25	.96	1.96	.98	+1	Bad	N.S*
28	24	24/25	.96	24	24/25	.96	1.92	.96	0	Very bad	N.S*
29	25	25/25	1	24	24/25	.96	1.96	.96	+1	Bad	N.S*
30	20	20/25	.80	20	20/25	.80	1.60	.80	0	Very bad	N.S*
31	25	25/25	1	20	20/25	.80	1.80	.90	+5	Best	S
32	24	24/25	.96	20	20/25	.80	1.76	.88	+4	Very good	S

33	23	23/25	.92	20	20/25	.80	1.72	.86	+3	Good	S
34	21	21/25	.84	18	18/25	.72	1.56	.78	+3	Good	S
35	18	18/25	.72	15	15/25	.60	1.32	.66	+3	Good	S
36	18	18/25	.72	21	21/25	.84	1.56	.78	-3	Negative	N.S*
37	19	19/25	.76	22	22/25	.88	1.64	.82	-3	Negative	N.S*
38	17	17/25	.68	23	23/25	.92	1.60	.80	-6	Negative	N.S*
39	24	24/25	.96	21	21/25	.84	1.80	.90	+3	Good	S
40	25	25/25	1	20	20/25	.80	1.80	.90	+5	Best	S
41	21	21/25	.84	20	20/25	.80	1.64	.82	+1	Bad	N.S*
42	20	20/25	.80	20	20/25	.80	1.60	.80	0	Very bad	N.S*
43	19	19/25	.76	21	21/25	.84	1.60	.80	-2	Negative	N.S*
44	20	20/25	.80	18	18/25	.72	1.52	.76	+2	Ordinary	S
45	21	21/25	.84	19	19/25	.76	1.60	.80	+2	Ordinary	S
46	23	23/25	.92	18	18/25	.72	1.64	.82	+5	Best	S
47	24	24/25	.96	20	20/25	.80	1.76	.88	+4	Very good	S
48	18	18/25	.72	19	19/25	.76	1.48	.74	-1	Bad	N.S*
49	25	25/25	1	23	23/25	.92	1.92	.96	+2	Ordinary	S
50	24	24/25	.96	22	22/25	.88	1.84	.92	+2	Ordinary	S
51	20	20/25	.80	16	16/25	.64	1.25	.63	+4	Very good	S
52	25	25/25	1	22	22/25	.88	1.88	.94	+3	Good	S
53	25	25/25	1	20	20/25	.80	1.80	.90	+5	Best	S
54	19	19/25	.76	16	16/25	.64	1.40	.70	+3	Good	S
55	20	20/25	.80	18	18/25	.72	1.52	.76	+2	Ordinary	S
56	20	20/25	.80	20	20/25	.80	1.60	.80	0	Very bad	N.S*
57	19	19/25	.76	21	21/25	.84	1.60	.80	-2	Negative	N.S*
58	18	18/25	.72	19	19/25	.76	1.48	.74	-1	Negative	N.S*
59	20	20/25	.80	21	21/25	.84	1.64	.82	-1	Negative	N.S*
60	25	25/25	1	23	23/25	.92	1.92	.96	+2	Ordinary	S
61	23	23/25	.92	20	20/25	.80	1.72	.86	+3	Good	S
62	21	21/25	.84	17	17/25	.68	1.52	.76	+4	Very good	S
63	23	23/25	.92	20	20/25	.80	1.72	.86	+2	Ordinary	S
64	20	20/25	.80	20	20/25	.80	1.60	.80	0	Very bad	N.S*
65	21	21/25	.84	16	16/25	.64	1.48	.74	+5	Best	S
66	20	20/25	.80	20	20/25	.80	1.60	.80	0	Very bad	N.S*
67	20	20/25	.80	22	22/25	.88	1.68	.84	-2	Negative	N.S*
68	24	24/25	.96	21	21/25	.84	1.80	.90	+3	Good	S
69	22	22/25	.88	19	19/25	.76	1.64	.82	+3	Good	S
70	22	22/25	.88	20	20/25	.80	1.68	.84	+2	Ordinary	S

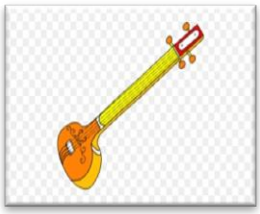
APPENDIX V A: **Marks: 1 X 50=50**

PREVIOUS KNOWLEDGE TEST IN BASIC SCIENCE **Time: 1hr**

1.Remembering: Non verbal

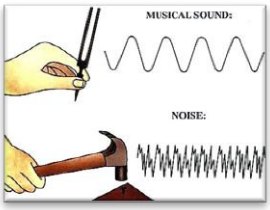
1. Given below are the pictures of some natural sources. Some are naturally occurring sound sources while some others are artificial sound sources made by humans. Correctly observe them and state which one is the correct statement.



(a) (b) (c) (d)

1. (a) and (b) are natural sound sources and (c) and (d) are artificial sound sources
2. (a) and (c) are natural sound sources and (b) and (d) are artificial sound sources
3. (a) ,(b) and (c) are natural sound sources but (d) is an artificial sound source
4. (a) and (d) are natural sound sources and (b) and (c) are artificial sound sources



2. Identify the two different sound waves shown in the figure and fill in the blanks

Musical sound is produced by --------- pattern of sound waves and noise is produced by --------- pattern of sound waves.

(a) regular, irregular (b) irregular, regular
(c)physical, chemical (d) chemical, physical

3. This is the image of a school bell.

We hear the sound of the school bell through our ears because sound travels through ----------

(a)Air (b) water (c) soil (d) none of these

4. The following images show the potential dangers of ----------


(a) thunder (b) lightening (c) pollution (d) wind

5. Given the flash cards of a duck and a peacock. You need to imitate the sounds of the birds. Whose sound is shriller?


a. Duck b. Peacock c. Cannot say d. None of them

Remembering: Verbal

6. Rearrange the words to get a thing that is commonly used in toys, torches, small machines etc. **'erttyab'**

_____

7. Read the passage and answer the following:

Sound is a form of energy that can be used for many useful purposes such as sound navigation and ranging which is used for search purposes under water. Sound waves are also used in hospitals for scanning the internal body parts of human beings with the help of an ultra sound scanning machine.

Ultra sound scanning machine uses .....to scan the internal body parts of human beings.

(a) Light waves (b) sound waves (c) air waves (d) heat waves

8. Rearrange the words to form a thing that easily passes electricity through it. **'atewr'**

---

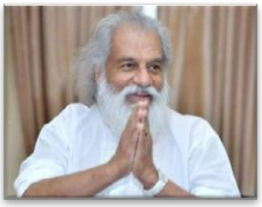
9. Read and understand the statements and tell which statements are true and which are false.

Statements:

i. I have a short swing which can swing easily in high speeds
ii. I have a long swing which can swing easily in high speeds
iii. I have a short swing which can swing easily in slow speeds
iv. I have a long swing which can swing easily both in high and slow speeds

(a) (i) and (ii) are true, (iii) and (iv) are false (b) (i) and (iii) are true, (ii) and (iv) are false
(c) (i) and (ii) are false, (iii) and (iv) are true (d) (ii), (iii) and (iv) are false and (i) is true

2. Understanding: Non Verbal



10. Identify the personality and tell in which area he is famous ?

(a) singer (b) guitarist (c) percussionist (d) violinist

11. Why the bat that is shown in the image has died. Say the reason.

(a) electric shock (b) starvation

(c) head on collision (d) unknown cause

12. What can you say about the roar of a lion? Is it low pitched or high pitched?

(a) High pitched (b) low pitched
(c) medium sound (d) cannot be determined

13. How do the balloons stick on to the walls, without actually pasting or nailing it to the wall? Tell the reason

(a) Balloon cannot be pasted on the wall (b) Balloon is hanged from ceiling

(c) Balloon is tied to nails on the wall (d) Balloon is attracted to the wall

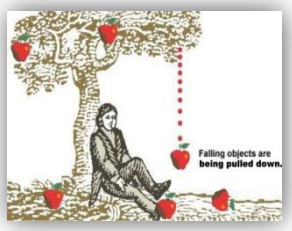
14. Identify the dog whistle and who will hear its sound? Is it the dog or the trainer?

(a) Dog can hear very high-pitched sounds, trainer cannot (b) Dog can hear very low-pitched sounds, trainer cannot

(c) Trainer can hear very high-pitched sound, dog cannot (d) Trainer can hear very low-pitched sounds, dog cannot

15. All the objects in earth are attracted towards earth's surface. This theory was formulated by the famous physicist Sir Isaac Newton. Given is the picture that led to the discovery of the famous theory by Sir Isaac Newton. An apple falling toward the ground made Sir Isaac Newton formulate the world-famous theory.

Can you correctly answer which was the famous theory formulated by Sir Isaac Newton?



(a) Theory of magnetism
(b) Theory of gravitation
(c) Theory of electrolysis
(d) Theory of proportions

16. Compare the dance forms 'bharathnatyam' and 'mohiniyattam'. Which is having more beats according to your observation and previous experiences?

a. Bharathnatyam b. Mohiniyattam c. Cannot say d. None of them

Understanding: Verbal

Read the passage and answer the following question.

17. All of us would have seen a battery. Many batteries are there of which all of us are more familiar with torch batteries. The torch batteries have + and – symbols on them. How are they arranged in a torch? Read the given statement and tick the correct answer.

'The positive side and negative side of two consecutively placed batteries are arranged together and if a positive side on one battery and the positive side of other are arranged together the torch will not light up.'

(a) True (b) False (c) Another manner (d) Don't know

18. Complete the comprehension with the suitable word given as choices.

Music is a beautiful representation of sound and noise is a disturbing representation of sound. We have seen that some vibrations are being transferred through the medium in order to hear music or noise. Thus, sound needs a medium to travel. So sound is a form of ---------- that can change its form to another form.

(a) energy (b) noise (c) music (d) force

3. Applying: Non Verbal

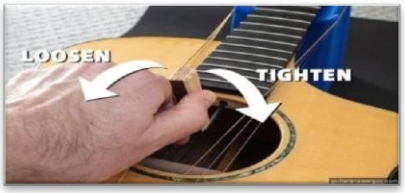
19. A lightning strike can be depicted as follows.

During a lightning, there is a flow of electricity established between the clouds and the ground. Hence there is a high chance of getting an ..... by stepping outside during a lightning.

(a) electric shock (b) electric heat (c) electric lightning (d) electric thunder

20. Given below is the picture of an electric bumper car used in malls for fun games.

The car works using..... (a)Electricity (b) light (c) heat (d) sound



21. Look at the picture.

Why does the guitarist tighten or loosen the guitar before he gets ready to perform?

(a) Adjusting sound (b) Adjusting voice
(c) Adjusting length (d)Adjusting surface

Applying: Verbal

22. Two children were playing with some steel utensils. Suddenly one of the steel utensils fell down and sound was heard. Sometime later another steel utensil also fell down from the same earlier place and a different sound was heard. Can you tell the reason why there was a difference in the two sounds?

(a) the steel utensils were of different shape and size

(b) the steel utensils were big

(c) the steel utensils were small

(d) the steel utensils were made up of different materials

23. Many people die of lightening because they don't take necessary steps that are needed to prevent the harmful effects of lightening. The people are not aware of the dangers that are caused by lightening. Is it safe to stay outdoors on a rainy day with lightning and thunder?

(a) yes (b) no (c) sometimes (d) don't know

24. You might have been to hospitals for some or other reason. There you might have noticed the ultra sound scanning room. It is useful for examining the internal parts of human body and to see whether the functioning is proper or not. A Doctor prescribes an ultrasound scanning to one of his patients in order to understand the internal functioning of his body. The patient sees the ultra sound scanning machine and complains that some high-pitched sound is being heard from the machine which is disturbing him. Is the patient saying true or false?

(a) true (b) false (c) sometimes true (d) sometimes false

25. We have seen torch/pencil batteries in our life and we have used it also. Why is there a small projection on top of the torch/pencil battery? Tell me the reason

(a) The projection corresponds to positive side and the other side negative

(b)The projection corresponds to negative side and the other side positive

(c) I haven't noticed the same (d) I don't know the reason

26. The mosquito is buzzing with an irritating sound. We cannot bear the buzzing sound of the mosquito. The mosquito buzz is heard from which part of the mosquito?

(a) wings (b) legs (c) mouth (d) antenna

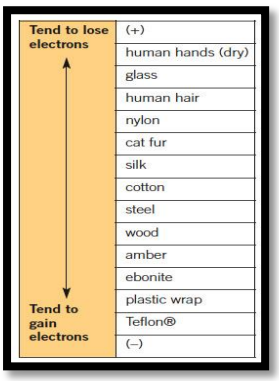
4. Analysing: Non Verbal

27. Here you can see many things and a sick earth.

A car is there, a loud speaker is there, an ambulance is there, musical instruments are there. All are producing sound.

What is making earth to be sick and cover the imaginary ears?

(a) Sound pollution (b) Air pollution (c) Water pollution (d) Soil pollution



28. Here you can see an image.

The series explains about acquiring electric charges by certain objects on contact with suitable other objects. Some objects on contact with other object gain positive charge while others gain negative charges.

Observe the series carefully and answer the statement.

Human dry hands are more towards ..... charge and when contacted with suitable objects tend to lose electrons for acquiring ..... charges

(a) Positive, negative (b) Positive, positive
(b) Negative, positive (d) Negative, negative

Analysing: Verbal

29. The word meaning of **'static'** refers to:

(a) Stationary (b) different (c) dynamic (d) equal

30. A girl is climbing hill along with her friends. They reached on top of the hill where there was nothing other than them. They were little afraid of the dark silence there and started screaming. They really got afraid when they heard their screams back. They repeated their voices. One girl made a noise she heard it back, another girl also did the same and she also heard the same. They were really afraid that they ran back to their homes. What could be that? Can you tell?

(a) Sound (b)Echo (c)Loudness (d) Pitch

31. Have you ever observed the high volt electric power cable lines? Some birds die away in those cable lines while some other birds don't die and sit easily on those high-power lines. How is it possible? Tick the correct statement

(a) When the birds sit on one single high-power line, there is no potential difference, so they don't get a shock and hence don't die

(b) When the birds flap their wings, they touch both the high-power cable lines, there comes a potential difference and hence they don't get an electric shock and don't die

(c) Whenever the birds sit on power lines they don't die

(d) When the birds having the capacity to absorb electricity sit on those power lines, they don't die

32. Have you noticed musical instruments that you, see?

Tabla, the musical instrument has a tight and firm film over it. A Guitar has tight strings. A violin also has different metal string wires. How does this affect sound?

(a) Sound depends upon the nature, tightness and surface area of the sound sources

(b) Sound does not depend on the nature, tightness and surface area of the sound sources

(c) Sound has no role in it

(d) Sound has no specific conditions to be heard from the sound sources

33. In our house hold electrical connections, we can see different coloured wires emerging out from our switch boards. These wires have a certain purpose. We know that flow of electrons causes electricity and these electric charges flow through a live wire. There is also another neutral wire that carry no charges and an earth wire that is connected to earth which helps to absorb extra charges and give that to earth. What are the usual colours of these live, neutral and earth wire?

(a) live =red, neutral = blue or black, earth = green

(b) live =green, neutral = blue or black, earth = red

(c) live =blue or black, neutral = red, earth = green

(d) live =red, neutral =green, earth = blue or black

34. A hospital and a school premise are to kept pollution free. A procession is being planned by some social activists and the procession is camping near a school. The people who are in the procession are raising their voices against some natural calamity and inviting the government attention to the same. The sound is too high that the school was unable to function that day. This is a violation of .....

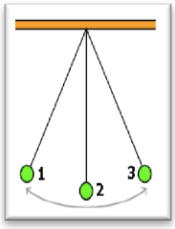
(a) environment conservation (b) social norms (c) sound free zone rules (d) child rights

5. Evaluating Visual: Non Verbal

35. Here is an image. Identify the same and answer correctly

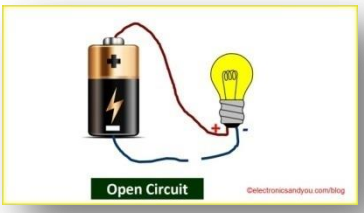
(a) Electric post and high power lines
(b) Lightening rescue conductor
(c) Lightning rescue device
(d) None of these

36. Identify this image and correctly answer. Where have you seen such an arrangement?



(a) Clocks
(b) Electric appliances
(c) Television
(d) None of these

37. Given is a diagram of an open circuit



Study the circuit and state whether the bulb will glow or not.

(a) Bulb will glow (b) Bulb will not glow

(c)Bulb will glow bright (d) Bulb will glow in a dim light

Evaluating Auditory : Non Verbal

38. An elephant standing in the temple festivals sometimes get irritated and run around in the festival thus creating chaos and fear among all the people who has come to see the colourful festival. This image is showing such a mad elephant.

The elephant gets irritated due to the:

(a) Rush, crowd, heat and noise (b) Silence and darkness

(c) Heaviness of the elephant (d) None of these

39. As some people get older, the power of hearing in them reduces to a great extent. The muscles of their ear get weaker and thus they wear some special appliances inorder to hear the sound clearly. You can see the image of such an appliance.

Identify this appliance that is used to process auditory signals and amplify the same to let the person hear clearly.

(a) Hearing aid (b) speaker (c) head phones (d) micro phone

40. A balloon bursts and pops when a child starts it to blow hard. The child was so afraid of the sound it made. He joined the pieces of balloon together and pasted it using a tape and then tried to blow it again but again in the same place the balloon bursts out and that there was a hole in the exact same place where he had pasted a tape.

The sound of bursting balloon was heard to the child because:

(a) the air inside the balloon popped out (b) the balloon is a sound source

(c) the balloon is made up of something strange material (d) don't know

41. The picture below shows a wonderful Indian percussion instrument which you all might have seen and heard. This produces different sounds because of the different levels of water placed inside the glass vessels. The music produced from this is sweet and nice to hear. What is the instrument?

(a) veena (b) sitar (c) jaltarang (d) tabla

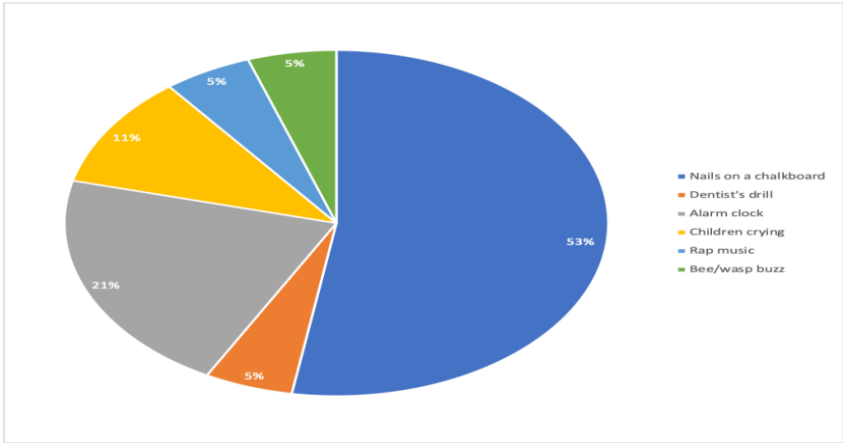
42. Here is the image of an old clock. You might have seen so many clocks right. Digital clocks, Analogclocks but this one is called a Pendulum clock. Here one complete to and fro swing of the pendulum makes an oscillation.

A ticking sound is heard from the clock and it completes a second or when the pendulum inside it completes:

(a) 1 oscillation (b) 10 oscillations (c) 30 oscillations (d) 60 oscillations

6. Creating: Non Verbal

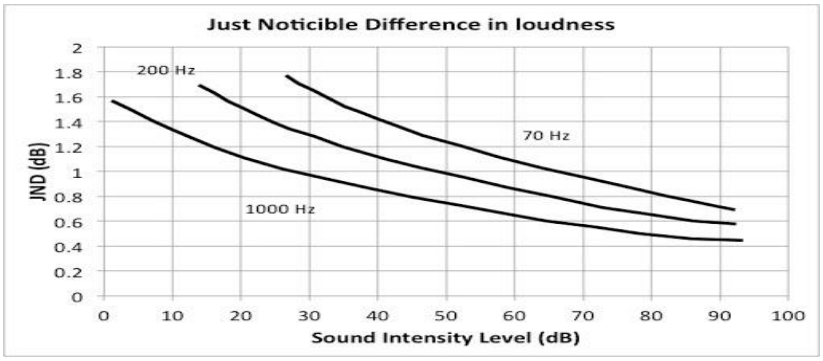
43. Which one is causing the worst sound and is attributing to sound pollution most



(a) Nails on a chalkboard (b) Bee/ wasp buzz (c) Rap music (d) Alarm clock

44. Look at the following graph levels. Given below are the different sound levels with Hertz(Hz) as the unit of frequency of the sound producing source and dB as the unit of sound. Frequency is termed as the number of vibrations or oscillations the sound producing source makes in a second (s) of time. The unit of frequency is Hertz which is denoted as Hz.

Identify which one is having maximum sound



(a) 70 Hz (b) 200 Hz (c) 1000 Hz (d) none of these

Creating: Verbal

Rearrange the following words to get meaningful terms which are familiar to you. The words are based on the concepts of sound and static electricity. Write your answers in the space provided.

45. liniov= .....

47. ghtningli=.....

46. hunterd=.....

48. tyicirteelc=.....

49. Calculate the result:

When a swing moves to and fro 30 times in 30 seconds what is the time taken by the swing to complete one to and fro motion

(a) 1 s (b) 30 s (d) 2 seconds (d) 60 seconds

50. Interpret the statement given and answer the question that follows.

'A unit amount of charge passes through a conductor in unit time. '

How much is the net charge passing through that conductor in 1 second?

(a) 1 unit (b) 2 units (c) 0 unit (d) no units

ANSWER KEY FOR FINAL DRAFT OF PREVIOUS KNOWLEDGE TEST

QUESTION NO:	ANSWER	MARKS
1	Statement 1, (a) and (b) are natural sound sources and (c) and (d) are artificial sound sources	1
2	A, regular, irregular	1
3	A, air	1
4	B, lightning	1
5	B, peacock	1
6	battery	1
7	B, sound waves	1
8	water	1
9	D, 2, 3 and 4 are false and 1 is true	1
10	A, singer	1
11	A, electric shock	1
12	B, low pitched	1
13	D, balloon is attracted to the wall	1
14	A, Dog can hear very high pitched sounds, trainer cannot	1
15	B, Theory of gravitation	1
16	A, Bharathnatyam	1
17	A, True	1
18	A, Energy	1
19	A, electric shock	1
20	A, electricity	1
21	C, adjusting length	1
22	A, the steel utensils were of different shape and size	1
23	B, No	1
24	B, False	1
25	A, The projection corresponds to positive side and the other side negative	1
26	A, Wings	1
27	A, Sound pollution	1
28	B, Positive, positive	1
29	A, stationary	1
30	B, echo	1
31	A, When the birds sit on one single high power line, there is no potential difference, so they don't get a shock and hence don't die	1
32	A, Sound depends upon the nature, tightness and surface area of the sound sources	1
33	A, live =red, neutral = blue or black, earth = green	1
34	C, sound free zone rules	1
35	A, Electric post and high power lines	1
36	A, clocks	1
37	A, Rush, crowd, heat and noise	1
38	A, Hearing aid	1
39	A, the air inside the balloon popped out	1
40	B, Bulb will not glow	1
41	C, jal tarang	1
42	A, one oscillation	1
43	C, Rap music	1
44	C, 1000 Hz	1
45	violin	1
46	thunder	1
47	lightning	1
48	electricity	1
49	A, 1s	1
50	A, 1 unit	1
TOTAL		**50**

Class: VIII

Strength: 40

APPENDIX V B SCIENCE PROCESS SKILL TEST

Time: 2 hour

Marks: **(1X60=60)**

1. OBSERVING

1. The students are given picture cards of the following images. They are asked to identify the high pitched voice from the given cards and then mark their answers on the score sheet.

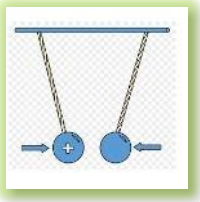



(a) Male voice (b) Lion roar (c) Drum sound (d) Cuckoo sound

2. The students are given a plastic scale which is combed and rubbed on a dry hair. They are asked to observe the phenomenon happening when it is brought near some small paper pieces. This phenomenon of paper pieces getting attracting to the comb is due to .....

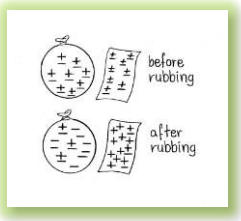
(a) Electrostatic conduction (b) Static electricity

(c) Magnetic induction (d) mutual attraction



3. The students are shown a flash card where two pith balls are attracted to each other. The object that was brought into contact was a positively charged pith ball. The balls attracted each other because the other pith ball was having ..... charge.

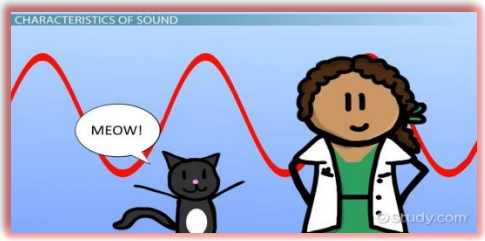
(a) positive (b) negative (c) neutral (d) none of these

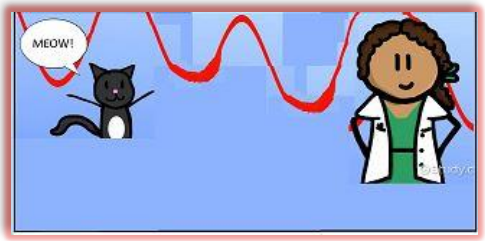


4. A balloon and a sweater shirt are given to the students. On rubbing the balloon with woollen cloth, the balloon gets a ..... charge

(a) positive (b) negative (c) neutral (d) none of these

5. Two cards are shown to students. In the first one the girl is standing near to the cat and in the second one the girl is standing at a distance with the cat. They are asked to identify in which situation, the sound is higher. They are asked what will happen to the loudness of sound if the distance between the source and the receiver increases.





(a) Increases (b) decreases (c) no change (d) no relation

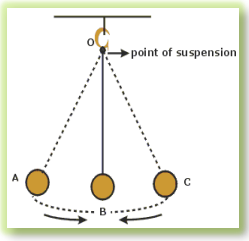
6. Here the students are given a flannel cloth. On rubbing the balloon with the flannel cloth, it loses electrons to the balloon and becomes ..... charged.

(a) positive (b) negative (c) neutral (d) none of these

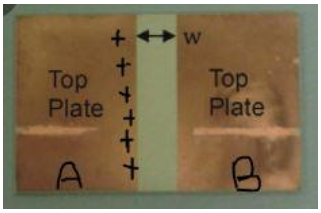
7. Here the students are given a wind bell that is shown below. They are asked to observe the sound of each pipe. Why do each pipe produces different sound?

(a) time difference (b) material difference

(c) length difference (d) nature difference



8. The students are asked to observe the motion of a simple pendulum and identify the mean position given in the figure
(a) A (b) B (c) C (d) O

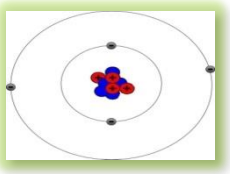


9. Here the students are shown two metallic plates kept side to side. One plate is charged positive and is named as A, and the other plate B is brought in contact with the first plate A. Then, that side of the B plate which is kept near the A plate will get induced with _____ charge.
(a) positive (b) no charge (c) earth (d) negative

10. Students are shown the image of Silent Valley National Park. They are asked the reason why 'Silent Valley national park' is named like that?

(a)No flies and bees (b) No cicadas

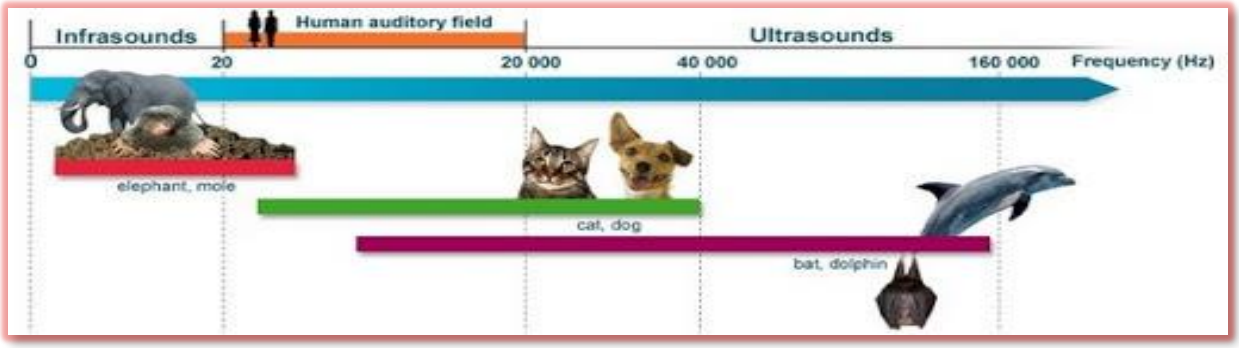
(c) No sound at all (d) None of these



11. The picture chart of the structure of atom is displayed on the wall. They are asked to observe it carefully and to identify the chargeless particle that is present inside every atom.

(a) protons (b) neutrons (c) electrons (d) chargeless

12. Again the students are given a picture chart depicting the sound limits of each living organism. They are asked to observe that carefully and to answer the question that follows.



What is the maximum audible sound range of a human being?

(a) 5000 Hz (b) 10000Hz (c) 15000 Hz (d) 20000 Hz

2. COMPARING

13. The students are asked to compare the table entry given below and identify which pendulum has higher frequency.

SIMPLE PENDULUM	LENGTH	NO: OF OSCILLATIONS	TIME	FREQUENCY
A	60 cms	10	15	0.67
B	80 cms	10	18	0.51

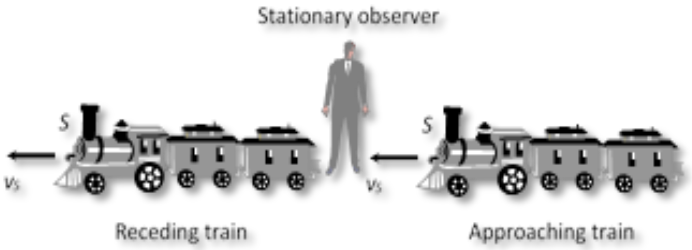
(a) A (b) B (C) Same (D) Cannot be determined

14. The picture cards of a cradle and a swing are shown. They are asked to find out which will move faster?

(a) Cradle
(b) swing

(c) unpredictable
(d) none

15. The students are given a situation. Two trains are passing through a platform of the railway station. Train A is approaching the railway station and Train B is leaving the station. The observer is standing on the platform. According to him, which train will produce more sound?



(a) Train A: Approaching train (b) Train B: Receding Train (c) Same sound (d) Don't know

16. A picture of two neighbouring houses are shown to students, one house, say House A is having their TV antenna earthed and the other house, say House B is having their TV antenna unearthed. They are asked to put a tick mark on the correct house antenna which will act as a lightning rescue conductor when lightning strikes?

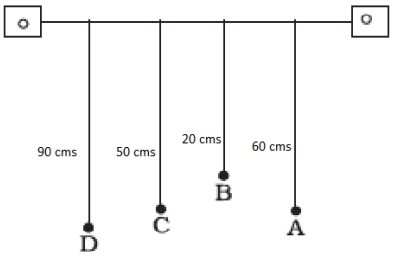
House A House B

(a) House A (b) House B (c) Both will get lightning struck (d) Both will act as lightning rescue

17. Two heated vessels are given to students. One is made up fully of copper and the other is having wooden handles for people to hold it. They are asked to experience which will produce more heat when both of them are held by their handles and tick mark the correct options

A. Vessel with metal handle B. Vessel with wooden handle

(a) A (b) B (c) both doesn't get heated up (d) both will be with same heat

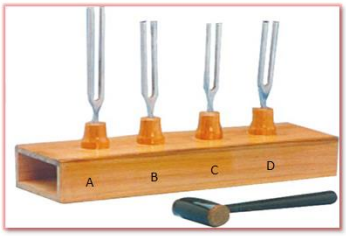


18. The students are given four simple pendulums of varying lengths as shown in the figure. They are asked to find out the simple pendulum having lowest frequency and tick the correct option of their choice

(a) 60cm (b) 20cm (c) 50cm (d) 90cm

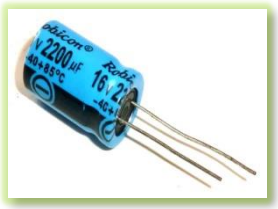
19. The students are given four set of tuning forks and they are asked to select the lowest frequency tuning fork from the group. They are asked to tick the correct option according to their choice.

(a) 266 Hz (b) 512 Hz (c) 480 Hz (d) 288 Hz



20. The students are shown the picture of a lightning rescue conductor and a capacitor. They are asked to compare the two devices. One is lightning rescue conductor and the other is a capacitor

Lightning rescue conductor



Capacitor

Through which activity charge is being discharged in both? Pick the correct choice.

(a) discharging (b) earthing (c) conductor (d) wiring

21. The steel tumblers given below are given to students. All of them are tightly wound by a stretched balloon on top open end of the tumblers. The tumblers are having different diameters. All are tightly tied with the help of a balloon as a diaphragm. Which one will produce louder sound if beaten in the same manner?

(a) A(b) B (c) C (d) D

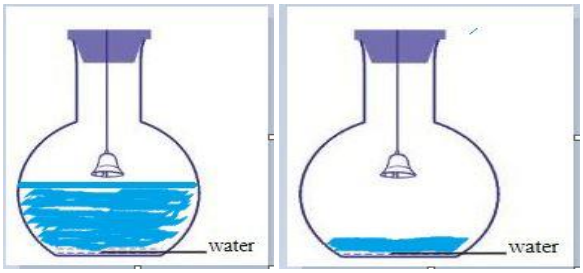
22. The students are shown the images of two boys standing under two different trees during heavy thunder and lightning, one under a mango tree and another boy under a coconut tree. They stand under two different trees since there was heavy rain, lightning and thunder. Both of them have a risk of getting lightning strike since both are outside and not under a safe shelter. But can you identify the boy who is comparatively safe and less prone to lightning accidents? Boy A or Boy B?

Boy A

Boy B

(a) Boy A (b) Boy B

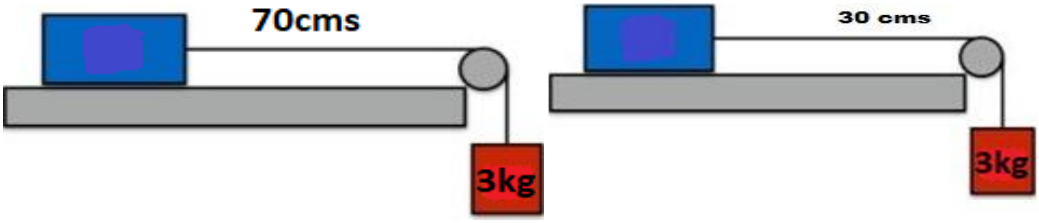
23. The students are given two round bottom flasks filled with different levels of water to compare the sound produced by the bell in both. A small bell is tied to the cap of the two flasks and tied at a same height inside the flasks. Compare the two round bottom flasks. Which one produces more sound when the bell tied inside the flasks are tied to ring? They are asked to tick the options of their choice



Flask A Flask B

(a) Flask A (b) Flask B (c) No sound from both the flasks (d) Same sound from both flasks

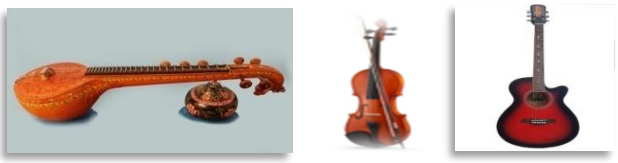
24. The students are given two wires of same material, one of 70 cms and other of 30 cms. Both of them are fixed at the blue support and a 3 kg weight is suspended from them at the same height. They are asked to compare the two similar material strings of different lengths from the fixed support but at same length from the point of suspension and hanging two equal weights of 3 kg from the point of suspension. Which one according to you has got the higher frequency?



(a) Wire 1of 70 cms (b) Wire 2 of 30 cms (c) same for both (d) can't predict the result

3. CLASSIFYING

Students are shown some picture cards. All the entries that are shown to them belong to a same classification. Students are instructed to select a most suitable entry from the options given below so that it can join with the other entries.

25. 

(a)  (b) (c)  (d) 

26.   

(a)  (b)  (c)  (d) 

Here the students are given a table to label andclassify the sounds given under music and noise

SOUNDS	CLASSIFICATION
27. Air horn, Traffic block	
28. Sitar, Jaltarang	

29. The students are made to hear different man made sounds that are given below and which are created by man. Hence it is called as man-made or artificial sounds.

Sound of rock mining, sound of crackers, sound from loudspeakers.

Then they are asked to pick out another example for man-made or artificial sound from the listed choices

(a) Sound of mosquito (b) sound of motor (c) sound of cuckoo (d) sound of lion

30. A flash card displaying the below picture is shown to students. They are asked whether they have seen this symbol that is given by the traffic authority in our state. They are asked to pick the correct choice of the symbol where they had seen the same.

(a) Forest roads (b) Bus stop (c) Parks (d) Shops

31. A sequence is shown to the students. They are asked to complete the sequence afterreading the sequence of sound propagation. Complete the last step after reading the steps.

- Sound experience can be experienced from a sound producing source.
- When the sound producing source produces sound, it gets into our ears, the hearing organ of organisms
- The hearing experience is possible because sound from the sound source reaches our ears through a .....

(a) Sound (b) Medium (c) Device (d) None of these

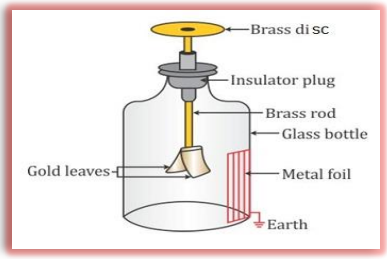
32. Here the sounds of natural sound sources are made audible to the students. There is no artificiality in that. Hence the name as natural sound sources

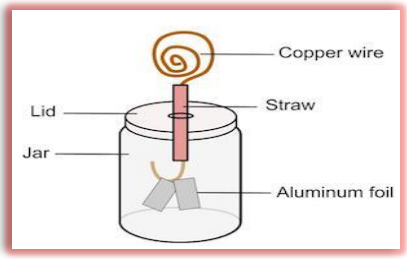
Sound from vocal cords of organisms, sound of thunder, sound of leaves

Then they are asked to give another example for a natural sound source from the list of sources given as choices

(a) Sound of a wind-mill (b) sound of a flute (c) sound of fan (d) sound of a water-fall

33. The students are shown the mages as given below. Here is an image of two electroscopes whose leaves are made up of gold and aluminium.

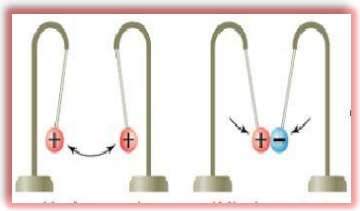




They are asked to identify that the gold leaves and aluminium leaves as:

(a) Semi conductors (b) insulators (c) conductors (d) di- electrics

34. Here is the picture of two pith balls having positive and negative charges shown to the students. Ball A is positively charged and Ball B is negatively charged. Now another pith ball which is positively charged is brought near both these balls. The Ball A repels it and the Ball B attracts it. They are asked to name the principle applicable here?



(a) Like charges repel each other and unlike charges attract each other
(b) Like charges attract each other and unlike charges repel each other
(c) The balls are magnetised
(d) None of these

35. The students are shown the following images listed down and asked to classify the suitable choices to the situations where the sound reflection principle is used and match with the shown images:

Ultrasound scanner, Stethoscope, Theatre Halls

(a) SONAR (b) Radio (c) TV (d) Microscope

36. The students are asked to give the common principle that is used in the below listed items. Classify the choices suitably and select one of them that states common principle used in these items

Capacitor, Electroscope, Lightning rescue conductor

(a) Electricity (b) Charge (c) Earthing (d) Energy

4. MEASURING

37. A measurement chart of the music notes is displayed to the students. They are asked to select the high pitch sound given in this measurement chart and tick the option of their choice.

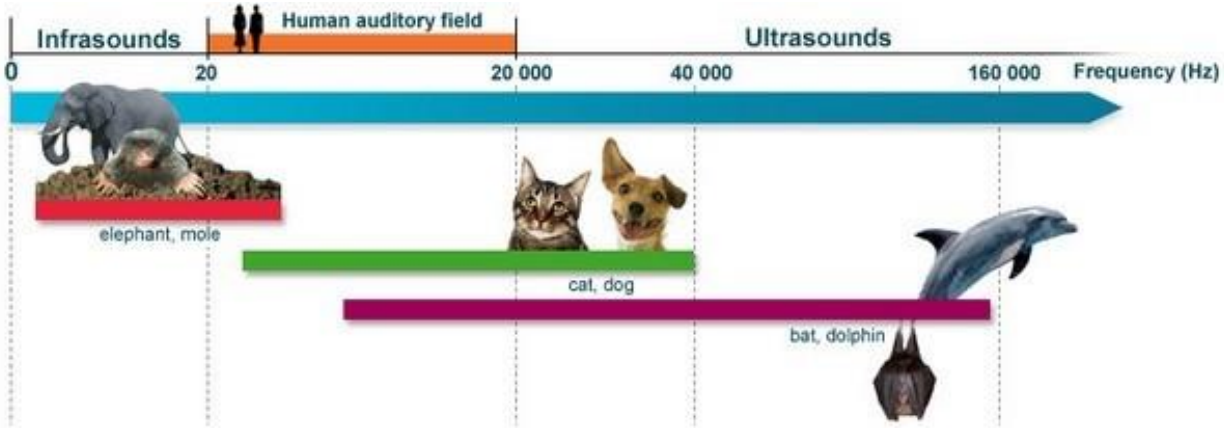
'Sa'	'Re'	'Ga'	'Ma'	'Pa'	'Dha'	'Ni'	'Sa'
240 Hz	270 Hz	300 Hz	320 Hz	360 Hz	400 Hz	450 Hz	480 Hz

(a) 240 Hz (b) 320 Hz (c) 450 Hz (d) 480 Hz

38. Given the students a meter scale. The measurement quantity or unit by which lengths are measured is_____

(a) Coulomb (b) Decibels (c) Meter (d) Farad

39. A measurement range is given to the students. The limits of audibility chart is displayed and the students are asked to select the measurement range that is audible to humans

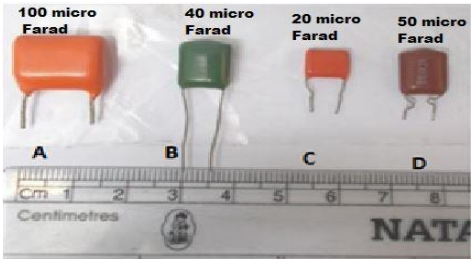


(a) 10-15 Hz (b) 10-10,000 Hz (c) 20- 20,000 Hz (d) 30-30,000 Hz

Here the students are given a table to complete the missing details by making their own simple pendulums

Simple pendulum	No: of oscillations	Time taken for the oscillations (seconds)	Frequency (Hertz)
40. Pendulum A	10	10	_____
41. Pendulum B	100	25	_____

42. The students are shown different types of capacitors. They are asked to write down the capacitor having smallest capacitance:



(a) A, 100 microFarad

(b) B, 40 microFarad

(c) C, 20 microFarad

(d) D, 50 microFarad

The students are given the following table and to answer the questions that follow

REGION	SOUND LIMIT	
DIFFERENT REGIONS	DAY TIME	NIGHT TIME
Industrial Area	75 Hz	70 Hz
Business Trade Area	65 Hz	55 Hz
Housing Colony Area	55 Hz	45 Hz
Silent Area	50 Hz	40 Hz

43. Find out the difference in the sound limit during day and night time in a Housing colony area.

(a) 10 Hz (b) 5 Hz (c) -5 Hz (d) -10 Hz

44. Find out from the table, which area is having the least difference in the sound limit?

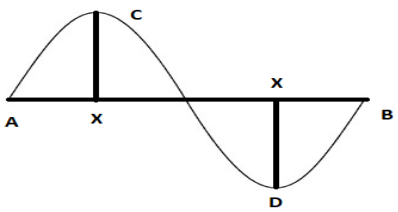
(a) Industrial Area (b) Business Trade Area (c) Housing Colony Area (d) Silent Area

45. Find out in which area the Day time sound limit is high as recorded in the table.

(a) Industrial Area (b) Business Trade Area (c) Housing Colony Area (d) Silent Area

46. Find out in which area the night time sound limit is least as recorded in the table.

(a) Industrial Area (b) Business Trade Area (c) Housing Colony Area (d) Silent Area



47. Here an image of a sine wave is shown to the students. They are asked to measure the total length and height of the wave as shown in the picture. The horizontal length refers to the wavelength and the vertical height refers to the amplitude of the wave. AB is the wavelength and CX, DX is the amplitude of the wave. They are asked to write down the lengths and check the correct option from the options listed below.

(a) AB=5 cms, CX=DX= 2 cms (b) AB=2 cms, CX=DX= 5cms (c) AB= CX=DX= 2 cms (d) AB=CX=DX=5 cms

48. The capacitor image is shown to the students. They are asked to select the leg which is conventionally referred to as positive.

(a) longer leg (b) shorter leg (c) cannot be determined (d) none of these

5. MAKING MODELS

49. The students are shown the below model of a "*Chenda"* a percussion instrument widely used in our state. They are asked to select when is the amplitude of the sound maximum on beating the drum?

(a)on beating slow (b) on beating hard
(c) on wiping (d) on rubbing

50. Given below is the model of a conducting plate brought to class by a student named Ramesh. The students are asked to select the correct option of charge distribution in the conducting plate. How will the charges be distributed in the conducting plate?

(a)  (b)  (c)  (d) 

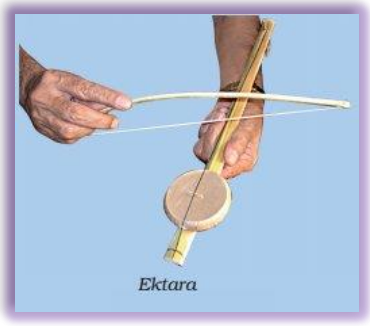
51. Sita has brought this model prepared using sticks and painted beautifully. The model is carefully pasted on a hard board. What is this symbol representing?

(a) Discharging (b) Earth (c) Capacitor (d) Electricity

52. Here you can see the model of a toy telephone that was prepared earlier. Which principle of sound works in this model?

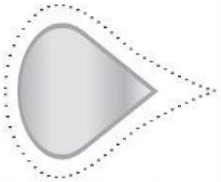
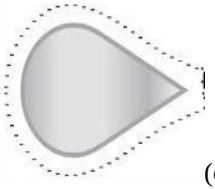
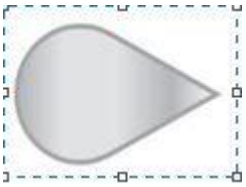
(a)sound characteristics (b) sound reflection
(c) sound pollution (d) sound propagation

53. Here is a model of children's sitar "*Ektara"* made from coconut shells. How sound is produced in this sitar? Which property of the string of the sitar produces loud sound?

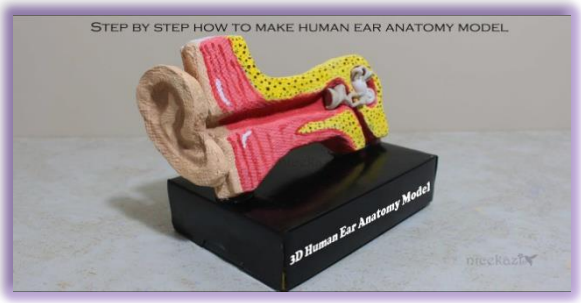


(a)the tightness of the string (b) the medium of the string
(c) the number of strings (d) the oscillation of the strings

54. Given below is the model of a rain drop model which is a conducting surface. How charges are distributed inside this conducting cone?

(a)  (b)  (c)  (d) 

55. Given below is the model of human ear structure



The cochlea which forms an important part of hearing is activated by the _____that reach and strike cochlea and hence sound experience is experienced by human beings

(a) Liquid (b) Sound waves (c) Impulse (d) None of these

56. Rajeev made the following model and brought to class. What is this model?

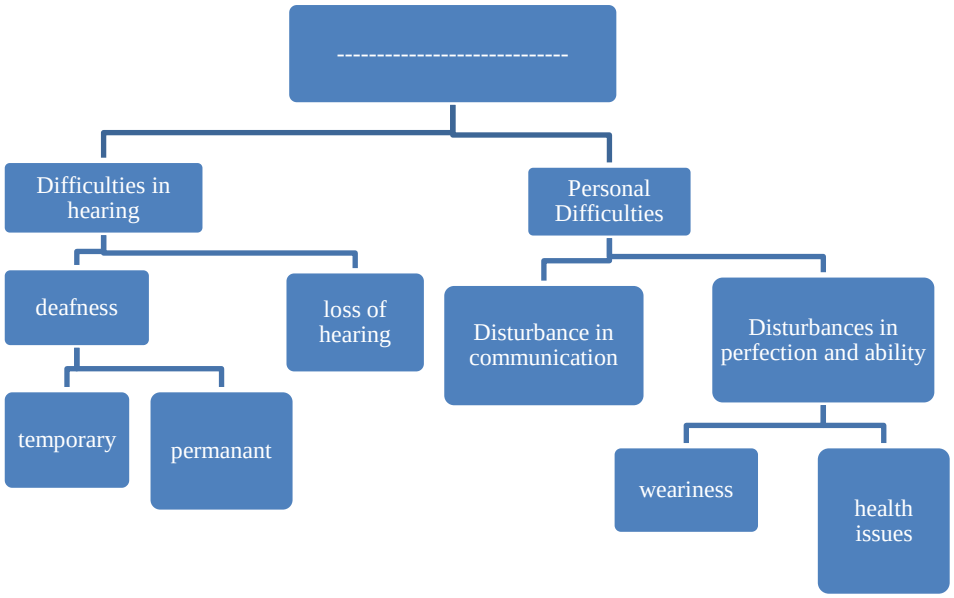
(a)Paper electroscope (b) Galvanoscope
(c) Telescope (d) Periscope

57. Given below is the model of a loud speaker. Which energy transfer is taking place here in this?

(a)Electrical energy to sound energy (b) Electrical energy to light energy

(c) Kinetic energy to sound energy(d) Potential energy to sound energy

58. Given below is the flow chart that is shown to the studentswhich depicts the adverse effects of sound. The flow chart can be titled and written as:



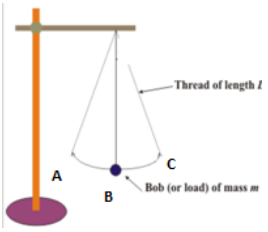
(a) Sound propagation (b) Sound characteristics (c)Sound pollution (d) Sound reflection

59. Given below is the model of stethoscope. What principle of sound is used in a Doctor's stethoscope?

(a) Sound characteristics (b) Sound loudness

(c) Sound propagation (d) Sound shrillness

60. Given below is the model of simple pendulum. The students are asked to identify the men and the extreme positions of the bob from the given choices



a) Mean position=B, Extreme Positions= A,C
b) Mean position=A, Extreme positions =B,C
c) Mean position=C, Extreme positions=A,B
d) Cannot be determined

ANSWER KEY FOR FINAL DRAFT OF SCIENCE PROCESS SKILL TEST

QUESTION NO:	ANSWER	MARKS
1	D, Cuckoo sound	1
2	B, Static electricity	1
3	B, Negative	1
4	B, Negative	1
5	B, Decreases	1
6	A, Positive	1
7	C, Length difference	1
8	B, B	1
9	D, Negative	1
10	B, No cicadas	1
11	B, Neutrons	1
12	D, 20000Hz	1
13	A, A	1
14	B, Swing	1
15	A, Train A: Approaching train	1
16	A, House A	1
17	A, A	1
18	D, 90 cms	1
19	A, 266 Hz	1
20	B, Earthing	1
21	A,A	1
22	A, Boy A	1
23	B, Flask B	1
24	B, Wire 2 of 30 cms	1
25	A, sitar	1
26	A, cicada	1
27	Noise	1
28	Music	1
29	B, Sound of motor	1
30	A, Forest roads	1
31	B, Medium	1
32	D, Sound of a water-fall	1
33	C, conductors	1
34	A, Like charges repel each other and unlike charges attract each other	1
35	A, SONAR	1
36	C, Earthing	1
37	D, 480 Hz	1
38	C, Meter	1
39	C, 20-20000Hz	1
40	1 Hz	1
41	4 Hz	1
42	C, 20 microFarad	1
43	A, 10 Hz	1
44	A, Industrial Area	1
45	A, Industrial Area	1
46	D, Silent Area	1
47	A, AB=5 cms, CX=DX= 2 cms	1
48	A, longer leg	1
49	B, On beating hard	1
50	C	1
51	B, Earth	1
52	D, sound propagation	1
53	A, the tightness of the string	1
54	A	1
55	B, sound waves	1
56	A, paper electroscope	1
57	A, Electrical energy to sound energy	1
58	C, Sound pollution	1
59	C, Sound propagation	1
60	A, Mean position=B, Extreme Positions= A,C	1
TOTAL		**60**

APPENDIX V C SCIENTIFIC ATTITUDE SCALE

Dear students,

As part of my research work I am doing a research on the topic "**EFFECTIVENESS OF EXPERIENTIAL PEDAGOGY ON SCIENCE PROCESS SKILLS, SCIENTIFIC ATTITUDE AND ACHIEVEMENT IN SCIENCE OF SECONDARY SCHOOL TRIBAL STUDENTS IN KERALA."** under the supervision of Dr.H.Indu, Head, Department of Education, Avinashilingam University, Coimbatore. Kindly co-operate with my work and record your answers as directed. Read each statement carefully and mark your response in the corresponding column given as

SA	A	U	D	SD

You are assured that your responses will be kept confidential and will be used solely for my research work. The responses are as follows: SA(strongly agree), A(agree), U(undecided), D(disagree) and SD(strongly disagree). After reading all statements carefully put a tick (✓) mark against the corresponding column

Example:

		Strongly Agree	Agree	Undecided	Decided	Strongly Decided
1	**I love science experiments very much**	✓				

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	I am of the view that all problems can be solved through apt and appropriate application of science.					
2	I am confident in doing scientific experiments and activities.					
3	I love science and its practical applications.					
4	I love to repeat experiments in science till I get a satisfying solution to my objective.					
5	I do not think science is really useful in solving real world problems.					
6	After I have solved a scientific problem, I will look for other supporting activities to substantiate my result.					
7	In my opinion chemical fertilizers are unavoidable for sustainable agriculture.					
8	It is always a practice for me to think and create novel activities from the lessons I have learnt from my science text books.					
9	I think that wearing the same colour clothing every day brings luck in my life.					
10	I do not like to relate my learning experience to the real world problems.					
11	I feel that science as a subject is very much important to understand the happenings in the present day world.					
12	At times I find myself bored doing science activities.					

13	I often consider that it is all fate and that medical sciences have no role in one's life.					
14	It cannot be denied that at times lying can be accepted to establish that science is true.					
15	It is boring experience for me to search and find answers to the mysteries behind the natural phenomena.					
16	I learn more about science and scientific concepts while working on my own.					
17	I get anxious to explore more about planets in the solar system which is not discovered by man.					
18	I receive good grades on science tests and quizzes.					
19	When I see a science problem, I am nervous and perplexed and I feel that I can never solve it.					
20	I am not very eager to participate in scientific discussions that involve my learning experiences.					
21	I believe that Parrot pick cards for predicting future is meaningless.					
22	Science has been my worst ever subject in my academic life					
23	In my opinion black magic is a solution to cure mental diseases.					
24	I don't think, I could do advanced studies in science.					
25	It is useless to find answers for questions that cannot be answered easily is my belief.					
26	In my opinion no further supporting evidence is necessary on matters which we feel to be true.					
27	I need science for finding solutions to my future work.					
28	I am sure that I can learn science in an interesting manner.					
29	"If I happen to see an advertisement of a face cream in the TV which claims that it can enhance fairness and beauty". I will always try to verify claims before buying it..					
30	I am of the view that there are no limits to human abilities.					
31	I dream to become a scientist.					
32	A report about extra terrestrial lives spreads in my locality. I will surely try to seek evidence about it.					
33	I believe that success depends upon luck.					
34	I believe that keeping a scare crow avoid damages that may occur to buildings.					
35	I like filling up cross words in science and that it is an enjoyable hobby doing scientific puzzles and jigsaws.					
36	In my opinion Organ transplantation should be prohibited.					
37	"After the Tsunami disaster, people in some area, decided to stop the use of sea food temporarily ".This decision is reasonable according to my belief.					

38	It is an enjoyable experience for me to observe the life cycle of organisms like journey of a butterfly from pupa.					
39	I believe that something dangerous and horrifying is going to happen if dogs keep on barking at a place.					
40	I am really afraid of old myths and existence of ghosts associated with it.					
41	I believe that guests will come with good gifts if a crow crows.					
42	I think that all questions can be solved by adopting scientific method.					
43	I believe that water scarcity in draught stricken areas can be overcome by extensive digging of bore wells.					
44	I really like to study from real world experiences and that I hate rote learning in science.					
45	According to me there is nothing creative about science, it is just a memorizing of formulae and facts.					
46	I believe in omens, though it is unscientific, it proves to be true for me.					
47	Science at times make me feel uneasy and confused.					
48	I believe that the life style of ancient man was in tune with the nature.					
49	According to me mobile phones should be prohibited suddenly due to the health hazards behind it.					
50	I am afraid that death news will be heard if dogs howl at night.					
51	If I happen to hear about the 'disappearance' of a well in your locality". I will make a visit that place to know about it.					
52	I really enjoy the experience of scientific study tours and field trips to be conducted to learn more about science.					
53	I am of the opinion that science achievements and tests are not necessary for creating scientific awareness.					
54	I believe that science helps in understanding more about nature.					
55	I am of the view that industries and factories pollute the environment and is hazardous for nature preservation.					
56	In my opinion scientific developments must not hamper the nature and our environment.					
57	I think that dams and reservoirs should not be constructed as it is dangerous for environment.					
58	Science is always interesting for me.					
59	I would like to participate in science exhibitions and science fairs.					
60	I don't like to explore the world for further advancements in science.					

APPENDIX V D ACHIEVEMENT TEST IN SCIENCE

Preparation of a Design

1. Weightage to the objectives

Sl. No:	Objectives	Questions	Marks	Percentage
1	Remembering	14	14	28
2	Understanding	12	12	24
3	Applying	11	11	22
4	Analysing	9	9	18
5	Evaluating	3	3	6
6	Creating	1	1	2
TOTAL		50	50	100

2. Weightage to form of questions

Sl. No:	Form of Questions	Questions	Marks	Percentage
1	One word type (OWT)	8	8	16
2	True or False (T/F)	8	8	16
3	Fill in the blanks (F/B)	10	10	20
4	Match the following (M/F)	6	6	12
5	Odd man out (OMO)	10	10	20
6	Give Examples (G/E)	8	8	16
TOTAL		50	50	100

3. Weightage to the difficulty level

Sl. No:	Difficulty level	Questions	Marks	Percentage
1	Easy	9	9	18
2	Average	38	38	76
3	Difficult	3	3	6
TOTAL		50	50	100

4. Weightage to the content

Sl. No:	Contents	Questions	Marks	Percentage
1	Natural Frequency	5	5	10
2	Sound characteristics	6	6	12
3	Sound propagation	4	4	8
4	Hearing/Echo	8	8	16
5	Ear/Audibility	3	3	6
6	Limits of Audibility	5	5	10
7	Static electricity	2	2	4
8	Electric charge	10	10	20
9	Electroscope	2	2	4
10	Earthing	1	1	2
11	Capacitors	2	2	4
12	Thunder/Lightning	2	2	4
TOTAL		50	50	100

BLUE PRINT

OBJECTIVES	REMEMBERING					UNDERSTANDING						APPLYING					
Contents/Form of Questions	OWT	T/F	F/B	M/F	OMO	G/E	OWT	T/F	F/B	M/F	OMO	G/E	OWT	T/F	F/B	M/F	OMO	G/E
Natural Frequency				1(1)									1(1)		1(1)			
Sound characteristics			1(1)					1(1)	1(1)							1(1)		
Sound propagation						1(1)								2(1)				
Hearing/Echo	1(1)					1(1)	1(1)					1(1)						2(1)
Ear/Audibility		1(1)									1(1)							1(1)
Limits of Audibility			2(1)					1(1)										
Static Electricity											1(1)		1(1)					
Electric charge	1(1)			1(1)	1(1)			1(1)	2(1)	1(1)							1(1)	1(1)
Electroscope						1(1)												
Earthing																		
Capacitors			1(1)	1(1)														
Thunder/Lightning								1(1)										
Total Questions in the Domain	14					12							11					
Total Marks in the Domain	14					12							11					

Numbers outside the bracket indicates the number of questions
Numbers inside the bracket indicates the mark each question carries

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BLUE PRINT

ANALYSING						EVALUATING						CREATING						Total Questions in the Content	Total Marks in the Content
OWT	T/F	F/B	M/F	OMO	G/E	OWT	T/F	F/B	M/F	OMO	G/E	OWT	T/F	F/B	M/F	OMO	G/E		
	1(1)							1(1)										5	5
1(1)				1(1)														6	6
		1(1)																4	4
				1(1)		1(1)												8	8
																		3	3
			1(1)							1(1)								5	5
																		2	2
				1(1)														10	10
				1(1)														2	2
				1(1)														1	1
																		2	2
												1(1)						2	2
9						3						1						50	
9						3						1							

Numbers outside the bracket indicates the number of questions
Numbers inside the bracket indicates the mark each question carries

SCIENCE ACHIEVEMENT TEST (Final Tool)

Class: VIII

Time: 1 hour

Strength: 40

Marks : (1 x 50 = 50)

I. Answer the following by selecting the most appropriate option given below each question

1. What is the frequency of a pendulum completing 10 oscillations in 10 seconds?
   (a) 1 Hz (b) 2Hz (c) 3Hz (d) 10 Hz

2. What vibrates and produces sound in a flute?
   (a) bamboo (b) air (c) holes (d) material

3. Why do we hear sound when a hacksaw blade is vibrating?
   (a) because of the air (b) because of higher frequency (c) because of lower frequency
   (d) because of static electricity

4. Why does the sound pitch become low when the vocal cord length increases?
   (a) frequency increases (b) frequency decreases
   (c) because of more air (d) because of less air

5. When we bring our ears near to an iron road and strike the other end of the iron rod with another iron rod why do we hear sound?
   (a) sound characteristics (b) sound transmission (c) sound pitch (d) sound loudness

6. Which charge is received by an object receiving an electron?
   (a) positive (b) negative (c) neutral (d) none of these

7. When a new freshly ironed polyester shirt is worn on our body, we experience our body hairs sticking on the shirt. Why does this happen?
   (a) Static electricity (b) Potential energy (c) Kinetic energy (d) Magnetism

8. What strikes first? A thunder or lightning on a rainy season? Why does this happen?

(a) Thunder, Sound transmission (b) Lightning, Sound transmission

(c) Lightning, Speed of light (d) Thunder, Speed of light

II. State True or False

9. Sound propagates through a medium

(a) True (b) False

10. Sound is produced due to the vibrations in objects

(a) True (b) False

11. The lowest range of sound frequency that humans can hear is 20 Hz

(a) True(b)False

12. The sound waves that fall below the frequency of 20 Hz are called as ultrasonic sound waves

(a) True (b) False

13. Bats move in night by using the principle of reflection of sound

(a) True (b) False

14. Copper is an excellent example for a conductor of electricity

(a) True (b) False

15. Lightning does not strike twice at the same place

(a) True (b) False

16. A simple pendulum frequency cannot be measured accurately

(a) True (b) False

III. <u>Fill in the blanks with suitable words given as cues under each statement</u>

17. Sound is expressed in ----------units

(a) dB (b) w/m^2 (c) c (d) F

18. The frequency of a wave which is travelling through a point as one wave per second can be found out and recorded as .....

(a) 1 Hz (b) 2Hz (c) 0Hz (d) 3Hz

19. ----------waves are formed during an earthquake

(a) radio waves (b) infrasonic waves (c) ultrasonic waves (d) x-ray waves

20. Frequency: Pitch:Loudness: ----------

(a) intensity (b) tone (c) vibration (d) amplitude

21. The equipment that is used to measure distances with the help of sound waves is

(a) RADAR (b) SONAR (c) INSAT (d) SCAN

22. When an explosion happens in the surface of moon, we cannot hear that sound because there is no ----------in moon.

(a) Water (b) air (c) fire (d) sky

23. The device that is used to store electric charges is known as ----------.

(a) Resistor (b) Inductor (c) Capacitor (d) Magnet

24. Electric charge is a ---------- quantity

(a) vector (b) scalar (c) charged (d) chargeless

25. Charging by induction is a process where charges are transferred between two objects by

(a) touch (b) contact (c) no contact (d) none of these

26. A tuning fork has a frequency labelled in it as 256 Hz. This means that the tuning fork makes ----------vibrations in one second.

(a) Below 256 (b) Above 256 (c) 256 (d) none of these

IV. Match the following

Column A	Column B
27. SI unit of charge	farad
28. High frequency sound waves	sound pollution
29. Charge less particle inside atom	ultrasonic
30. SI unit of capacitance	hertz
31. Air horn	Coulomb
32. SI unit of frequency	neutron

V. Circle the odd man out

33. Proton, Neutron, Electron, Sound
34. Wood, Iron, Rubber, Plastic
35. Male sound, Cuckoo sound, Cicada sound, Female sound
36. Sound, Electricity, Heat, Oscillation
37. Earth wire, Plastic wire, Live wire, Neutral wire
38. Infrasonic Ultrasonic, Human audible, Thunder
39. Loudspeaker, Air horn, Rain sound, Vehicle sound
40. Gold leaf electroscope, Paper electroscope, Aluminium foil electroscope, Microscope
41. Positive, Electricity, Negative, Neutral
42. Loudness, Noise, Pitch, Frequency

VI. Give examples

43. A man made sound:

(a) Violin sound (b) Rain sound (c) Thunder sound (d) Water fall sound

44. A high pitched voice

(a) Cuckoo song (b) Duck quack (c) Sheep bleat (d) Mouse nibble

45. A device used to detect the presence of static charges

(a) Microscope (b) Telescope (c) Electroscope (d) Kaleidoscope

46. A device that amplifies sound

(a) Scanner (b) Plotter (c) Amplifier (d) Microphone

47. A device working in the principle of reflection of sound

(a) Pan flute (b) Whistle (c) Stethoscope (d) Electroscope

48. An insulator

(a) Copper (b) Aluminium (c) Wood (d) Silver

49. A low frequency sound

(a) Duck quack (b) Female voice (c) Cicada sound (d) Whistle sound

50. An example of frequency in the range of audible sound to humans

(a) 10 Hz (b) 25000 Hz (c) 14 Hz (d) 250 Hz

ANSWER KEY FOR FINAL DRAFT OF ACHIEVEMENT TEST

QUESTION NO:	ANSWER	Marks
1	A, 1 Hz	1
2	B, Air	1
3	B, Because of higher frequency	1
4	B, Because frequency decreases	1
5	B, Sound Transmission	1
6	B, Negative	1
7	A, Static Electricity	1
8	C, Lightning, Speed of Light	1
9	A, True	1
10	A, True	1
11	A, True	1
12	B, False	1
13	A, True	1
14	A, True	1
15	B, False	1
16	B, False	1
17	A, dB	1
18	A, 1 Hz	1
19	B, Infrasonic Waves	1
20	D, Amplitude	1
21	B, SONAR	1
22	B, Air	1
23	C, Capacitor	1
24	B, Scalar	1
25	C, No Contact	1
26	C, 256	1
27	Coulomb	1
28	Ultrasonic	1
29	Neutron	1
30	Farad	1
31	Sound Pollution	1
32	Hertz	1
33	Sound	1
34	Iron	1
35	Male sound	1
36	Oscillation	1
37	Plastic Wire	1
38	Thunder	1
39	Rain Sound	1
40	Microscope	1
41	Electricity	1
42	Noise	1
43	A, Violin Sound	1
44	A, Cuckoo Song	1
45	C, Electroscope	1
46	C, Amplifier	1
47	C, stethoscope	1
48	C, Wood	1
49	A, Duck Quack	1
50	D, 250 Hz	1
TOTAL		**50**

APPENDIX V E Focus group interview schedule on ELPSS for teachers

1. How effective is ELPSS to the students:
2. How do you rate the activities and experiences in the ELPSS?
3. Do you find any activities in the ELPSS as boring and uninteresting?
4. Have you got any comment on the time frame of the ELPSS package?
5. Can you tell any appreciable change has happened in your students after the ELPSS administration?
6. Will there be any difficulties in transacting the curriculum if the ELPSS package is to be taught by you?
7. According to you, are the activities and experiences given in the ELPSS package student centric?
8. How do you rate the student progress in science achievement before and after the ELPSS package administration?
9. Do you find the students more active and curious after the ELPSS package administration?
10. Which method do you prefer to teach, the experiential learning method or the traditional method? Why do you think that way? Please give your opinions.
11. Do you have any suggestions or opinions that can help improve the effectiveness of ELPSS package in student achievement and attitude?

APPENDIX V F ELPSS Focus Group Interview Schedule

1. Did you enjoy the activities and experiences in the package?
2. What did you enjoy in ELPSS, an indoor experience or an outdoor experience?
3. What are the advantages that you appreciate in the ELPSS package?
4. Were the activities and the experiences provided in the ELPSS package interesting?
5. Is it interesting to learn when you are taught science using locally available materials?
6. Whether the materials used for the activity suited the learning objectives?
7. What were the activities that you felt difficult?
8. Which were the activities that were not completed on time?
9. What were the reasons for not completing those activities on time?
10. Did you involve seriously in the extended learning activities?
11. What were the methods used by the researcher in sparking curiosity in you?
12. Do you think that the teaching using package like ELPSS will help you score good marks?
13. Do you think that the teaching using package like ELPSS will help you gain practical knowledge
14. How well can you relate the activities with the daily life?
15. What are the limitations that you felt in the ELPSS package?
16. What are your suggestions for improvement of the ELPSS package?

APPENDIX V G REFLECTION OF THE RESEARCHER ON ELPSS

1. Details on conduct of the study
2. Activities that the students were very much interested to participate and complete
3. Activities that the students lacked interest in took time in completing
4. Activities that cannot be completed on time
5. The process skills of the students those are noteworthy after the completion of ELPSS
6. The difficulties faced by the researcher on the successful implementation of ELPSS
7. Contents completed successfully and effectively during the ELPSS
8. Contents that took time in completing
9. Conclusion

KOLB LEARNING STYLE INVENTORY (ADAPTED VERSION)

Name..... Name of the School..... Std.....

Twelve incomplete statements are given below. Four different descriptions are also given against each incomplete statement. Kindly complete all statements by writing the appropriate number in the box given above each description of a statement

Example **4 = most** like you **1 = least** like you

Eg:	When I learn	2 I am happy	4 I am careful	1 I am fast	3 I am logical
1.	When I learn	☐ I like to relate with my experience	☐ I like to relate with my ideas	☐ I like doing things	☐ I like to watch and listen
2.	I learn best when	☐ I listen and watch carefyully	☐ I rely on logical thinking	☐ I trust my ideas and experience	☐ I work hard to getthings done
3.	When I am learning	☐ I do not relate with things	☐ I relate with facts	☐ I am quiet and reserved	☐ I think and respond in my own way
4.	I learn by	☐ experience	☐ doing	☐ watching	☐ thinking
5.	When I learn	☐ I consider all diamensions of problems	☐ I look at all sides of issues	☐ I like to analyse things	☐ I like toexperiment things
6.	When I am learning	☐ I am an observing person	☐ I am an active person	☐ I am an intutive person	☐ I am a logical person
7.	I learn best from	☐ Observation	☐ Personal relationship	☐ rational theories	☐ experiment and practice
8.	When I learn	☐ I like to see the results	☐ I like ideas and theories	☐ I take myown time before acting	☐ I feel personally involved in things
9.	I learn best when	☐ I rely on my observations	☐ I rely on my experience	☐ I rely on my experiment	☐ I rely on my ideas
10.	When I am learning	☐ I am a reserved person	☐ I am an accepting person	☐ I am a responsible person	☐ I am a rational person
11.	When I learn	☐ I get involved	☐ I like to observe	☐ I evaluate things	☐ I like to be active
12.	I learn best when	☐ I analyze ideas	☐ I am receptive	☐ I am careful	☐ I am practical

KOLB LEARNING STYLE INVENTORY (SCORING KEY)

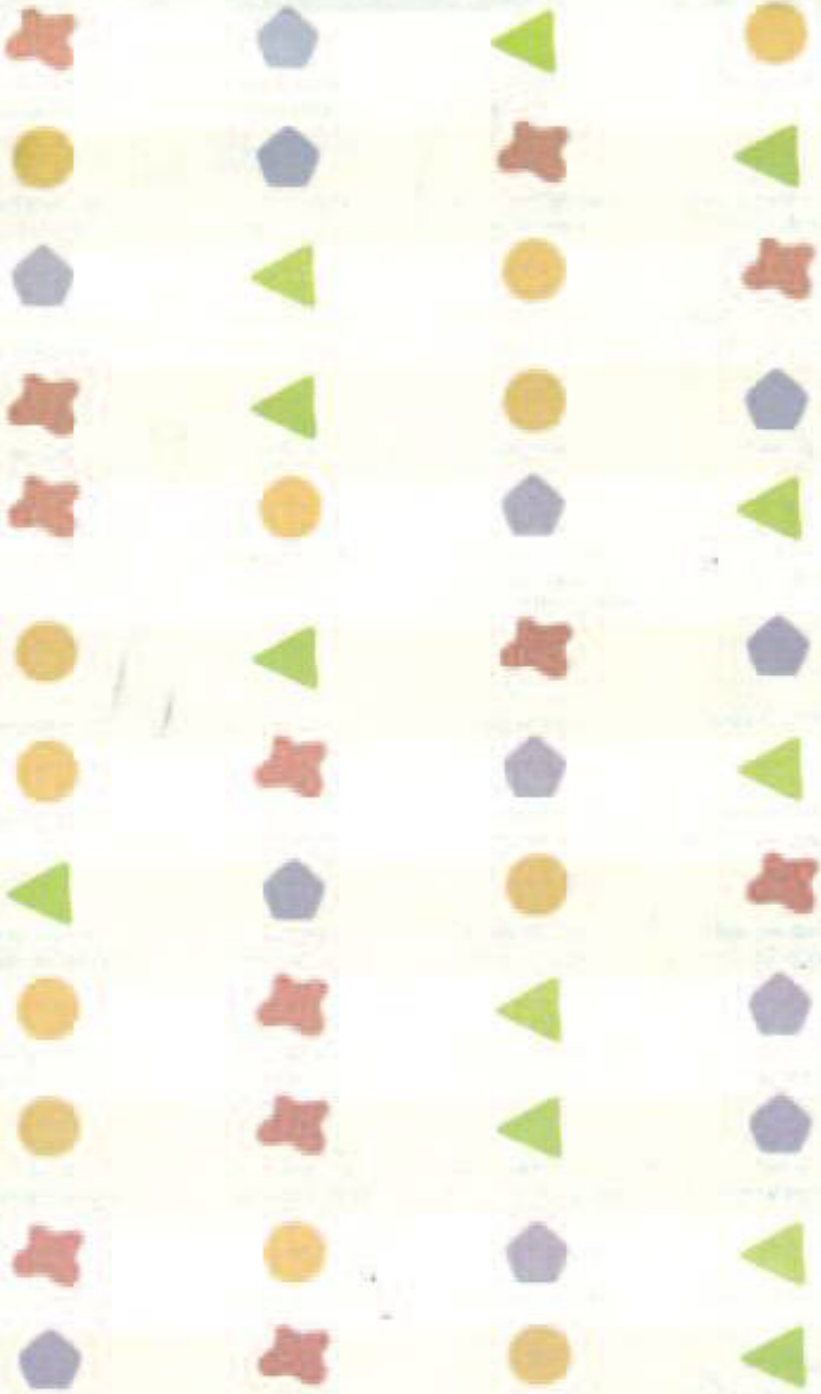
Scoring the LSI

Total for AC _____ Total for CE _____

Total for AE _____ Total for RO _____

Add up each of the 12 numbers you gave to AC and write the total in the space next to **Total for AC**.

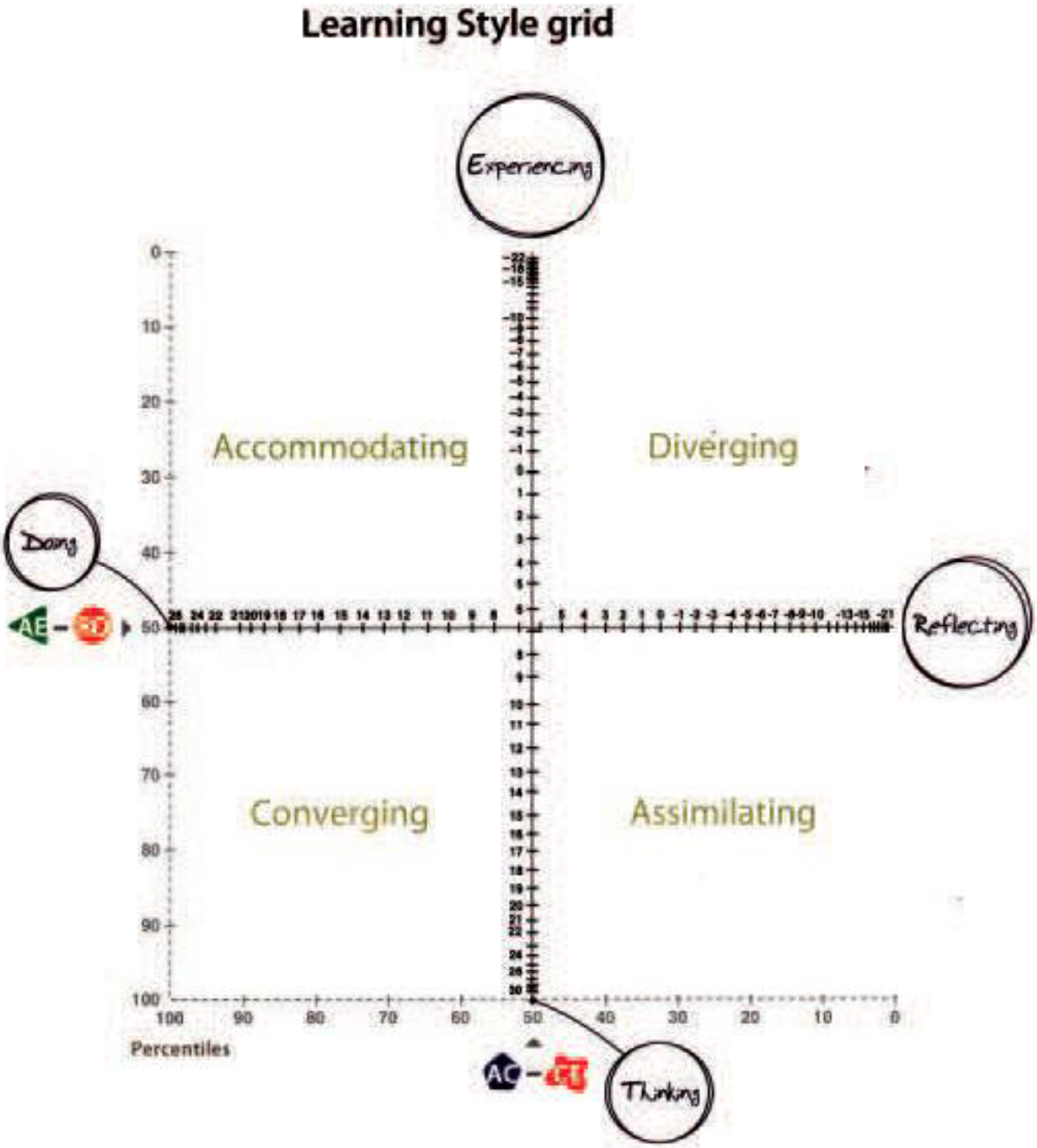
Then do the same for RO, CE, and AE.



Hint: Each shape should have a total score in the range of **12-48**.

Your four shape scores should add up to a total of **120**.

KOLB LEARNING STYLE INVENTORY



KOLB LEARNING STYLE INVENTORY
(Adapted Version)

വിദ്യാർത്ഥിയുടെ പേര് : ..... ക്ലാസ്സ് : .....

സ്കൂളിന്റെ പേര് : ..... വിഭാഗം : .....

ക്ലാസ്സ് നമ്പർ : .....

അപൂർണ്ണങ്ങളായ 12 പ്രസ്ഥാവനകളാണ് താഴെ കൊടുത്തിട്ടുള്ളത്. ഓരോന്നിനും നേരേ നാല് വ്യത്യസ്ഥ അഭിപ്രായങ്ങൾ കൊടുത്തിട്ടു്. അഭിപ്രായങ്ങളെ സൂചിപ്പിക്കുന്ന അനുയോജ്യമായ സംഖ്യ ബോക്സിൽ രേഖപ്പെടുത്തുക.

4 - നിങ്ങൾക്ക് ഏറ്റവും സ്വീകാര്യമാണ്. **1 - നിങ്ങൾക്കു കുറച്ച് സ്വീകാര്യമാണ്.**

ഉദാ: **ഞാൻ പഠിക്കുമ്പോൾ**

a. സന്തോഷവാനാണ് [2] .

b. ശ്രദ്ധാലുവാണ് [4]

c. തിടുക്കമുള്ളവനാണ് [1]

d. യുക്തി ചിന്തയുള്ളവനാണ്. [3]

1. ഞാൻ പഠിക്കുമ്പോൾ

a. വ്യക്തിപരമായ അനുഭവങ്ങളോട് ബന്ധിപ്പിക്കുവാൻ ആഗ്രഹിക്കുന്നു ☐

b. ആശയങ്ങളുമായി ബന്ധിപ്പിക്കുവാൻ ആഗ്രഹിക്കുന്നു ☐

c. പ്രവർത്തിച്ചു പഠിക്കുവാൻ ആഗ്രഹിക്കുന്നു ☐

d. കേൾവിയും നിരീക്ഷണവും ആഗ്രഹിക്കുന്നു. ☐

2. ഞാൻ ഏറ്റവും കാര്യക്ഷമമായി പഠിക്കുന്നത്

a. സൂഷ്മമായി കേൾക്കുകയും നിരീക്ഷിക്കുകയും ചെയ്യുമ്പോൾ ☐

b. യുക്തിസഹമായ രീതിയിൽ ചിന്തിക്കുമ്പോൾ ☐

c. വ്യക്തിപരമായ തോന്നലുകളോടും അനുഭവങ്ങളോടും വിശ്വസ്തത തോന്നുമ്പോൾ ☐

d. കഠിനാദ്ധ്വാനത്തോടെ പരിശ്രമിക്കുമ്പോൾ ☐

3. ഞാൻ പഠിച്ചുകൊിരിക്കുമ്പോൾ

a. വസ്തുതകളുമായി ബന്ധിപ്പിക്കാറില്ല ☐

b. വസ്തുതകളുമായി ബന്ധിപ്പിക്കുന്നു ☐

c. വസ്തുതകളെപ്പറ്റി ചിന്തിക്കാറേയില്ല ☐

d. വസ്തുതകളെപ്പറ്റി എന്റേതായ രീതിയിൽ ചിന്തിക്കുകയും പ്രതികരിക്കുകയും ചെയ്യുന്നു ☐

4. ഞാൻ പഠിക്കുന്നത്

a. അനുഭവിച്ച് ☐

b. പ്രവർത്തിച്ച് ☐

c. നിരീക്ഷിച്ച് ☐

d. ചിന്തിച്ച് ☐

5. ഞാൻ പഠിക്കുമ്പോൾ

a. പുതിയ അനുഭവങ്ങളോട് തുറന്ന സമീപനം സ്വീകരിക്കുന്നു ☐
b. പ്രശ്നങ്ങളെ വ്യത്യസ്ഥ മാനങ്ങളിലൂടെ നോക്കിക്കാണുന്നു. ☐
c. വസ്തുതകളെ അപഗ്രഥിക്കുവാൻ ആഗ്രഹിക്കുന്നു ☐
d. വസ്തുതകളെ പരീക്ഷിച്ച് അറിയുവാൻ ആഗ്രഹിക്കുന്നു ☐

6. ഞാൻ പഠിച്ചുകൊിരിക്കുമ്പോൾ

a. നിരീക്ഷകനാണ് ☐
b. ഉത്സാഹിയാണ് ☐
c. അന്തർജ്ഞാനിയാണ് ☐
d. യുക്തിചിന്തയുള്ളവനാണ് ☐

7. ഞാൻ ഏറ്റവും കാര്യക്ഷമമായി പഠിക്കുന്നത്

a. നിരീക്ഷണങ്ങളിലൂടെ ☐
b. വ്യക്തി ബന്ധങ്ങളിലൂടെ ☐
c. യുക്തിയുക്തമായ സിദ്ധാന്തങ്ങളിലൂടെ ☐
d. പരീക്ഷണ പരിശീലനങ്ങളിലൂടെ ☐

8. ഞാൻ പഠിക്കുമ്പോൾ

a. പ്രവർത്തനത്തിന്റെ ഫലം കാണാനാഗ്രഹിക്കുന്നു ☐
b. ആശയങ്ങളും സിദ്ധാന്തങ്ങളും ഇഷ്ടപ്പെടുന്നു ☐
c. പ്രവർത്തിപഥത്തിലെത്തിക്കാൻ തന്റേയതായ സമയമെടുക്കുന്നു ☐
d. വസ്തുതകളോട് വ്യക്തിപരമായ ആഭിമുഖ്യം പുലർത്തുന്നു ☐

9. ഞാൻ ഏറ്റവും കാര്യക്ഷമമായി പഠിക്കുന്നത്

a. സ്വന്തം നിരീക്ഷണളെ ആശ്രയിക്കുമ്പോൾ ☐
b. സ്വന്തം അനുഭവങ്ങളെ ആശ്രയിക്കുമ്പോൾ ☐
c. സ്വന്തം പരീക്ഷണങ്ങളെ ആശ്രയിക്കുമ്പോൾ ☐
d. സ്വന്തം ആശയങ്ങളെ ആശ്രയിക്കുമ്പോൾ ☐

10. ഞാൻ പഠിച്ചുകൊിരിക്കുമ്പോൾ

a. അന്തർമുഖനാണ് ☐
b. സ്വീകൃതനാണ് ☐
c. ഉത്തരവാദിത്വബോധമുള്ളവനാണ് ☐
d. യുക്തിബോധമുള്ളവനാണ് ☐

11. ഞാൻ പഠിക്കുമ്പോൾ

a. പൂർണ്ണമായി മുഴുകുന്നു ☐
b. നിരീക്ഷിക്കാൻ ആഗ്രഹിക്കുന്നു ☐
c. വിലയിരുത്താൻ ആഗ്രഹിക്കുന്നു ☐
d. ഉത്സാഹിയായിരിക്കുവാൻ ആഗ്രഹിക്കുന്നു ☐

12. ഞാൻ ഏറ്റവും കാര്യക്ഷമമായി പഠിക്കുന്നത്

a. വസ്തുതകളെ വിശകലനം ചെയ്യുമ്പോൾ ☐
b. സ്വീകൃതനായിരിക്കുമ്പോൾ ☐
c. ശ്രദ്ധാലുവായിരിക്കുമ്പോൾ ☐
d. പ്രായോഗിക ബുദ്ധിയോടെ പ്രവർത്തിക്കുമ്പോൾ ☐

Appendix V Tools (Regional Language-Malayalam)

VA. Previous Knowledge Test in Basic Science (Malayalam)

1. Remembering: Non Verbal

1. താഴെ തന്നിരിക്കുന്ന ചിത്രങ്ങളിൽ ചിലത് പ്രകൃത്യാലുള്ളതും ചിലത് മനുഷ്യ നിർമ്മിതമായയും ആയ ശബ്ദ സ്രോതസ്സുകളാണ്. ശരിയായി നിരീക്ഷിച്ച് ഉചിതമായ പ്രസ്താവന തിരഞ്ഞെടുക്കുക.




(a) (b) (c) (d)

പ്രസ്താവനകൾ

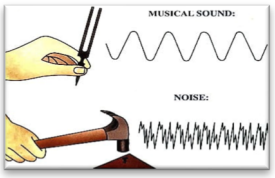
(a) (b) പ്രകൃതാലുള്ളത് (c) (d) മനുഷ്യനിർമ്മിതം

(a) (c) പ്രകൃതാലുള്ളത് (b) (d) മനുഷ്യനിർമ്മിതം

(a) (b) (c) പ്രകൃതാലുള്ളത് (d) മനുഷ്യനിർമ്മിതം

(a) (d) പ്രകൃതാലുള്ളത് (b) (c) മനുഷ്യനിർമ്മിതം

2. ചുവടെ കൊടുത്തിരിക്കുന്ന ശബ്ദ തരംഗങ്ങളെ തിരിച്ചറിഞ്ഞ്, പ്രസ്താവ നയുടെ വിട്ടുപോയ ഭാഗം പൂരിപ്പിക്കുക.



ശബ്ദ തരംഗങ്ങളായ സുന്ദരമായ നാദം ആകുന്നത് ..... മാത്യകയിലുള്ള ശബ്ദ തരംഗങ്ങൾ ഉണ്ടാകുമ്പോഴാണ്. മറിച്ച് ..... മാത്യകയിലുള്ള ശബ്ദതരംഗങ്ങൾ ഉണ്ടാകുമ്പോഴത് ബഹളമായി മാറുന്നു.

(a) ക്രമമായ, ക്രമരഹിതമായ (b) ക്രമരഹിതമായ, ക്രമമായ
(c) ഭൗതിക, രാസപരമായ (d) രാസപരമായ, ഭൗതിക

3. ചുവടെ ഒരു മണിയുടെ ചിത്രം കാണുന്നില്ലേ.

നമ്മൾ മണിയുടെ ശബ്ദം കേൾക്കുവാൻ കാരണം ശബ്ദതരംഗങ്ങൾ ..... സഞ്ചരിച്ച് നമ്മുടെ ചെവിയിൽ എത്തുന്നു.

(a) വായുവിലൂടെ (b) വെള്ളത്തിലൂടെ (c) മണ്ണിലൂടെ (d) ഇവയൊന്നുമല്ല

4. താഴെ തന്നിരിക്കുന്ന ചിത്രങ്ങൾ .....കൊണ്ടുണ്ടാകുന്ന അപകടത്തെ ക്കുറിച്ച് കാണിക്കുന്നു.


(a) ഇടി (b) മിന്നൽ (c) മലിനീകരണം (d) കാറ്റ്

5. താഴെ ഒരു താറാവിന്റെയും മയിലിന്റെയും ചിത്രങ്ങൾ കൊടുത്തിരിക്കുന്നു. ആരുടെ ശബ്ദമാണ് ചെവിയിൽ കൂടുതൽ തുളച്ചുകയറുക.


(a) താറാവ് (b) മയിൽ
(c) അറിയില്ല (d) രണ്ടും അല്ല

Remembering: Verbal

6. 'erttyab' ഈ വാക്ക് സാധാരണയായി നമ്മൾ എപ്പോഴും ഉപയോഗിക്കു ന്നതാണ്. ചെറിയ കളിപ്പാട്ടങ്ങൾ, ടോർച്ചുകൾ ഇവയിലിത് ഉപയോഗിക്കുന്നു. എന്താണിത്.

7. ചുവടെ കൊടുത്തിരിക്കുന്ന വാക്യങ്ങൾ വായിച്ച് ഉത്തരമെഴുതുക.
വെള്ളത്തിനടിയിൽ പ്രത്യേകിച്ച് ആഴം അളക്കുവാൻ വേണ്ടി ശബ്ദതരംഗങ്ങൾ ഉപയോഗിക്കുന്നു. ആന്തരിക അവയവങ്ങളുടെ പ്രവർത്തനം മനസ്സിലാക്കാൻ സ്കാനിംഗ് യന്ത്രത്തിലും ഉപയോഗിക്കുന്നു.
അൾട്രാസൗണ്ട് സ്കാനിംഗ് യാന്ത്രം ..... ഉപയോഗിച്ച് ആന്തരിക അവയവങ്ങളുടെ പ്രവർത്തനക്ഷമത മനസ്സിലാക്കുന്നു.

(a) പ്രകാശ തരംഗങ്ങൾ (b) ശബ്ദ തരംഗങ്ങൾ
(c) വായു തരംഗങ്ങൾ (d) താപതരംഗങ്ങൾ

8. 'atewr' ഈ വാക്ക് എന്താണെന്ന് ശരിയായി എഴുതുക.

9. ഇവിടെ തന്നിരിക്കുന്ന ചില പ്രസ്താവനകൾ തെറ്റാണ്. ചിലത് ശരിയുമാണ്. ഏതൊക്കെ ശരി, തെറ്റ് എന്ന് അടയാളപ്പെടുത്തുക.

(i) എന്റെ നീളം കുറഞ്ഞ ഊഞ്ഞാലിൽ എനിക്ക് വേഗത്തിൽ ആടാൻ കഴിയും.
(ii) എന്റെ നീളം കുറഞ്ഞ ഊഞ്ഞാലിൽ എനിക്ക് പതുക്കെ ആടാൻ കഴിയും.
(iii) എന്റെ നീളം കൂടിയ ഊഞ്ഞാലിൽ എനിക്ക് വേഗത്തിൽ ആടാൻ കഴിയും.
(iv) എന്റെ നീളം കൂടിയ ഊഞ്ഞാലിൽ എനിക്ക് പതുക്കെ ആടാൻ കഴിയും.

(a) (i), (ii) ശരിയാണ് എന്നാൽ (iii), (iv) തെറ്റാണ്
(b) (i), (iii) ശരിയാണ് എന്നാൽ (ii), (iv) തെറ്റാണ്
(c) (i), (ii) തെറ്റാണ്, എന്നാൽ (iii), (iv) ശരിയാണ്
(d) (ii), (iii) തെറ്റാണ്, എന്നാൽ (i) ശരിയാണ്

2. Understanding: Non Verbal

10. ചിത്രത്തിൽ ആരെയാണ് കാണിച്ചിരിക്കുന്നത്.

(a) പാട്ടുകാരൻ (b) വാദ്യ കലാകാരൻ
(c) ഗിറ്റാറിസ്റ്റ് (d) വയലിൻ വാദകൻ

11. എന്തുകൊണ്ടായിരിക്കും ഈ വവ്വാൽ ചത്തത്.

(a) വൈദ്യുത ഷോക്ക് (b) പട്ടിണിമൂലം
(c) തലയിടിച്ചത് മൂലം (d) അറിയില്ല

12. സിംഹത്തിന്റെ ഒച്ച എങ്ങിനെയാണ്? പിച്ച് കുറഞ്ഞതാണോ കൂടിയതാണോ?

(a) ഉയർന്ന പിച്ച് (b) കുറഞ്ഞ പിച്ച്
(c) ഇടകലർന്നത് (d) അറിയില്ല

13. പശയില്ലാതെ, ആണിയിലല്ലാതെ ബലൂണുകൾ എങ്ങിനെയാണ് ചുമരിൽ നില്ക്കുന്നത്?

(a) ബലൂണുകൾ ഒട്ടിക്കാൻ പറ്റില്ല
(b) ബലൂണുകൾ തൂക്കിയിട്ടിരിക്കുകയാണ്
(c) ബലൂണുകൾ ആണിയിൽ തൂക്കിയിട്ടിരിക്കുകയാണ്
(d) ബലൂണുകൾ ചുമരിലേക്ക് ആകർഷിക്കപ്പെട്ടിരിക്കുകയാണ്

14. ഈ വിസിൽ നായകളെ പരിശീലിപ്പിക്കാൻ ഉപയോഗിക്കുന്നതാണ്. ഇതിന്റെ ശബ്ദം ആരാണ് ഓർക്കുക? നായയോ, പരിശീലകനോ

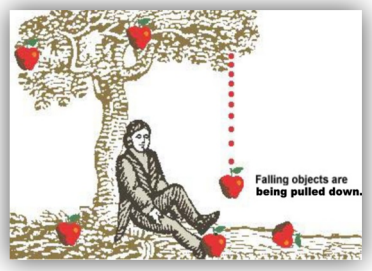
(a) നായക്ക്, ഉയർന്ന പിച്ച് കാരണം കേൾക്കും പരിശീലകന് കേൾക്കില്ല

(b) നായക്ക്, ചെറിയ പിച്ച് കാരണം കേൾക്കും പരിശീലകന് കേൾക്കില്ല

(c) പരിശീലകന് ഉയർന്ന പിച്ച് കാരണം കേൾക്കും നായക്ക് കേൾക്കില്ല

(d) പരിശീലകന് ചെറിയ പിച്ച് കാരണം കേൾക്കും നായക്ക് കേൾക്കില്ല

15. എല്ലാ വസ്തുക്കളും ഭൂമിയിലേക്ക് ആകർഷിക്കപ്പെടുന്നു. ഈ സിദ്ധാന്തം വിഖ്യാത ശാസ്ത്രജ്ഞൻ ന്യൂട്ടൻ കണ്ടുപിടിച്ചതാണ്. ഈ സിദ്ധാന്തത്തിന്റെ നാമം എങ്ങിനെയാണ്.



(a) കാന്തികാകർഷണ സിദ്ധാന്തം

(b) ഗുരുത്വാകർഷണ സിദ്ധാന്തം

(c) ഇലക്ട്രോളിസിസ് സിദ്ധാന്തം

(d) ഭാഗിക സിദ്ധാന്തം

16. ഭരതനാട്യം, മോഹിനിയാട്ടം ഇതിൽ ഏതിനാണ് കൂടുതൽ താളവും മേളവും?


(a) ഭരതനാട്യം (b) മോഹിനിയാട്ടം (c) അറിയില്ല (d) രണ്ടും അല്ല

Understanding: Verbal

17. വായിച്ച് മനസ്സിലാക്കി ഉത്തരം എഴുതുക.

നമ്മളെല്ലാവരും ബാറ്ററി കണ്ടിട്ടുള്ളതല്ലേ. ടോർച്ച് ബാറ്ററികളിൽ +ve, -ve അറ്റങ്ങൾ കണ്ടിട്ടില്ലേ? എങ്ങിനെയാണ് ടോർച്ചിൽ അവ ഇട്ടിരിക്കുന്നത്.

ടോർച്ച് കത്തണമെങ്കിൽ രണ്ട് ബാറ്ററികളുടെ +ve, -ve അറ്റങ്ങൾ അടുപ്പിച്ച് വെക്കുന്നു, രണ്ട് ബാറ്ററികളുടെ +ve അല്ലെങ്കിൽ -ve അറ്റങ്ങൾ അടുപ്പിച്ച് വെക്കുക.

(a) ശരി (b) തെറ്റ് (c) വേറൊരു തരത്തിൽ (d) അറിയില്ല

18. താഴെ തന്നിരിക്കുന്ന ഗദ്യാംശം പഠിച്ച് വിട്ടഭാഗം പൂരിപ്പിക്കുക.

ശബ്ദതരംഗങ്ങളുടെ സുന്ദരമായ സമ്മേളനമാണ് ഒരു പാട്ട് എങ്കിൽ ബഹളമുണ്ടാകുന്നത് ശബ്ദ തരംഗങ്ങളുടെ ക്രമരഹിതമായ കമ്പനങ്ങളിലൂടെ ആണ്. കമ്പനങ്ങൾക്ക് സഞ്ചരിക്കാൻ ഒരു മാധ്യമം ആവശ്യമാണ്. ശബ്ദ സഞ്ചാരത്തിന് മാധ്യമം അതിനാൽ വളരെ അത്യാവശ്യമാണ്. അതുകൊണ്ട് ശബ്ദതരംഗങ്ങളെ ഒരു ..... ആയി കണക്കാക്കാം. ഒരു രൂപത്തിൽ നിന്ന് മറ്റൊരു രൂപത്തിലേക്ക് മാറാൻ കഴിവുണ്ട്.

(a) ഊർജ്ജം (b) ബഹളം (c) പാട്ട് (d) ബലം

3. Applying: Non Verbal

19. താഴെ മിന്നലിന്റെ ഒരു ചിത്രം തന്നിട്ടുണ്ടല്ലോ.

മിന്നലടിക്കുമ്പോൾ ഒരു നിശ്ചിത അളവിലും കൂടുതൽ വൈദ്യുതയി മേഘങ്ങളിൽ നിന്നും ഭൂമിയിലേക്ക് പ്രവഹിക്കുന്നു. അതുകൊണ്ട് തന്നെ മിന്നലുള്ളപ്പോൾ പുറത്ത് പോകുമ്പോൾ ..... ഏല്ക്കുവാൻ സാദ്ധ്യതയുണ്ട്.

(a) വൈദ്യുത ഷോക്ക് (b) വൈദ്യുത താപം

(c) വൈദ്യുത മിന്നൽ (d) വൈദ്യുത ഇടി

20. ചുവടെ തന്നിരിക്കുന്ന ചിത്രത്തിൽ ശ്രദ്ധിച്ച് ഉത്തരമെഴുതുക.

ഈ കാർ ..... യിൽ പ്രവർത്തിക്കുന്നു
(a) വൈദ്യുതി (b) പ്രകാശം (c) താപം (d) ശബ്ദം

21. ചുവടെ തന്നിരിക്കുന്ന ചിത്രം ശ്രദ്ധിക്കുക.

എന്തിനായിരിക്കും ഗിറ്റാറിന്റെ കമ്പി വലിക്കുകയും മുറുക്കുകയുമൊക്കെ ചെയ്യുന്നത്?
(a) ശബ്ദം ചിട്ടപ്പെടുത്താൻ (b) പാട്ട് ചിട്ടപ്പെടുത്താൻ
(c) വലിവ് ചിട്ടപ്പെടുത്താൻ (d) പ്രതലം ചിട്ടപ്പെടുത്താൻ

Applying: Verbal

22. രണ്ട് കുട്ടികൾ സ്റ്റീൽ പാത്രങ്ങൾ കൊണ്ട് കളിക്കുകയായിരുന്നു. പെട്ടെന്ന് ഒരു കുട്ടിയുടെ കയ്യിൽ നിന്ന് ഒരു പാത്രം താഴെ വീണു. പിന്നിട് അടുത്ത കുട്ടിയുടെ കയ്യിൽനിന്നും അതേ ഉയരത്തിൽ നിന്നും പാത്രം വീണു. എന്നാൽ വ്യത്യസ്ത ശബ്ദങ്ങളായിരുന്നു ഉണ്ടായത്. എന്തുകൊണ്ടാകും?

(a) വ്യത്യസ്ത വലിപ്പത്തിലുള്ള പാത്രങ്ങളായതുകൊണ്ട്.
(b) വലുതായത് കൊണ്ട്
(c) ചെറുതായത് കൊണ്ട്
(d) വ്യത്യസ്ത പദാർത്ഥങ്ങൾ കൊണ്ട് നിർമ്മിക്കപ്പെട്ടതായതുകൊണ്ട്.

23. മിന്നലടിച്ച് ഒരുപാട് മരണങ്ങൾ നടക്കുന്നു. ഇടിയും മിന്നലുമുള്ളപ്പോൾ പുറത്ത് പോകുന്നത് ശരിയാണോ?
(a) ശരി (b) തെറ്റ് (c) ചിലപ്പോൾ (d) അറിയില്ല

24. ആശുപത്രിയിൽ ചെന്ന ഒരു രോഗി അൾട്രാ സൗണ്ട് സ്കാനിംഗ് ചെയ്ത് കൊണ്ടിരുന്നപ്പോൾ വേദനിപ്പിക്കുന്ന ശബ്ദം കേട്ടു എന്ന് പറയുന്നത് ശരിയാണോ തെറ്റാണോ?
(a) ശരി (b) തെറ്റ് (c) ചിലപ്പോൾ ശരി (d) ചിലപ്പോൾ തെറ്റ്

25. ടോർച്ചിൽ ഉപയോഗിക്കുന്ന ബാറ്ററികളുടെ ഒരറ്റം കുറച്ച് ഉയർന്നിരി ക്കുന്നതെന്താണ്?
(a) ഉയർന്ന അറ്റം +ve ആണ്. (b) ഉയർന്ന അറ്റം -ve ആണ്.
(c) എനിക്കറിയില്ല (d) ഞാൻ കണ്ടിട്ടില്ല

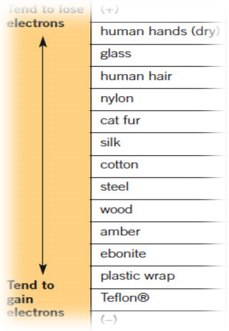
26. കൊതുകിന്റെ മൂളൽ ശബ്ദം എവിടെനിന്നാണ് വരുന്നത്.
(a) ചിറക് (b) കാൽ (c) വായ(d) കൊമ്പ്

4. Analysing - Non Verbal

27. ചുവടെ തന്നിരിക്കുന്ന ചിത്രത്തിൽ ഭൂമി എന്തിനാണ് ചെവികൾ പൊത്തിപ്പിടിച്ചിരിക്കുന്നത്.

(a) ശബ്ദമലിനീകരണം
(b) വായു മലിനീകരണം
(c) ജല മലിനീകരണം
(d) മണ്ണ് മലിനീകരണം

28. താഴെ തന്നിരിക്കുന്ന പട്ടിക ശ്രദ്ധിക്കുക.



മുകളിലേക്ക് നീങ്ങുന്തോറും ചില വസ്തുക്കൾ ഇലക്ട്രോണുകൾ നഷ്ടപ്പെട്ട് +ve ചാർജ്ജ് സ്വീകരിക്കുന്നു. എന്നാൽ ചിലത് താഴേക്ക് പോകുമ്പോൾ ഇലക്ട്രോൺ സ്വീകരണം നടത്തി -ve ചാർജ്ജ് സ്വീകരിക്കുന്നു.

പ്രസ്താവനയിൽ വിട്ട ഭാഗം പൂരിപ്പിക്കുക.
മനുഷ്യന്റെ കയ്യുകൾ ..... ചാർജ്ജുകൾ സ്വീകരിക്കും. ഉചിതമായ വസ്തുക്കളുടെ സമ്പർക്കം മൂലം ഇലക്ട്രോണുകൾ കളഞ്ഞ് ..... ചാർജ്ജുകൾ സ്വീകരിക്കുന്നു.
(a) +ve, -ve (b) +ve, +ve (c) -ve, +ve (d) -ve, -ve

Analysing: Verbal

29. 'Static' എന്ന വാക്കിന്റെ അർത്ഥം
(a) സ്ഥായിയായി (b) വ്യത്യസ്തം
(c) മാറിക്കൊണ്ടിരിക്കുന്ന (d) തുല്യമായ

30. മലയുടെ മുകളിലേക്ക് കയറിക്കൊണ്ടിരിക്കുന്ന കുറച്ച് കുട്ടികൾ അവരുടെ തന്നെ ശബ്ദം മുകളിൽ നിന്ന് തിരിച്ച് കേട്ടു എന്ന് പറഞ്ഞ് താഴെ ഇറങ്ങിപ്പോന്നു. കാരണം എന്താകും.
(a) ശബ്ദം (b) പ്രതിധ്വനി (c) ഉച്ചത (d) ശ്രുതി

31. വൈദ്യുത കമ്പികൾ കണ്ടിട്ടില്ലേ. ചില പക്ഷികൾ അതിലിരുന്ന് ചത്തു പോകുന്നു. എന്നാൽ ചിലത് ചാകുന്നില്ല. കാരണമെന്താണ്. ശരിയായ പ്രസ്താവന തെരഞ്ഞെടുക്കുക.
(a) ഒറ്റ കമ്പിയിൽ ഇരുന്നാൽ പൊട്ടൻഷ്യൽ വ്യത്യാസം ഇല്ലാത്തതിനാൽ അവ ചാകില്ല.
(b) ചിറകുകൾ ചലിപ്പിക്കുമ്പോൾ പൊട്ടൻഷ്യൽ വ്യത്യാസം ഉണ്ടാകാത്ത തിനാൽ ചത്തുപോകില്ല.
(c) എപ്പോഴും ചത്തു പോകില്ല
(d) വൈദ്യുത കമ്പിയിൽ നിന്നും വൈദ്യുതി പക്ഷികളെ സംരക്ഷിക്കുന്നത് മൂലം ചത്തുപോകില്ല.

32. തബലക്കും, വയലിനും പ്രതല പരപ്പും കമ്പിയുടെ നീളവും ഒക്കെ പ്രധാനമാണ്. കാരണം
(a) ശബ്ദം വസ്തുവിന്റെ പ്രകൃതം, വലിവ്, പ്രതലപരപ്പിനേയും ആശ്രയി ച്ചിരിക്കുന്നു.
(b) ശബ്ദം വസ്തുവിന്റെ പ്രകൃതം, വലിവ്, പ്രതലപരപ്പ് ഒന്നിനേയും ആശ്രയി ക്കുന്നില്ല.
(c) ശബ്ദം ഇതിനെയൊന്നും ആശ്രയിക്കുന്നില്ല.
(d) ശബ്ദതരംഗങ്ങൾക്ക് ഈ ശബ്ദസ്രോതസ്സുകളുമായി ഒരു ബന്ധവുമില്ല.

33. നമ്മുടെ വീടുകളിൽ കണ്ടുവരുന്ന വൈദ്യുതി കണക്ഷനുകളിലെ നിറങ്ങളുടെ അർത്ഥം എന്താണ്.
(a) ചുകപ്പ് = live, നീല, കറുപ്പ് = neutral, പച്ച = earth.
(b) പച്ച = live, നീല, കറുപ്പ് = neutral, ചുകപ്പ് = earth
(c) നീല, കറുപ്പ് = live, ചകുപ്പ് = neutral, പച്ച = earth
(d) ചുകപ്പ് = live, പച്ച = neutral, നീല, കറുപ്പ് = earth

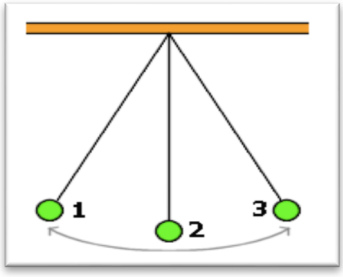
34. ഒരു സ്ക്കൂളിന്റെ പരിസരത്ത് നടക്കുന്ന ഒരു ജാഥയും, പ്രസംഗവും കാരണം സ്ക്കൂളും അതിനടുത്തുള്ള ഒരു ആശുപത്രിയും പ്രവർത്തിക്കുവാൻ സാധിക്കുന്നുണ്ടായിരുന്നില്ല. ഇത് എന്തിന്റെ ലംഘനം ആണ്.
(a) പരിസ്ഥിതി ലംഘനം (b) ശബ്ദ പരിമിതി ലംഘനം
(c) സാമ്യഹ്യ ലംഘനം (d) ബാലനീതി ലംഘനം

5. Evaluating Visual: Non Verbal

35. ചുവടെ ചേർത്തിരിക്കുന്ന ചിത്രം എന്താണ്?

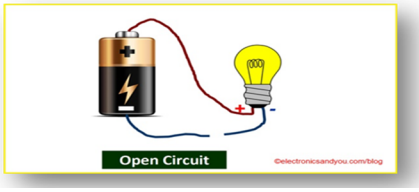
(a) വൈദ്യുത കമ്പികൾ (b) മിന്നൽ രക്ഷാചാലകം
(c) മിന്നൽ രക്ഷാപേടകം (d) ഇവയൊന്നുമല്ല

36. ചുവടെ തന്നിരിക്കുന്ന ചിത്രം എന്താണ്.



(a) ക്ലോക്ക് (b) വൈദ്യുത ഉപകരണം
(c) ടെലിവിഷൻ (d) ഇവയൊന്നുമല്ല

37. താഴെ ഒരു സർക്യൂട്ടിന്റെ മാതൃക തന്നിരിക്കുന്നു. ഇതിലെ ബൾബ് കത്തുമോ ഇല്ലയോ.



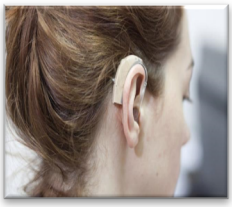
(a) കത്തും
(b) കത്തില്ല
(c) ബൾബ് നല്ല പ്രകാശത്തിൽ കത്തും
(d) ബൾബ് മങ്ങിയ വെളിച്ചത്തിൽ കത്തും

Evaluating Auditory : Non Verbal

38. താഴെ മദയാന നില്ക്കുന്ന ചിത്രം കണ്ടില്ലേ. ആനയ്ക്ക് ദേഷ്യം വന്നത് എന്തുകൊണ്ടാകും.

(a) തിരക്ക്, ബഹളം, ചൂട്
(b) ഇരുട്ടും, നിശബ്ദതയും
(c) ഭാരണം കാരണം
(d) ഇവയൊന്നുമല്ല

39. താഴെ ചിത്രത്തിൽ ചെവി കേൾക്കുവാനായി ഈ സ്ത്രീ എന്താണ് ധരിച്ചിരിക്കുന്നത്.



(a) കേൾവി സഹായി
(b) സ്പീക്കർ
(c) ഹെഡ് ഫോൺ
(d) മൈക്രോഫോൺ

40. ബലൂൺ ഊതി വീർപ്പിക്കുമ്പോൾ പൊട്ടാൻ കാരണമെന്താണ്?

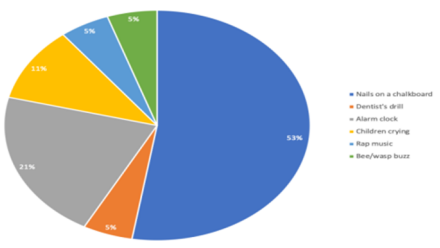
(a) ബലൂണിനുള്ളിലെ വായു പൊട്ടിത്തെറിക്കുന്നു
(b) ബലൂൺ ശബ്ദ സ്രോതസ്സാണ്
(c) ബലൂൺ ഒരു പ്രത്യേക പദാർത്ഥമാണ്.
(d) അറിയില്ല

41. വെള്ളം കൊണ്ട് ശബ്ദം ഉണ്ടാക്കുന്ന ഈ ഉപകരണത്തിന്റെ പേരെന്താണ്?

(a) വീണ
(b) സിതാർ
(c) ജല തരംഗ്
(d) തബല

42. താഴെ തന്നിരിക്കുന്നത് ഒരു പഴയകാല പെൻഡുലം ക്ലോക്കാണ്. ഒരു സെക്കണ്ട് കഴിയുമ്പോൾ അതിലെ പെൻഡുലം എത്ര ദോലനം നടത്തും.

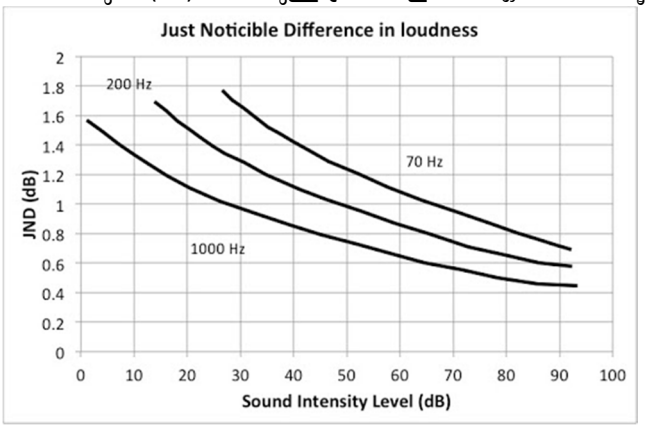
(a) 1 ദോലനം
(b) 10 ദോലനം
(c) 30 ദോലനം
(d) 60 ദോലനം



6. Creating: Non Verbal

43. താഴെ തന്നിരിക്കുന്നതിൽ ഏതാണ് ഏറ്റവും കൂടുതൽ ശബ്ദമലിനീകരണം നടത്തുന്നത്.
(a) ആണികൾ (b) വണ്ടുകൾ (c)റാപ്പ് സോങ്ങുകൾ (d)അലാമുകൾ

44. താഴെ ഒരു ഗ്രാഫ് തന്നിട്ടുണ്ട്. ആവൃത്തിയുടെ യൂണിറ്റായ (Hz), ശബ്ദ കൂർമ്മതയും ഉച്ചതയും കാണിക്കുന്ന (dB) തമ്മിലുള്ള ഗ്രാഫ്. ഇതിൽ ഏതിനാണ് കൂടുതൽ ശബ്ദം.



(a) 70 Hz. (b) 200 Hz. (c) 1000 Hz. (d) ഇവയൊന്നുമല്ല.

Creating: Verbal

ശരിയാക്കി എഴുതുക

45. liniov = ...

46. hunterd = ...

47. ghtningli = ...

48. tyicirteelc = ...

49. കണ്ടെത്തുക

ഒരു ഊഞ്ഞാൽ 30 സെക്കണ്ടിൽ 30 പ്രാവശ്യം ദോലനം ചെയ്യുന്നു. 1 ദോലനം ചെയ്യാനുള്ള സമയം എത്ര.

(a) 1s (b) 30s (c) 2s(d) 60s

50. ഒരു യൂണിറ്റ് ചാർജ്ജ് എന്നാൽ ഒരു ചാലകത്തിലൂടെ ഒരു യൂണിറ്റ് സമയത്തിൽ പ്രവഹിക്കുന്ന ചാർജ്ജാണ്.

1 സെക്കണ്ടിൽ എത്ര ചാർജ്ജ് ചാലകത്തിൽ കൂടി പോകും.?

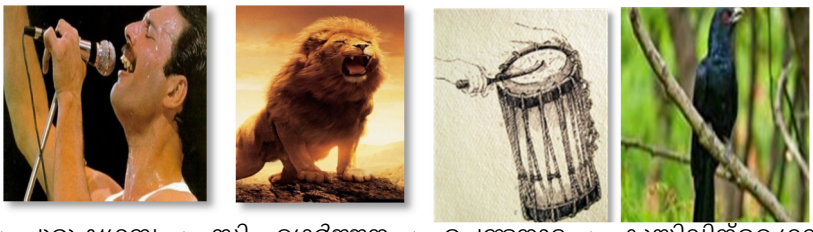
(a) 1 യൂണിറ്റ് (b) 2 യൂണിറ്റ് (c) 0 യൂണിറ്റ് (d) ഒന്നും പോകില്ല

VB. SCIENCE PROCESS SKILLS TEST (Malayalam)

SCIENCE PROCESS SKILL TEST

1. നിരീക്ഷണം

1. കുട്ടികൾക്ക് പിക്ചർ കാർഡുകൾ നൽകുന്നു. തന്നിരിക്കുന്ന കാർഡുകളിൽ നിന്നുടൻ ഏറ്റവും ഉയർന്ന പിച്ചുള്ള ശബ്ദം കണ്ടെത്തി തന്നിരിക്കുന്ന സ്കോർ ഷീറ്റിൽ അടയാളപ്പെസ്ലുത്താൻ ആവശ്യപ്പെടുന്നു.

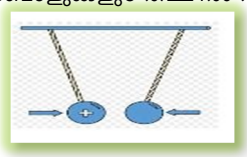


(ി) പുരുഷശബ്ദം (യ)സിംഹഗർജ്ജനം (ൈ) ചെണ്ടനാദം (ാ) കുയിലിന്റെ ശബ്ദം

2. വിദ്യാർത്ഥികൾക്ക് ഉണങ്ങിയ തലമുടിയിൽ നന്നായി ഉറച്ച ഒരു പ്ലാസ്റ്റിക് സ്കെയിൽ നൽകുന്നു. അത് ചെറിയ കടലാസ്സ് കഷ്ണങ്ങളുടെ അടുത്തേക്ക് കൊണ്ടുവരുമ്പോൾ ഉണ്ടാകുന്ന പ്രതിഭാസം നിരീക്ഷിക്കാൻ ആവശ്യപെടുന്നു. കടലാസ്സ് കഷ്ണങ്ങൾ സ്കെയിലിനു അടുത്തേക്ക് ആകർഷിക്കപ്പെടുന്നത് ---------- കാരണമാണ്.

(a) സ്ഥിതവൈദ്യുത പ്രവാഹം (b) സ്ഥിതവൈദ്യുതി
(c)കാന്തികപ്രവാഹം (d) പരസ്പര ആകർഷണം

3. രണ്ട് പിത് ബോളുകൾ പരസ്പരം ആകർഷിക്കുന്ന ചിത്രം അടങ്ങിയ ഫ്ലാഷ് കാർഡ് കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു . പിത് ബോളിനടുത്തേക്ക് കൊണ്ടുവന്ന വസ്തു പോസ്റ്റിറ്റീവ് ചർഗ്ഗുള്ള ഒരു പിത് ബോൾ ആയിരുന്നു. മറ്റേ പിത് ബോളിനു --------- ചാർജ് ആയതു കൊണ്ടാണ് രണ്ടു ബോളുകളും തമ്മിൽ ആകർഷിക്കപ്പെട്ടത്.



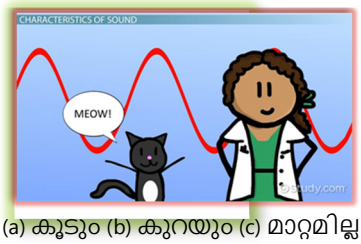
(a) പോസിറ്റീവ് (b) നെഗറ്റീവ്

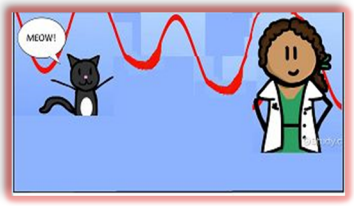
(c) ന്യൂട്രൽ (d) ഇവയൊന്നുമല്ല

4. വിദ്യാർത്ഥികൾക്ക് ഒരു ബലൂണും ഒരു സ്വെറ്റർ ഷർട്ടും നല്കുന്നു. ബലൂൺ കമ്പിളി വസ്ത്രവുമായി ഉരസുമ്പോൾ ബലൂണിനു --------- ചാർജ് ലഭിക്കുന്നു.

(a) പോസിറ്റീവ് (b) നെഗറ്റീവ്
(c) ന്യൂട്രൽ (d) ഇവയൊന്നുമല്ല

5. വിദ്യാർത്ഥികൾക്ക് രണ്ടു കാർഡുകൾ കാണിച്ചുകൊടുക്കുന്നു. ആദ്യത്തേതിൽ പൂച്ചയുടെ അടുത്തു നിൽക്കുന്ന ഒരു പെൺകുട്ടിയുടെ ചിത്രവും രണ്ടാമത്തേതിൽ പൂച്ചയിൽ നിന്നും ദൂരെ നിൽക്കുന്ന പെഡകുട്ടിയുടെയും ചിത്രമാണ്. ഇതിൽ ഏത് സാഹചര്യത്തിൽ ആണ് പൂച്ചയുടെ ശബ്ദം കൂടുതലായി കേൾക്കുക എന്ന് തിരിച്ചറിയാൻ കുട്ടികളോട് ആവശ്യപ്പെടുന്നു. ശബ്ദത്തിന്റെ ഉറവിടവും സ്വീകർത്താവും തമ്മിൽ ഉള്ള ദൂരം കൂടുംതോറും ശബ്ദത്തിന്റെ ഉച്ചതക്ക് എന്ത് സംഭവിക്കും?





(a) കൂടും (b) കുറയും (c) മാറ്റമില്ല (d) ബന്ധമില്ല

6. B കുട്ടികൾക്ക് ഒരു ഫ്ലാനൽ തുണി നൽകുന്നു. ബലൂൺ ഫ്ലാനൽ തുണി കൊണ്ട് തടവുമ്പോൾ അത് അതിന്റെ ഇലക്ട്രോണുകൾ ബലൂണിനു നൽകുകയും --------- ചാർജ് ആവുകയും ചെയ്യുന്നു.

(a) പോസിറ്റീവ് (b) നെഗറ്റീവ്

(c) ന്യൂട്രൽ (d) ഇവയൊന്നുമല്ല

7. താഴെ കാണിച്ചിരിക്കുന്നപോലെ ഒരു വിൻഡ് ബെൽ വിദ്യാർത്ഥികൾക്ക് നൽകുന്നു. ഓരോ പൈപ്പിന്റെയും ശബ്ദം നിരീക്ഷിക്കാൻ പറയുന്നു. ഓരോ പൈപ്പും വ്യത്യസ്ത തരത്തിൽ ശബ്ദം പുറപ്പെടുവിക്കുന്നത് എന്തുകൊണ്ട്?

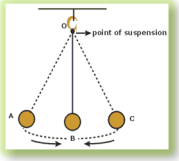
(a) സമയത്തിൽ ഉള്ള വ്യത്യാസം

(b) ഉണ്ടാക്കാൻ ഉപയോഗിച്ച വസ്തുവിൽ ഉള്ള വ്യത്യാസം

(c) നീളത്തിൽ ഉള്ള വ്യത്യാസം

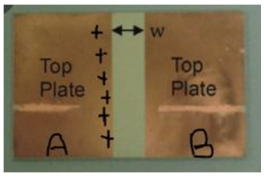
(d) സ്വഭാവത്തിൽ ഉള്ള വ്യത്യാസം

8. ഒരു സിമ്പിൾ പെൻഡുലത്തിന്റെ ചലനം നിരീക്ഷിച്ചു, ചിത്രത്തിൽ തന്നിട്ടുള്ള പെൻഡുലത്തിന്റെ ശരാശരി സ്ഥാനം കണ്ടെത്താൻ കുട്ടികളോട് പറയുന്നു.



(a) A (b) B (c) C (d) O

9. വശങ്ങൾ അടുത്ത് വെച്ച രണ്ടു ലോഹപ്ലേറ്റുകൾ കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു . ഒരു പ്ലേറ്റിന് പോസിറ്റീവ് ചാർജ് നൽകുന്നു, A എന്ന് വിളിക്കുന്നു. B എന്ന രണ്ടാമത്തെ ലോഹപ്ലേറ്റ് Aയുടെ അടുത്തേക്ക് കൊണ്ടുവരുന്നു. എങ്കിൽ, A യുടെ അടുത്തു വരുന്ന ബിയുടെ വശം ---------- ചാർജ് ആവുന്നു.

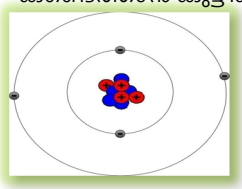


(a) പോസിറ്റീവ് (b) ചാർജ് ഇല്ല
(c) ഏർത് (d) നെഗറ്റീവ്

10. കുട്ടികൾക്ക് സൈലന്റ് വാലി ദേശീയോദ്യാനത്തിന്റെ ചിത്രം കാണിച്ചുകൊടുക്കുന്നു. ആ പേര് വരാനുള്ള കാരണം?

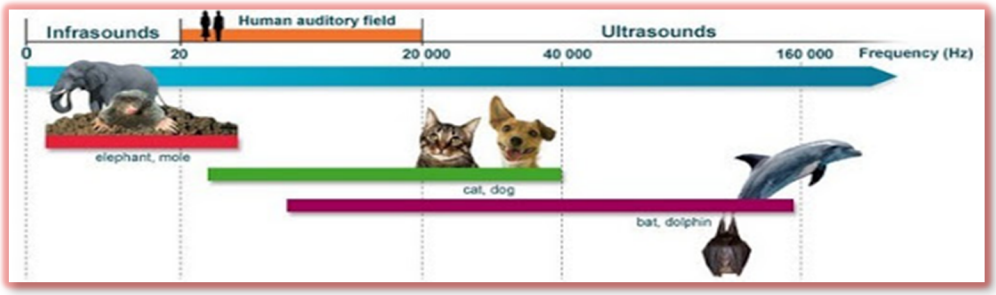
(a) ഈച്ചകളും ഇല്ലാത്തതുകൊണ്ട്
(b) ചീവീടുകൾ ഇല്ലാത്തതുകൊണ്ട്
(c) തേനീച്ചകളും ഇല്ലാത്തതുകൊണ്ട്
(d) പ്രവചിക്കാൻ കഴിയില്ല

11. ആറ്റത്തിന്റെ ഘടന കാണിക്കുന്ന ഒരു പിക്ചർ ചാർട്ട് കുട്ടികൾക്ക് കാണിച്ചു കൊടുക്കുന്നു. സൂക്ഷ്മമായി നിരീക്ഷിച്ചു എല്ലാ ആറ്റത്തിലും ഉള്ള ചാർജ് ഇല്ലാത്ത കാര്യങ്ങൾ ഏത് എന്ന് കണ്ടെത്താൻ കുട്ടികളോട് പറയുന്നു.



(a) പ്രോട്ടോണുകൾ (b) ന്യൂട്രോണുകൾ
(c) ഇലക്ട്രോണുകൾ
(d) ചാർജ് ഇല്ലാത്ത കാര്യങ്ങൾ

12. ഓരോ ജീവികളുടെയും ശബ്ദപരിധി കാണിക്കുന്ന ഒരു പിക്ചർ ചാറ്റ് വിദ്യാർത്ഥികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. അത് സൂക്ഷ്മമായി നിരീക്ഷിച്ച താഴെ പറയുന്ന ചോദ്യങ്ങൾക്ക് ഉത്തരം എഴുതാൻ ആവശ്യപ്പെടുന്നു.



മനുഷ്യന് കേൾക്കാൻ കഴിയുന്ന ഏറ്റവും ഉയർന്ന ശബ്ദപരിധി എത്ര?
(a) 5000 Hz (b) 10000 Hz (c)15 000 Hz (d)20000 Hz

2. താരതമ്യം

13. താഴെ പട്ടികയിൽ തന്നിരിക്കുന്ന വിവരങ്ങൾ താരതമ്യം ചെയ്ത് ഏത് പെന്ഡുലത്തിനു ഏറ്റവും ഉയർന്ന ആവൃത്തി എന്ന് കണ്ടെത്താൻ വിദ്യാർത്ഥികളോട് പറയുന്നു

സിമ്പിൾ പെൻഡുലും	നീളം	എത്ര ഓസിലേഷൻ (ചാഞ്ചാട്ടം)	സമയം	ആവൃത്തി
A	60 cms	10	15	0.67
B	80cms	10	18	0.51

(a) A (b) B (c) തുല്യം (d) തീരുമാനിക്കാൻ കഴിയില്ല

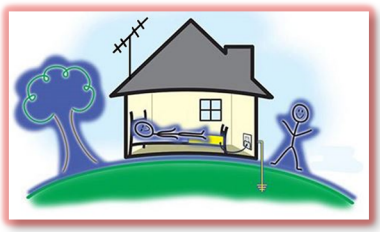
14. ഒരു തൊട്ടിലിന്റെയും ഒരു ഊഞ്ഞാലിന്റെയും പിക്ചർ കാർഡ് കാണിക്കുന്നു. ഏത് ആണ് കൂടുതൽ വേഗത്തിൽ ചലിക്കുക എന്ന് കണ്ടെത്താൻ പറയുന്നു.

(a) തോട്ടിൽ
(b) ഊഞ്ഞാൽ
(c)പ്രവചിക്കാൻ കഴിയില്ല
(d)രണ്ടും അല്ല.

15. കുട്ടികൾക്ക് ഒരു സന്ദർഭം കൊടുക്കുന്നു. റെയിൽവേ സ്റ്റേഷൻ പ്ലാറ്റഫോമിലൂടെ രണ്ടു ട്രെയിനുകൾ കടന്നുപോകുന്നു. ട്രെയിൻ A റെയിൽവേ സ്റ്റേഷനിലേക്ക് വരുകയും ട്രെയിൻ B സ്റ്റേഷൻ വിടുകയും ആണ്. ഒരു നിരീക്ഷിക്കാൻ ആ പ്ലാറ്റഫോമിൽ നിൽക്കുന്നുണ്ട്. അദ്ദേഹത്തെ സംബന്ധിച്ച് ഏത് ട്രെയിൻ ആണ് കൂടുതൽ ശബ്ദം പുറപ്പെടുവിക്കുക?

(a) ട്രെയിൻ A (b) ട്രെയിൻ B (c) ഒരേ ശബ്ദം (d) അറിയില്ല

16. അടുത്തടുത്ത രണ്ടു വീടുകളുടെ ചിത്രം കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. ആദ്യത്തെ വീട്, വീട് A അവരുടെ TV ആന്റിന ഏർത്ത് ചെയ്തിട്ടുണ്ട്. രണ്ടാമത്തെ വീട്. Bയുടെ TV ആന്റിന എർത്ത് ചെയ്തിട്ടില്ല. ഇടിമിന്നൽ ഉണ്ടാകുമ്പോൾ ഒരു മിന്നൽ രക്ഷാകവചം ആയി പ്രവർത്തിക്കുന്ന ആന്റിന ഉള്ളത് ഏത് വീടിനു ആണ് എന്ന് കണ്ടെത്തി അതിനു മുകളിൽ ഒരു ടിക്ക് മാർക്ക് ഇടാൻ കുട്ടികളോട് പറയുന്നു.

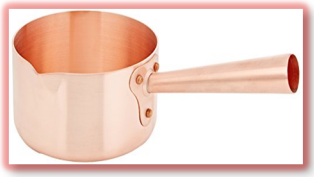


വീട് A

വീട് B

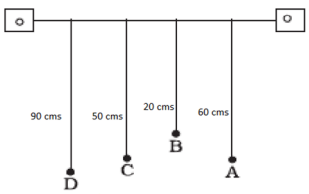
(a) വീട് A (b) വീട് B (c) രണ്ടു വീടിനും ഇടിമിന്നൽ ഏൽക്കും
(d) രണ്ടും മിന്നൽ രക്ഷാകവചമായി പ്രവർത്തിക്കും.

17. ചൂടാക്കിയ രണ്ടു പാത്രങ്ങൾ കുട്ടികൾക്ക് നൽകുന്നു. ഒന്ന് മുഴുവനായും ചെമ്പുകൊണ്ടു ഉണ്ടാക്കിയതും മറ്റേത് മരത്തിന്റെ പിടിയുള്ളതും ആണ്. രണ്ടു പാത്രങ്ങളും ചൂടാക്കുമ്പോൾ ഏതാണ് കൂടുതൽ ചൂടാവുക എന്ന് അവയുടെ പിടി പിടിച്ച പരീക്ഷിച്ച അറിയാൻ നിർദ്ദേശിക്കുകയും അവരുടെ ഉത്തരം രക്ഷപെടുത്താൻ പറയുകയും ചെയ്യുന്നു.



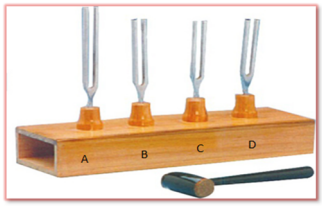
(a) ലോഹ പിടി ഉള്ള പാത്രം B. മരപിടിയുള്ള പാത്രം

(a) A (b) B (c) രണ്ടും ചൂടാവില്ല (d) രണ്ടിനും ഒരേ ചൂടായിരിക്കും



18. ചിത്രത്തിൽ കാണിച്ചിരിക്കുന്നതുപോലെ വ്യത്യസ്ത നീളത്തിൽ ഉള്ള നാല് സിമ്പിൾ പെൻഡലും വിദ്യാർത്ഥികൾക്ക് കൊടുക്കുന്നു. ഏറ്റവും ചെറിയ ആവൃത്തിയുള്ള പെൻഡലും കണ്ടുപിടിച്ചു ടിക്ക് മാർക്ക് ഇടാൻ നിർദ്ദേശിക്കുന്നു.

(a) 60 cm (b) 20 cm (c) 50 cm (d) 90 cm

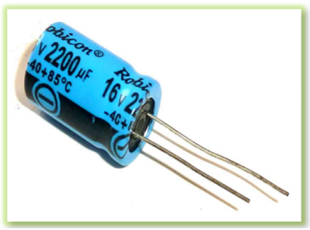


19. നാല് സെറ്റ് ട്യൂണിങ് ഫോക് വിദ്യാർത്ഥികൾക്ക് നൽകുന്നു. അവയിൽ നിന്നും ചെറിയ ആവൃത്തിയുള്ള ട്യൂണിങ് ഫോക് തിരഞ്ഞെടുക്കാൻ ആവശ്യപ്പെടുന്നു. അവരുടെ ഉത്തരം മാർക്ക് ചെയ്യാൻ പറയുന്നു.

(a) 266 Hz (b) 512 Hz (c) 480 Hz (d) 288 Hz

20. ഒരു മിന്നൽ രക്ഷാകവചത്തിന്റെയും ഒരു കപ്പാസിറ്ററിന്റെയും ചിത്രം കുട്ടികളെ കാണിക്കുന്നു. ഇവ രണ്ടും താരതമ്യം ചെയ്യാൻ ആവഹ്സ്യപ്പെടുന്നു..

Lightning rescue conductor



Capacitor

ഏത് പ്രവർത്തിയുടെ ഫലമായി ആണ് ഇവ രണ്ടും ഡിസ്ചാർജ് ആവുന്നത് എന്ന് കണ്ടെത്താൻ ആവശ്യപ്പെടുന്നു
(a) ഡിസ്ചാർജ് ചെയ്യുക (b) എർത്ത് ചെയ്യുക (c) കണ്ടക്ടർ (d) വയറിങ്

21. താഴെ കാണിച്ചിരിക്കുന്ന സ്റ്റീൽ ഗ്ലാസ്സുകൾ കുട്ടികൾക്ക് കൊടുക്കുന്നു. ഗ്ലാസിന്റെ വായ് ഭാഗം ബലൂണുകൾ കൊണ്ട് മുറുക്കി അടച്ചിരിക്കുന്നു. ഓരോ ഗ്ലാസ്സിന്റെയും വ്യാസം വ്യത്യസ്തമാണ്. ചിത്രത്തിൽ കാണിച്ചിരിക്കുന്നതു പോലെ ബലൂണ് ഉപയോഗിച്ച എല്ലാം വളരെ മുറുക്കി അടച്ചിരിക്കുന്നു. ഒരേ രീതിയിൽ ഇവയിൽ അടിച്ചാൽ ഏത് ആണ് കൂടുതൽ ശബ്ദം പുറപ്പെടുവിക്കുക?

(a) A (b) B (c) C (d) D

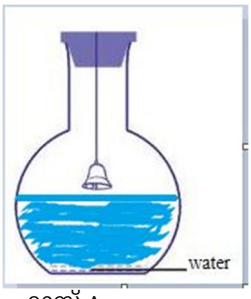
22. ശക്തമായ ഇടിമിന്നൽ ഉള്ള നേരത്ത രണ്ടി വ്യത്യസ്ത മരത്തിന്റെ ചുവട്ടിൽ നിൽക്കുന്ന രണ്ടു ആൺകുട്ടികളുടെ ചിത്രം കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. ഒരാൾ ഒരു മാവിന്റെ ചുവട്ടിലും മറ്റേ കുട്ടി ഒരു തെങ്ങിൻ ചുവട്ടിലും ആണ് നിൽക്കുന്നത്. നല്ല മഴയും ഇടിയും മിന്നലും ഉള്ളത് കൊണ്ടാണ് അവർ മരച്ചുവട്ടിൽ നിൽക്കുന്നത്. രണ്ടു പേരും പുറത്തു ആയതിനാലും സുരക്ഷിതമായ ഒരു മേൽക്കൂരയ്ക്ക് ചുവട്ടിൽ അല്ലാത്തതിനാലും രണ്ടു പേർക്കും ഇടിമിന്നൽ ഏൽക്കാൻ ഉള്ള സാധ്യത ഉണ്ട്. എന്നാൽ താരതമ്യേന ആർക്കാണ് ഇടിമിന്നൽ നിൽക്കാനുള്ള സാധ്യത കുറവ് എന്ന് നിങ്ങൾക്ക് കണ്ടെത്താമോ? ആൺകുട്ടി A അതോ കുട്ടി B?

ആൺകുട്ടി A

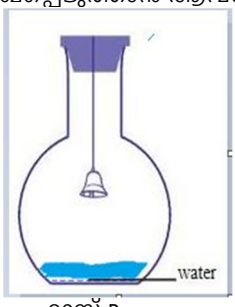
ആൺകുട്ടി B

(a) ആൺകുട്ടി A (b) ആൺകുട്ടി B

23. ഉരുണ്ട രണ്ടു ഫ്ലാസ്കുകൾ കുട്ടികൾക്ക് നൽകുന്നു. രണ്ടിലും വ്യത്യസ്ത അളവിൽ ജലം ഒഴിച്ചിരിക്കുന്നു. ഫ്ലാസ്കിനുള്ളിൽ അടപ്പിനോടു ചേർന്ന് ഒരേ ഉയരത്തിൽ ഓരോ മണി കെട്ടി തൂക്കിയിരിക്കുന്നു.ഇതിൽ ഏത് ഫ്ലാസ്കിൽ ആണ് മാണി കൂടുതൽ ശബ്ദം പുറപ്പെടുവിക്കുക എന്ന് കണ്ടെത്തി ഉത്തരം രേഖപ്പെടുത്താൻ ആവശ്യപ്പെടുന്നു.



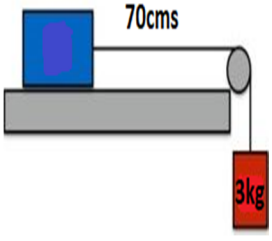
ഫ്ലാസ്ക് A

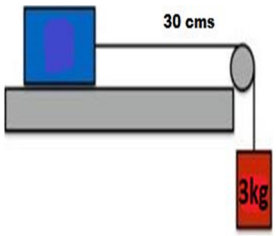


ഫ്ലാസ്ക് B

(a) ഫ്ലാസ്ക് A (b) ഫ്ലാസ്ക് B (c)രണ്ടു ഫ്ലാസ്കിൽ നിന്നും ശബ്ദം കേൾക്കില്ല
(d) രണ്ടു ഫ്ലാസ്കിൽ നിന്നും ഒരേ തോതിൽ ഉള്ള ശബ്ദം കേൾക്കുന്നു

24. 70 സെന്റിമീറ്ററും 30 സെന്റിമീറ്ററും വീതം നീളം ഉള്ള, ഒരേ വസ്തു കൊണ്ട് നിർമ്മിച്ച രണ്ടു വയറുകൾ കുട്ടികൾക്ക് കൊടുക്കുന്നു. രണ്ടെണ്ണവും ബ്ലൂ സപ്പോർട്ടിൽ ഘടിപ്പിക്കുന്നു. മൂന്നു കിലോഗ്രാം ഭാരം ഒരേ ഉയരത്തിൽ ഇവയിൽ നിന്നും തൂക്കിയിടുന്നു. ഒരേ സ്ഥാനത്തു ഉറപ്പിച്ച രണ്ടു വ്യത്യസ്ത കമ്പികൾ താരതമ്യം ചെയ്ത് ഏതിനാണ് കൂടുതൽ ആവൃത്തി എന്ന് കണ്ടെത്താൻ പറയുന്നു?





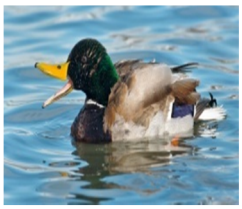
(a) എഴുപത് സെന്റിമീറ്റർ ഉള്ള കമ്പി
(b)മുപ്പത് സെന്റിമീറ്റർ ഉള്ള കമ്പി
(c) രണ്ടും ഒരേ പോലെ
(d) ഉത്തരം കണ്ടെത്താൻ കഴിയില്ല

3. വർഗീകരണം

25. വിദ്യാർത്ഥികൾക്ക് പിക്ചർ കാർഡുകൾ കാണിച്ചു കൊടുക്കുന്നു. ഒരേ വിഭാഗത്തിൽ പെട്ടവയാണ് അവ എല്ലാം. അവയുമായി ഏറ്റവും യോജിച്ചവ താഴെ തന്നിരിക്കുന്നവയിൽ ഏത് എന്ന് കണ്ടെത്താൻ കുട്ടികളോട് പറയുന്നു.

(a)  (b)  (c)  (d) 

26.   

(a)  (b)  (c)  (d) 

തന്നിരിക്കുന്ന ശബ്ദങ്ങളെ വർഗീകരിച്ച തന്നിരിക്കുന്ന പട്ടികയിൽ എഴുതാൻ കുട്ടികളോട് പറയുന്നു, പാട്ട്, ബഹളങ്ങൾ

ശബ്ദം	വർഗീകരണം
27. Air horn, Traffic block	
28. Sitar, Jaltarang	

29. മനുഷ്യൻ ഉണ്ടാകുന്ന വിവിധ ശബ്ദങ്ങൾ കുട്ടികളെ കേൾപ്പിക്കുന്നു. ഇവ മനുഷ്യർ ഉണ്ടാക്കുന്നത് കൊണ്ട് ഇവയെ മനുഷ്യ-നിർമിത ശബ്ദങ്ങൾ അഥവാ കൃത്രിമ ശബ്ദങ്ങൾ എന്ന് പറയുന്നു.
പാറ പൊട്ടിക്കുന്ന ശബ്ദം, പടക്കത്തിന്റെ ശബ്ദം, ഉച്ചഭാഷിണികളുടെ ശബ്ദം
അതിനു ശേഷം താഴെ തന്നിരിക്കുന്നവയിൽ നിന്നും കൃത്രിമ ശബ്ദം തിരഞ്ഞെടുക്കാൻ കുട്ടികളോട് ആവശ്യപ്പെടുന്നു.
(a) കൊതുകിന്റെ ശബ്ദം (b) മോട്ടോറിന്റെ ശബ്ദം (c) കുയിലിന്റെ ശബ്ദം (d) സിംഹത്തിന്റെ ശബ്ദം

30. താഴെ കൊടുത്തിരിക്കുന്ന ചിത്രം അടങ്ങിയ ഒരു ഫ്ലാഷ് കാർഡ് കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. നമ്മുടെ സംസ്ഥാനത്തെ ട്രാഫിക് അതോറിറ്റി ഉപയോഗിക്കുന്ന ഈ ചിഹ്നം ഇതിനു മുൻപ് കണ്ടിട്ടുണ്ടോ എന്ന് കുട്ടികളോട് ചോദിക്കുന്നു. അവർ ഇത് എവിടെയാണ് കണ്ടിട്ടുള്ളത് എന്ന് താഴെ കൊടുത്തിരിക്കുന്ന സൂചികകളിൽ നിന്ന് തിരഞ്ഞെടുത്ത എഴുതാൻ ആവശ്യപ്പെടുന്നു.

(a) കാട്ടിലെ റോഡുകളിൽ (b) ബസ് സ്റ്റോപ്പിൽ
(c) പാർക്കിൽ (d) കടകളിൽ

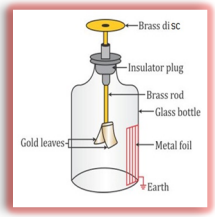
31. ശബ്ദം പുറപ്പെടുവിക്കുന്ന ക്രമം നന്നായി വായിച്ചു മനസ്സിലാക്കാൻ കുട്ടികളോട് പറയുന്നു. അതിനു ശേഷം തന്നിരിക്കുന്ന ശ്രീനിയിലെ അവസാന ഘട്ടം പൂർത്തീകരിക്കാൻ ആവശ്യപ്പെടുന്നു

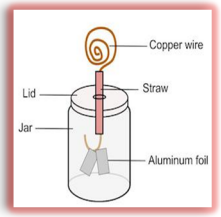
- ശബ്ദം പുറപ്പെടുവിക്കുന്ന ഒരു സ്രോതസ്സിൽ നിന്ന് ശബ്ദം അനുഭവിക്കാൻ സാധിക്കും
- ശബ്ദത്തിന്റെ ഉറവിടം ശബ്ദം പുറപ്പെടുവിക്കുമ്പോൾ അത് നമ്മുടെ കേൾക്കാനുള്ള അവയവമായ ചെവിയിലേക്ക് എത്തുന്നു.
- സ്രോതസ്സിൽ നിന്നുള്ള ശബ്ദം ഒരു ------ ലൂടെ നമ്മുടെ ചെവിയിലേക്ക് എത്തുന്നതുകൊണ്ടാണ് ശ്രവണം സാധ്യമാകുന്നത്.

(a) ശബ്ദം (b) മാധ്യമം (c) ഉപകരണം (d) ഇവയൊന്നുമല്ല

32. കുറച്ചു പ്രകൃതിജന്യ ശബ്ദങ്ങൾ വിദ്യാർത്ഥികൾക്ക് കേൾപ്പിച്ചുകൊടുക്കുന്നു. യാതൊരു കൃത്രിമത്വവും ഇല്ലാത്തവ ആണ് അവ. അതുകൊണ്ട് അവയെ പ്രകൃതിജന്യ ശബ്ദത്തിന്റെ ഉറവിടം എന്ന് പറയുന്നു.
ജീവികളുടെ സ്വരനാളത്തിൽ നിന്നുള്ള ശബ്ദം, ഇടിമുഴക്കം, ഇലകളുടെ ശബ്ദം
അതിനു ശേഷം താഴെ കൊടുത്ത ലിസ്റ്റിൽ നിന്നും പ്രകൃതിജന്യമായ ശബ്ദങ്ങൾക്ക് ഉദാഹരണം കണ്ടെത്താൻ പറയുന്നു.
(a) വിൻഡ് മില്ലിന്റെ ശബ്ദം (b) ഓടക്കുഴലിന്റെ ശബ്ദം (c) ഫാനിന്റെ ശബ്ദം (d)വെള്ളച്ചാട്ടത്തിന്റെ ശബ്ദം

33. താഴെ തന്നിരിക്കുന്ന ചിത്രങ്ങൾ കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. സ്വർണ്ണം കൊണ്ടും അലൂമിനിയം കൊണ്ടും ലീഫുകൾ നിർമിച്ച രണ്ടു ഇലക്ട്രോസ്കോപ്പുകൾ ആണ് ചിത്രത്തിൽ.

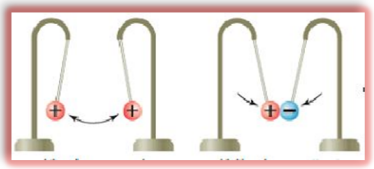




സ്വർണ ലീഫുകളെയും അലുമിനിയും ലീഫുകളെയും ------- ആയി തിരിച്ചറിയാൻ അവരോട് പറയുന്നു.

(a) അർധചാലകങ്ങൾ
(b) ഇന്സുലേറ്ററുകൾ
(c) ചാലകങ്ങൾ
(d) ഡൈ-ഇലക്ട്രിക്സ്

34. പോസിറ്റിവ് ചാർജും നെഗറ്റീവ് ചാർജും ഉള്ള രണ്ടു പിത് ബോളുകളുടെ ചിത്രമാണ് കൊടുത്തിരിക്കുന്നത്. ബോൾ A യ്ക്ക് പോസിറ്റീവ് ചാർജും ബോൾ B യ്ക്ക് നെഗറ്റീവ് ചാർജും ആണ്. പോസിറ്റിവ് ചാർജ് ഉള്ള മറ്റൊരു പിത് ബോൾ ഈ ബോളുകളുടെ അടുത്തേക്ക് കൊണ്ടുവരുന്നു. ബോൾ A അതിനെ വികർഷിക്കുകയും ബോൾ B അതിനെ ആകർഷിക്കുകയും ചെയ്യുന്നു. ഇവിടെ ഉപയോഗപ്പെടുത്താവുന്ന തത്വം ഏത് എന്ന് കുട്ടികളോട് ചോദിക്കുന്നു.



(a) സമാന ചാർജുകൾ പരസ്പരം വികർഷിക്കുകയും വ്യത്യസ്ത ചാർജുകൾ പരസ്പരം ആകർഷിക്കു കയും ചെയ്യുന്നു
(b) സമാന ചാർജുകൾ പരസ്പരം ആകർഷിക്കുകയും വ്യത്യസ്ത ചാർജുകൾ വികർഷിക്കുകയും ചെയ്യുന്നു
(c) ആ ബോളുകൾ കാന്തികശക്തി ഉള്ളവയാണ്
(d) ഇവയൊന്നുമല്ല

35. താഴെ തന്നിരിക്കുന്നവയുടെ ചിത്രങ്ങൾ കുട്ടികളെ കാണിക്കുന്നു. അവയെ ശബ്ദ പ്രതിഫലന തത്വം ഉപയോഗപ്പെടുത്തുന്ന സാഹചര്യങ്ങളുടെ അടിസ്ഥാനത്തിൽ വർഗ്ഗീകരിക്കുകയും ശരിയായ ചിത്രവുമായി ചേർക്കുകയും ചെയ്യാൻ പറയുന്നു.
അൾട്രാ സൗണ്ട് സ്കാനർ , സ്റ്റെതസ്കോപ്പ്, തീയറ്റർ ഹാളുകൾ
(a) SONAR (b) റേഡിയോ (c) ടീവി (d) മൈക്രോസ്കോപ്പ്

36. താഴെ കൊടുത്തിരിക്കുന്ന വസ്തുക്കളിൽ ഉപയോഗപ്പെടുത്തിയിരിക്കുന്ന പൊതുതത്വം ഏതെന്നു പറയാൻ കുട്ടികളോട് ആവശ്യപ്പെടുന്നു. ചോയ്സുകൾ ഉചിതമായി തരംതിരിക്കുകയും അവയിൽ നിന്ന് ഈ വസ്തുക്കളിൽ ഉപയോഗപ്പെടുത്തുന്ന പൊതു തത്വം വിശദീകരിക്കുന്ന ഒന്ന് തിരഞ്ഞെടുക്കുക
കപ്പാസിറ്റർ, എലെക്ട്രോസ്കോപ്പ് , മിന്നൽ രക്ഷാകവചം
(a) വൈദ്യുതി (b) ചാർജ് (c) എർത്ത് (d) ഊർജ്ജം

4. അളവ്

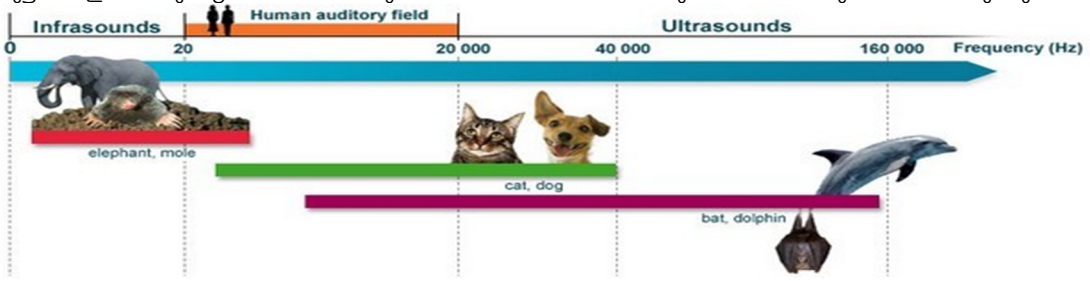
37. മ്യൂസിക് നോട്ടുകളുടെ അളവ് കാണിക്കുന്ന ഒരു ചാറ്റ് കുട്ടികൾക്ക് കാണിച്ചു കൊടുക്കുന്നു. അതിൽ നിന്നും ഏറ്റവും ഉയർന്ന പിടിച്ച ഉള്ള ശബ്ദം ഏതെന്നു തിരഞ്ഞെടുത്ത ടിക്ക് ചെയ്യാൻ കുട്ടികളോട് പറയുന്നു.

സ	രി	ഗ	മ	പ	ധ	നി	സ
240 Hz	270 Hz	300 Hz	320 Hz	360 Hz	400 Hz	450 Hz	480 Hz

(a) 256 Hz (b) 320 Hz (c) 427 Hz (d) 480 Hz

38. കുട്ടികൾക്ക് ഒരു മീറ്റർ സ്കെയിൽ നൽകുന്നു. നീളം അളക്കുന്ന യൂണിറ്റ് _____ ആണ്.
(a) കൂളും (b) ഡെസിബെൽ (c) മീറ്റർ (d) ഫാരഡ്

39. ഒരു അളവ് പരിധി ചാർട്ട് കുട്ടികൾക്ക് നൽകുന്നു. ഓഡിബിലിറ്റി ചാർട്ട് പ്രദർശിപ്പിക്കുന്നു. കുട്ടികളോട് മനുഷ്യന് കേൾക്കാവുന്ന പരിധി അതിൽ നിന്നും തിരഞ്ഞെടുക്കാൻ പറയുന്നു.

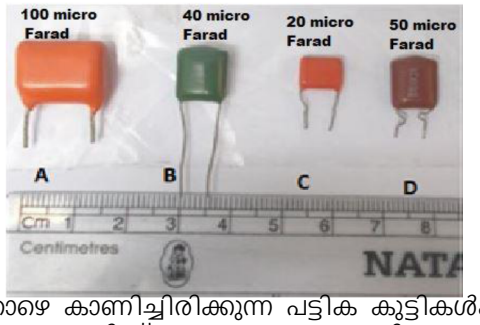


(a) 10-15 Hz (b) 10-10,000 Hz (c) 20- 20,000 Hz (d) 30-30,000 Hz

വിട്ടുപോയ വിവരങ്ങൾ പൂരിപ്പിക്കാനായി കുട്ടികൾക്ക് ഒരു പട്ടിക നൽകുന്നു. കുട്ടികൾ സ്വന്തമായി ഒരു സിമ്പിൾ പെൻഡുലം നിർമ്മിച്ച് വേണം ഈ പട്ടിക പൂർത്തീകരിക്കാൻ.

സിമ്പിൾ പെൻഡുലം	**ഓസിലേഷനുകളുടെ എണ്ണം**	**ഓസിലേഷന് എടുക്കുന്ന സമയം (സെക്കൻഡിൽ)**	**ആവൃത്തി**
40. **പെൻഡുലം A**	**10**	**10**	
41. **പെൻഡുലം B**	**100**	**25**	

42. വിവിധ തരത്തിൽ ഉള്ള കപ്പാസിറ്റർ വിദ്യാർത്ഥികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. അവയിൽ ഏറ്റവും ചെറിയ കപ്പാസിറ്റൻസ് ഉള്ള കപ്പാസിറ്റർ ഏതെന്നു എടുത്തെഴുതാൻ കുട്ടികളോട് പറയുന്നു



(a) A, 100 microFarad

(b) B, 40 microFarad

(c) C, 20 microFarad

(d) D, 50 microFarad

താഴെ കാണിച്ചിരിക്കുന്ന പട്ടിക കുട്ടികൾക്ക് നൽകി അതിനെ തുടർന്ന് കൊടുത്തി രിക്കുന്ന ചോദ്യങ്ങൾക്ക് ഉത്തരം കണ്ടെത്താൻ പറയുന്നു

പ്രദേശം	ശബ്ദപരിധി	
വ്യത്യസ്ത പ്രദേശങ്ങൾ	പകൽ സമയം	രാത്രി നേരം
വ്യാവസായിക പ്രദേശം	75Hz	70 Hz
വ്യവസായ വാണിജ്യ പ്രദേശം	65 Hz	55 Hz
ഹൌസിങ് കോളനി പ്രദേശം	55 Hz	45 Hz
സൈലന്റ് ഏരിയ	50 Hz	40 Hz

43. ഹൌസിങ് കോളനി പ്രദേശത്തെ പകൽ സമയത്തെയും രാത്രിയിലെയും ശബ്ദപരിധിയിൽ ഉള്ള വ്യത്യാസം കണ്ടെത്തുക
(a) 10 Hz (b) 5 Hz (c) -5 Hz (d) -10 Hz

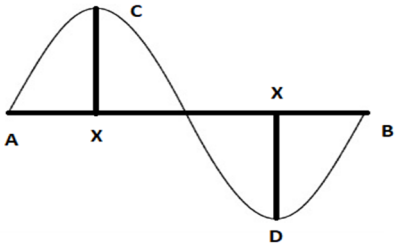
44. ഏത് പ്രദേശത്താണ് ശബ്ദപരിധികൾ തമ്മിൽ ഏറ്റവും കുറവ് വ്യത്യാസം എന്ന് പട്ടികയിൽ നിന്നും കണ്ടെത്തുക
(a) വ്യാവസായിക പ്രദേശം (b) വ്യവസായ വാണിജ്യ പ്രദേശം
(c) ഹൌസിങ് കോളനി പ്രദേശം (d) സൈലന്റ് ഏരിയ

45. പട്ടിക പ്രകാരം ഏത് പ്രദേശത്താണ് പകൽ നേരത്തെ ഏറ്റവും ഉയർന്ന ശബ്ദപരിധി ഉള്ളത്?
(a) വ്യാവസായിക പ്രദേശം (b) വ്യവസായ വാണിജ്യ പ്രദേശം
(c) ഹൌസിങ് കോളനി പ്രദേശം (d) സൈലന്റ് ഏരിയ

46. രാത്രി സമയത് ഏറ്റവും കുറവ് ശബ്ദപരിധി ഉള്ള പ്രദേശം ഏത് എന്ന് പട്ടികയിൽ നിന്നും കണ്ടെത്തുക
(a) വ്യാവസായിക പ്രദേശം (b) വ്യവസായ വാണിജ്യ പ്രദേശം
(c)ഹൌസിങ് കോളനി പ്രദേശം (d) സൈലന്റ് ഏരിയ

47. സൈൻ വേവിന്റെ ചിത്രം കുട്ടികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു. ചിത്രം വിശകലനം ചെയ്ത് തരംഗത്തിന്റെ ആകെ നീളവും ഉയരവും കണക്കാക്കാൻ കുട്ടികളോട് പറയുന്നു. തിരശ്ചീന ദൈർഘ്യം തരംഗദൈർഘ്യത്തെയും ലംബമായ ഉയരം തരംഗത്തിന്റെ ആംപ്ലിറ്റൂഡിനെയും

സൂചിപ്പിക്കുന്നു. AB തരംഗദൈർഘ്യവും CX , DX എന്നിവ തരംഗത്തിന്റെ ആംപ്ലിറ്റ്യൂഡും ആണ്. ശരിയായ നീളം കണ്ടെത്തി, തന്നിരിക്കുന്ന ഓപ്ഷനുകളിൽ നിന്ന് ശരിയായ ഉത്തരം കണ്ടെത്താൻ കുട്ടികളോട് ആവശ്യപ്പെടുന്നു



(a) AB = 5 cms, CX = DX = 2 cms

(b) AB = 2 cms, CX = DX = 5 cms

(c) AB = CX = DX = 2 cms

(d) AB = CX = DX = 5 cms

48. ഒരു കപ്പാസിറ്ററിന്റെ ചിത്രം വിദ്യാർത്ഥികൾക്ക് കാണിക്കുന്നു. പരമ്പരാഗതമായി പോസിറ്റീവ് എന്ന് വിളിക്കുന്ന കാൽ തിരഞ്ഞെടുക്കാൻ അവരോട് ആവശ്യപ്പെടുന്നു.

(a) നീളമുള്ള കാൽ (b) ചെറിയ കാൽ
(c) നിർണ്ണയിക്കാൻ കഴിയില്ല
(d) ഇവയൊന്നും അല്ല

<u>5. മോഡലുകൾ നിർമ്മിക്കുന്നു</u>

49. നമ്മുടെ സംസ്ഥാനത്ത് വ്യാപകമായി ഉപയോഗിക്കുന്ന "ചെണ്ട" എന്ന താളവാദ്യത്തിന്റെ മാതൃക വിദ്യാർത്ഥികൾക്ക് കാണിച്ചുകൊടുക്കുന്നു . ചെണ്ടയടിക്കുമ്പോൾ ശബ്ദത്തിന്റെ ആംപ്ലിറ്റ്യൂഡ് ഏറ്റവും കൂടുതൽ ആവുന്നത് എപ്പോഴാണെന്ന് തിരഞ്ഞെടുക്കാൻ അവരോട് ആവശ്യപ്പെടുന്നു.

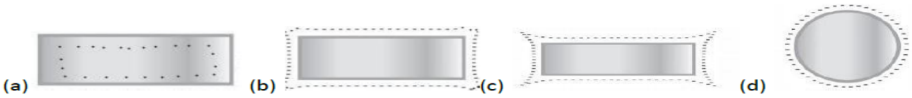
(a) പതുക്കെ അടിക്കുമ്പോൾ

(b) കഠിനമായി അടിക്കുമ്പോൾ

(c) തുടയ്ക്കുമ്പോൾ

(d) തിരുമ്മുമ്പോൾ

50. രമേഷ് എന്ന വിദ്യാർത്ഥി ക്ലാസ്സിൽ കൊണ്ടുവന്ന കണ്ടക്ടിംഗ് പ്ലേറ്റിന്റെ മാതൃക താഴെ കൊടുത്തിരിക്കുന്നു. കണ്ടക്ടിംഗ് പ്ലേറ്റിൽ ചാർജ് വിതരണത്തിനുള്ള ശരിയായ ഓപ്ഷൻ തിരഞ്ഞെടുക്കാൻ വിദ്യാർത്ഥികളോട് ആവശ്യപ്പെടുന്നു. ചാലക പ്ലേറ്റിൽ ചാർജുകൾ എങ്ങനെ വിതരണം ചെയ്യും?



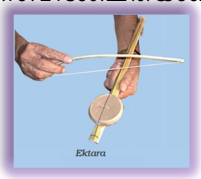
51. വടികൾ ഉപയോഗിച്ച് തയ്യാറാക്കിയ ഈ മോഡൽ മനോഹരമായി വരച്ചാണ് സീത കൊണ്ടുവന്നിരിക്കുന്നത്. മോഡൽ ഒരു ഹാർഡ് ബോർഡിൽ ശ്രദ്ധാപൂർവ്വം ഒട്ടിച്ചിരിക്കുന്നു. ഈ ചിഹ്നം എന്തിനെ പ്രതിനിധീകരിക്കുന്നു?

(a) ഡിസ്ചാർജിംഗ് (b) ഏർത്ത്
(c) കപ്പാസിറ്റർ (d) വൈദ്യുതി

52. നേരത്തെ തയ്യാറാക്കിയ കളിപ്പാട്ട ടെലിഫോണിന്റെ മാതൃക താഴെ കാണാം. ഈ മാതൃകയിൽ ശബ്ദത്തിന്റെ ഏത് തത്വമാണ് പ്രവർത്തിക്കുന്നത്?

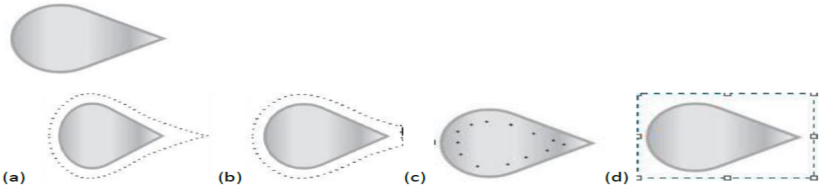
(a) ശബ്ദ സവിശേഷതകൾ (b) ശബ്ദ പ്രതിഫലനം
(c)ശബ്ദമലിനീകരണം (d) ശബ്ദപ്രചരണം

53. തെങ്ങിൻ തോട് കൊണ്ട് നിർമ്മിച്ച കുട്ടികളുടെ സിത്താർ "ഏക്താര" യുടെ ഒരു മാതൃക ചുവടെയുണ്ട്. എങ്ങനെയാണ് ഈ സിത്താറിൽ ശബ്ദം ഉണ്ടാകുന്നത്? സിത്താറിന്റെ തന്ത്രിയുടെ ഏത് സവിശേഷതയാണ് ഉച്ചത്തിലുള്ള ശബ്ദം പുറപ്പെടുവിക്കുന്നത്?

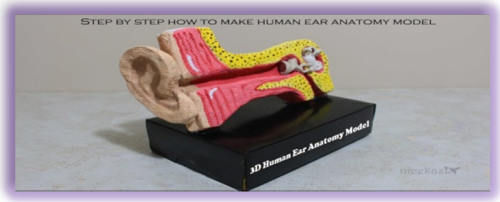


(a) സ്ട്രിംഗിന്റെ ഇറുകിയത
(b) സ്ട്രിംഗിന്റെ മാധ്യമം
(c) സ്ട്രിംഗുകളുടെ എണ്ണം
(d) സ്ട്രിംഗുകളുടെ ആന്ദോളനം

54. ചാലക പ്രതലമായി പ്രവർത്തിക്കുന്ന മഴത്തുള്ളിയുടെ മാതൃക ചുവടെ നൽകിയിരിക്കുന്നു. ഈ ചാലക കോണിനുള്ളിൽ എങ്ങനെയാണ് ചാർജുകൾ വിതരണം ചെയ്യുന്നത്?



55. ചെവിയുടെ ഘടനയുടെ മാതൃകയാണ് താഴെ കൊടുത്തിരിക്കുന്നത്.



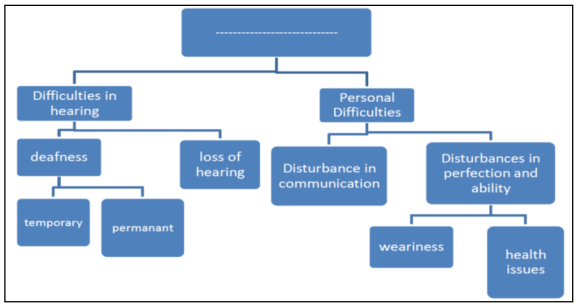
കേൾവിയുടെ ഒരു പ്രധാന ഘടകമായ കോക്ലിയയെ സജീവമാക്കുന്നത് കോക്ലിയയിലെത്തുകയും തട്ടുകയും ചെയ്യുന്ന _____ ആണ്, അതിനാൽ മനുഷ്യർക്ക് ശബ്ദാനുഭവം അനുഭവപ്പെടുന്നു.
(a) ജലം (b) ശബ്ദതരംഗം (c) ആവേഗം (d) ഇവയൊന്നുമല്ല

56. രാജീവ് നിർമ്മിച്ചു ക്ലാസ്സിലേക്ക് കൊണ്ടുവന്ന മോഡൽ ആണ് താഴെ കൊടുത്തിരിക്കുന്നത്. ഇത് എന്തിന്റെ മോഡൽ ആണ്?

(a) പേപ്പർ ഇലക്ട്രോസ്കോപ്പ്
(b) ഗാൽവനോസ്കോപ്പ്
(c) ടെലിസ്കോപ്പ്
(d) പെരിസ്കോപ്പ്

57. ഒരു ഉച്ചഭാഷിണിയുടെ മാതൃക താഴെ കൊടുത്തിരിക്കുന്നു. ഇതിൽ ഏത് ഊർജ്ജ കൈമാറ്റമാണ് ഇവിടെ നടക്കുന്നത്?

a. വൈദ്യുതോർജ്ജം ശബ്ദ ഊർജ്ജം ആകുന്നു
b. വൈദ്യുതോർജ്ജം പ്രകാശോർജ്ജം ആകുന്നു
c. ഗതികോർജ്ജം ശബ്ദോർജ്ജം ആകുന്നു
d. പൊട്ടൻഷ്യൽ ഊർജ്ജം ശബ്ദ ഊർജ്ജം ആകുന്നു



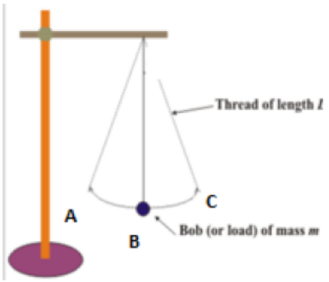
58. വിദ്യാർത്ഥികൾക്ക് കാണിക്കുന്ന ഫ്ലോ ചാർട്ട് ചുവടെ നൽകിയിരിക്കുന്നു, അത് ശബ്ദത്തിന്റെ ദോഷഫലങ്ങൾ ചിത്രീകരിക്കുന്നു. ഫ്ലോ ചാർട്ടിന്റെ തലക്കെട്ട് ഇങ്ങനെ എഴുതാം:

(a) ശബ്ദ പ്രചരണം (b) ശബ്ദ സവിശേഷതകൾ
(c)ശബ്ദ മലിനീകരണം (d) ശബ്ദ പ്രതിഫലനം

59. സ്റ്റെതസ്കോപ്പിന്റെ മാതൃക ചുവടെ നൽകിയിരിക്കുന്നു. ഒരു ഡോക്ടറുടെ സ്റ്റെതസ്കോപ്പിൽ ഏത് ശബ്ദ തത്വമാണ് ഉപയോഗിക്കുന്നത്?

(a) ശബ്ദ സവിശേഷതകൾ (b) ശബ്ദ ഉച്ചത
(c) ശബ്ദ പ്രചരണം (d) ശബ്ദ കൂർമ്മത

60. സിമ്പിൾ പെൻഡുലത്തിന്റെ മാതൃക ചുവടെ നൽകിയിരിക്കുന്നു. നൽകിയിരിക്കുന്ന ചോയ്സുകളിൽ നിന്ന് ബോബിന്റെ ശരാശരി സ്ഥാനവും അത്യന്ത സ്ഥാനങ്ങളെയും തിരിച്ചറിയാൻ വിദ്യാർത്ഥികളോട് ആവശ്യപ്പെടുന്നു



(a) ശരാശരി സ്ഥാനം=B, എക്സ്ട്രീം പൊസിഷനുകൾ= A, C
(b) ശരാശരി സ്ഥാനം=A, എക്സ്ട്രീം സ്ഥാനങ്ങൾ =B, C
(c) ശരാശരി സ്ഥാനം=C, എക്സ്ട്രീം സ്ഥാനങ്ങൾ=A ,B
(d) നിർണ്ണയിക്കാൻ കഴിയില്ല

VC SCIENTIFIC ATTITUDE SCALE (Malayalam)

ശാസ്ത്ര അഭിരുചി പരീക്ഷ

താഴെ 60 പ്രസ്താവനകൾ കൊടുത്തിരിക്കുന്നു. ഈ 60 പ്രസ്താവനകൾക്കും നിങ്ങൾക്കനുയോജ്യം എന്ന് തോന്നുന്ന ഒരു അഭിപ്രായം / ഉത്തരം മാർക്ക് ചെയ്യുക. എല്ലാ പ്രസ്താവനകൾക്ക് നേരെയും 5 ഉത്തരങ്ങൾ / അഭിപ്രായങ്ങൾ രേഖപ്പെടുത്തിയിട്ടുണ്ട്. അവയിൽ ഏറ്റവും അനുയോജ്യമായതിന് നേരെ (✓) ശരി എന്ന ചിഹ്നം രേഖപ്പെടുത്തുക.

ഉദാഹരണം

		പൂർണ്ണമായും യോജിക്കുന്നു	50% യോജിക്കുന്നു	അറിയില്ല	50% വിയോജിക്കുന്നു	പൂർണ്ണമായും വിയോജിക്കുന്നു.
1	എനിക്ക് ശാസ്ത്ര പരീക്ഷണങ്ങൾ ഇഷ്ടമാണ്.	✓				

		പൂർണ്ണമായും യോജിക്കുന്നു	50% യോജിക്കുന്നു	അറിയില്ല	50% വിയോജിക്കുന്നു	പൂർണ്ണമായും വിയോജിക്കുന്നു.
1	എന്റെ എല്ലാ പ്രശ്നങ്ങൾക്കുമുള്ള പരിഹാരമാർഗ്ഗം ശാസ്ത്രത്തിന് നിർദ്ദേശിക്കാൻ കഴിയും.					
2	ശാസ്ത്ര പ്രവർത്തനങ്ങളും, പരീക്ഷണങ്ങളും ചെയ്യാൻ എനിക്ക് നല്ല പോലെയറിയാം.					
3	ശാസ്ത്രത്തിന്റെ പ്രായോഗികമായ തലങ്ങൾ മനസ്സിലാ ക്കുവാനും അവയെന്റെ ജീവിതത്തിൽ പകർത്തുവാനും എനിക്കിഷ്ടമാണ്.					
4	ശാസ്ത്ര പ്രവർത്തനങ്ങൾ ശരിയായ ഉത്തരം ലഭിക്കുന്നത് വരെ വീണ്ടും വീണ്ടും ആവർത്തിക്കാൻ എനിക്കിഷ്ടമാണ്.					
5	ലോകത്തിലെ എല്ലാ പ്രശ്നങ്ങൾക്കുമുള്ള പരിഹാരം ശാസ്ത്രത്തിന് നിർദ്ദേശിക്കാൻ സാധിക്കുകയില്ല.					
6	ശാസ്ത്ര പരീക്ഷണം വിജയകരമായി പരീക്ഷിച്ച് കഴിഞ്ഞാൽ അതിന് സമാനമായ മറ്റ് പരീക്ഷണങ്ങൾ ചെയ്യുവാനെ നിക്കിഷ്ടമാണ്.					
7	എന്റെ അഭിപ്രായത്തിൽ മികച്ച കൃഷി ലഭിക്കാൻ രാസവളങ്ങൾ ഉപയോഗിക്കുന്നത് ഒഴിച്ചുകൂടാൻ കഴിയാ ത്തതാണ്.					
8	എന്റെ ശാസ്ത്ര പുസ്തകങ്ങളിൽ പഠിച്ച കാര്യങ്ങളുടെ സമാനമായ പുതിയ പ്രവർത്തനങ്ങൾ കണ്ടെത്തുവാൻ ഞാനാഗ്രഹിക്കുന്നു.					
9	ഒരേ നിറമുള്ള വസ്ത്രങ്ങൾ ദിവസവും ധരിക്കുന്നത് ഭാഗ്യം കൊണ്ടുവരുമെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
10	എന്റെ പഠനാനുഭവങ്ങളെ വ്യക്തിജീവിതവുമായി ബന്ധിപ്പി ക്കുവാൻ എനിക്കിഷ്ടമല്ല.					

11	എന്റെ അഭിപ്രായത്തിൽ ശാസ്ത്രം എന്ന വിഷയം ലോകത്തിൽ നടക്കുന്ന സംഭവവികാസങ്ങളെ കുറിച്ച് പഠിക്കുവാൻ അനിവാര്യമാണ്.					
12	ചില സമയങ്ങളിൽ എനിക്ക് ശാസ്ത്ര പ്രവർത്തനങ്ങൾ ചെയ്യുന്നത് മുഷിപ്പുളവാക്കുന്നതാണ്.					
13	ഒരാളുടെ വ്യക്തിജീവിതത്തിൽ മെഡിക്കൽ സയൻസിന് പ്രാധാന്യമില്ല മറിച്ച് അയാളുടെ വിധിയാണ് ജീവിതം തീരുമാനിക്കുന്നത്.					
14	ശാസ്ത്രം സത്യമാണ് എന്ന് തെളിയിക്കാൻ ചില സമയ ങ്ങളിൽ എനിക്ക് നുണ പറയാൻ തോന്നാറുണ്ട്.					
15	പ്രകൃതി പ്രതിഭാസങ്ങളുടെെ രഹസ്യങ്ങൾ അറിയുന്നത് എനിക്ക് മുഷിപ്പുളവാക്കുന്ന ഒരനുഭവമാണ്.					
16	ശാസ്ത്ര പരീക്ഷണങ്ങൾ സ്വയം ചെയ്യുവാനും ആശയങ്ങൾ സ്വയം കണ്ടെത്തുവാനും എനിക്ക് കഴിയും.					
17	അന്യഗ്രഹങ്ങൾ, മനുഷ്യൻ കണ്ടെത്തിയിട്ടില്ലാത്ത ഗ്രഹങ്ങൾ, പ്രപഞ്ചം എന്നിവയെക്കുറിച്ച് കൂടുതൽ മനസ്സിലാക്കുവാൻ എനിക്ക് ഇഷ്ടമാണ്.					
18	ശാസ്ത്ര പരീക്ഷകൾ, കവിസ്സുകൾ ഇവയിൽ എനിക്ക് നല്ല മാർക്ക് കിട്ടാറുണ്ട്.					
19	ശാസ്ത്രത്തിലെ ഏതെങ്കിലും ചോദ്യം കാണുമ്പോൾ എനിക്ക് പേടിയാകാറുണ്ട്.					
20	ശാസ്ത്രമേളകൾ, സെമിനാറുകൾ, ക്ലാസ്സുകൾ ഇവയി ലൊന്നും പങ്കെടുക്കുവാൻ എനിക്ക് ഒട്ടും താല്പര്യമില്ല.					
21	തത്തമ്മയെ കൊണ്ട് ശീട്ടെടുപ്പിച്ച് ഭാഗ്യം പ്രവചിക്കു ന്നതിൽ ഒരു സത്യവുമില്ല.					
22	എനിക്ക് ശാസ്ത്രം പഠിക്കുവാൻ ഇഷ്ടമല്ല.					
23	എന്റെ അഭിപ്രായത്തിൽ മാനസിക രോഗങ്ങൾ പരിഹരി ക്കുവാൻ മന്ത്രവാദം ആവശ്യമാണ്.					
24	എനിക്ക് ശാസ്ത്രം മുഖ്യ വിഷയമായി എടുത്ത് തുടർന്ന് പഠിക്കുവാനിഷ്ടമല്ല.					
25	എന്റെ അഭിപ്രായത്തിൽ എളുപ്പത്തിൽ ഉത്തരം ലഭിക്കാത്ത ചോദ്യങ്ങൾക്ക് മുന്നിൽ ഉത്തരം കണ്ടെത്തുക പ്രയാസപ്പെട്ട ഒരു കാര്യമാണ്.					
26	ശാസ്ത്രം സത്യമാണ് എന്ന് തെളിയിക്കുവാൻ പരീക്ഷണ ങ്ങളുടെയൊന്നും ആവശ്യമില്ല.					
27	ഭാവിയിൽ സയൻസ് എന്ന വിഷയം കൂടുതൽ മനസ്സിലാ ക്കുവാൻ ഞാനാഗ്രഹിക്കുന്നു.					
28	എനിക്ക് ശാസ്ത്രം രസകരമായി പഠിക്കാൻ സാധിക്കുമെന്ന ഉറച്ച വിശ്വാസമുണ്ട്.					
29	ടി.വി.യിൽ സൗന്ദര്യം വർദ്ധിപ്പിക്കുവാൻ വേണ്ടിയുള്ള എന്തെങ്കിലും പരസ്യം കാണുകയാണെങ്കിൽ അത് വാങ്ങു ന്നതിന് മുമ്പ് അതിന്റെ വസ്തുതകളെ കുറിച്ചറിയാൻ ഞാൻ ശ്രമിക്കും.					
30	മനുഷ്യന്റെ കഴിവുകൾക്ക് പരിമിതികൾ ഇല്ല എന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
31	ഞാൻ ഒരു ശാസ്ത്രജ്ഞൻ ആകുവാനാഗ്രഹിക്കുന്നു.					

32	അന്യഗ്രഹ ജീവികളെ കുറിച്ച് പഠിക്കുവാനും, അറിയു വാനും ഞാനിഷ്ടപ്പെടുന്നു.					
33	വിജയം ഭാഗ്യത്തെ ആശ്രയിച്ചിരിക്കുന്നുവെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
34	ശകുനം കുത്തികൾ സ്ഥാപിക്കുന്നത് കെട്ടിടങ്ങൾക്ക് കേടുപറ്റാതിരിക്കുവാൻ ഉപകരിക്കുമെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
35	ശാസ്ത്ര പദപ്രശ്നങ്ങൾ പൂരിപ്പിക്കുവാനെനിക്കിഷ്ടമാണ്.					
36	എന്റെ അഭിപ്രായത്തിൽ അവയവദാനം നിരോധിക്കണം.					
37	സുനാമിക്ക് ശേഷം ചില ആളുകൾ മത്സ്യങ്ങളും മറ്റ് കടൽ ഉല്പ്പന്നങ്ങളും കഴിക്കുന്നത് ഒഴിവാക്കി. ഈ തീരുമാന ത്തോട് ഞാൻ യോജിക്കുന്നു.					
38	ജീവികളുടെ ജീവചക്ര നിരീക്ഷണം (ഉദാഹരണം പ്യൂപ്പയിൽ നിന്നും പൂമ്പാറ്റ) എനിക്കിഷ്ടമാണ്.					
39	നായ ഓരിയിടുകയാണെങ്കിൽ എന്തോ അപകടം സംഭവിക്കുമെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
40	പ്രാകൃത വിശ്വാസങ്ങളും, മന്ത്രവാദവും, ആത്മാക്കളും, പേടിപ്പെടുത്തുന്ന അനുഭവങ്ങളാണെനിക്ക്.					
41	കാക്ക വിരുന്നു വിളിച്ചാൽ വിരുന്നുകാർ വരുമെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
42	എല്ലാ ചോദ്യങ്ങളും ശാസ്ത്രീയമായി പരിഹരിക്കുവാൻ കഴിയുമെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
43	കുഴൽ കിണറുകൾ കുഴിക്കുന്നത് വരൾച്ചാ പ്രദേശങ്ങളിൽ വെള്ളക്ഷാമം പരിഹരിക്കാൻ ഉപകാരപ്പെടുമെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
44	ശാസ്ത്രം പരീക്ഷണ നിരീക്ഷണങ്ങളിലൂടെ പഠിക്കുന്നതാണ് എനിക്കിഷ്ടം. മന:പാഠം പഠിക്കുവാൻ എനിക്കിഷ്ടമല്ല.					
45	ശാസ്ത്രം എന്ന വിഷയം രസകരമല്ല മറിച്ച് കുറേ ആശയങ്ങളും, നിർവ്വചനങ്ങളും മാത്രമാണ്.					
46	ചില ശകുനങ്ങൾ അശാസ്ത്രീയമാണ് എങ്കിൽപ്പോലും എനിക്ക് സത്യമാണ് എന്ന് തോന്നാറുണ്ട്.					
47	ശാസ്ത്രം ചിലപ്പോൾ എനിക്ക് വളരെ പ്രയാസമുള്ള വിഷയമായി തോന്നാറുണ്ട്.					
48	ആദിമ മനുഷ്യന്റെ സംസ്ക്കാരം പ്രകൃതിയോടനുയോ ജ്യമായ ഒന്നായിരുന്നു; എന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
49	മൊബൈൽ ഫോണുകൾ ആരോഗ്യ പ്രശ്നങ്ങൾ ഉണ്ടാക്കുന്നത് കാരണം അവ നിരോധിക്കണം.					
50	'മരണം സംഭവിക്കും നായകൾ ഒരിയിട്ടാൽ' ഈ ശകുന ത്തിനെ ഞാൻ ഭയപ്പെടുന്നു.					
51	പെട്ടെന്ന് ഒരു വീട്ടിൽ കിണർ അപ്രത്യക്ഷമായി എന്ന വാർത്ത പരക്കുന്നു. ഞാൻ ആ വീടും പരിസരവും സന്ദർശിക്കുവാൻ ആഗ്രഹിക്കുന്നു.					
52	ശാസ്ത്ര വിനോദയാത്ര (ഉദാഹരണം – ദേശീയോദ്യാ നങ്ങൾ, പ്ലാനറ്റോറിയങ്ങൾ) പോകുവാൻ എനിക്കിഷ്ടമാണ്.					

53	എന്റെ അഭിപ്രായത്തിൽ ശാസ്ത്രബോധം ഉണ്ടാകണ മെങ്കിൽ ശാസ്ത്രമെന്ന വിഷയത്തിൽ നല്ല മാർക്കുകൾ വേണമെന്നില്ല.					
54	എന്റെ അഭിപ്രായത്തിൽ ശാസ്ത്രം എന്ന വിഷയം പഠിക്കുന്നത് പ്രകൃതിയെ കുറിച്ച് കൂടുതൽ അറിയുവാൻ സഹായിക്കും.					
55	വലിയ പരീക്ഷണശാലകളും, ഫാക്ടറികളും നമ്മുടെ പ്രകൃതിയെ ചൂഷണം ചെയ്യുന്നവയാണെന്ന് ഞാൻ വിശ്വസിക്കുന്നു.					
56	എന്റെ അഭിപ്രായത്തിൽ ശാസ്ത്ര പുരോഗതി ഒരിക്കലും നമ്മുടെ പ്രകൃതിയെ ചൂഷണം ചെയ്തുകൊണ്ടാകരുത്.					
57	ഡാമുകൾ ഉണ്ടാക്കുവാൻ പാടുള്ളതല്ല. കാരണം അവ നമ്മുടെ പ്രകൃതിക്ക് ദോഷമാണ് എന്ന് ഞാൻ കരുതുന്നു.					
58	ശാസ്ത്രം എന്നും എനിക്ക് ഇഷ്ടമുള്ള, അത്ഭുതം ജനിപ്പി ക്കുന്ന ഒരു വിഷയമാണ്.					
59	ഞാൻ ശാസ്ത്ര മേളകൾക്ക് പങ്കെടുക്കുവാനാഗ്രഹി ക്കുന്നു.					
60	ലോകം ചുറ്റി നടന്ന് ശാസ്ത്രത്തെ കൂടുതൽ അടുത്തറി യാൻ ഞാനിഷ്ടപ്പെടുന്നു.					

VD SCIENCE ACHIEVEMENT TEST (Malayalam)

ശാസ്ത്ര സിദ്ധിശോധകം പരീക്ഷ

1. ഏറ്റവും അനുയോജ്യമെന്ന് തോന്നുന്ന ഉത്തരം എഴുതുക.

1. 10 സെക്കൻഡിൽ 10 ദോലനം പൂർത്തിയാക്കുന്ന പെൻഡുലത്തിന്റെ ആവൃത്തിയെത്ര?
   (a) 1 Hz (b) 2 Hz (c) 3 Hz (d) 10Hz
2. ഓടക്കുഴലിൽ എന്ത് കമ്പനം ചെയ്യുമ്പോൾ ആണ് ശബ്ദം ഉണ്ടാകുന്നത്?
   (a) മുള (b) വായു (c) ദ്വാരങ്ങൾ (d) വസ്തു
3. ഒരു അരക്കവാൾ കമ്പനം ചെയ്യുമ്പോൾ എങ്ങിനെയാണ് നാം ശബ്ദം കേൾക്കുന്നത്.
   (a) കാരണം, ആവൃത്തി കൂടുന്നു (b) കാരണം, ആവൃത്തി കുറയുന്നു
   (c) കാരണം, വായു കൂടുതലാണ് (d) കാരണം, വായു കുറവാണ്
4. വോക്കൽ കോഡിന്റെ നീളം കൂടുന്നതനുസരിച്ച് ശബ്ദത്തിന്റെ പിച്ച് കുറയുവാൻ കാരണമെന്താണ്?
   (a) കാരണം, വായുവാണ്
   (b) കാരണം, ആവൃത്തി കൂടുതലായത് കൊണ്ട്
   (c) കാരണം, ആവൃത്തി കുറഞ്ഞത് കൊണ്ട്
   (d) കാരണം, സ്ഥിത വൈദ്യുതി ഉത്പാദനം കൊണ്ട്
5. ഒരു ഇരുമ്പ് കമ്പിയുടെ ഒരറ്റത്ത് അടുത്ത് ചെവികൾ കൊണ്ടുവന്ന ശേഷം മറ്റേ അറ്റത്ത് വേറൊരു ഇരുമ്പുകമ്പി കൊണ്ട് ശക്തിയായി അടിച്ചാൽ നാം എങ്ങിനെ ശബ്ദം കേൾക്കുന്നു.
   (a) ശബ്ദ സവിശേഷതകൾകൊണ്ട് (b) ശബ്ദ പ്രേഷണം
   (c) ശബ്ദ തീവ്രത (d) ശബ്ദ കൂർമ്മത
6. ഇലക്ട്രോൺ സ്വീകരിക്കുന്ന വസ്തുവിനേത് ചാർജ്ജാണ് ലഭിക്കുന്നത്
   (a) പോസിറ്റീവ് (b) നെഗറ്റീവ് (c) ന്യൂട്രൽ (d) ഇവയൊന്നുമല്ല
7. പുതുതായി ഇസ്തിരിക്കിട്ട ഒരു ഷർട്ട് ശരീരത്ത് അണിഞ്ഞാൽ രോമങ്ങൾ അതിലേക്ക് ഒട്ടിപ്പിടിക്കുന്ന പോലൊരു തോന്നൽ ഉണ്ടാകാറില്ലേ? എന്തുകൊണ്ടാണിത്?
   (a) സ്ഥിത വൈദ്യുതി (b) സ്ഥിതികോർജ്ജം
   (c) ഗതികോർജ്ജം (d) കാന്തികത
8. മിന്നലാണോ ഇടിയാണോ ആദ്യം എത്തുക? കാരണം?
   (a) ഇടി, ശബ്ദ പ്രേഷണം (b) മിന്നൽ, ശബ്ദ പ്രേഷണം
   (c) ഇടി, പ്രകാശവേഗത (d) മിന്നൽ, പ്രകാശവേഗത

2. ശരിയോ തെറ്റോ?

9. ശബ്ദത്തിന് സഞ്ചരിക്കാൻ മാധ്യമം ആവശ്യമാണ്?
   (a) ശരി (b) തെറ്റ്

10. വസ്തുക്കളിൽ കമ്പനം നടക്കുമ്പോൾ ശബ്ദം ഉണ്ടാകുന്നു.
(a) ശരി (b) തെറ്റ്
11. മനുഷ്യന്റെ ഏറ്റവും കുറഞ്ഞ ശബ്ദപരിധി 20Hz. ആണ്.
(a) ശരി (b) തെറ്റ്
12. 20 Hz. ൽ താഴെയുള്ള ശബ്ദതരംഗങ്ങളെ ആൾട്രാസോണിക് ശബ്ദ തരംഗങ്ങൾ എന്നുവിളിക്കുന്നു.
(a) ശരി (b) തെറ്റ്
13. ശബ്ദപ്രതിഫലനം ഉപയോഗിച്ചാണ് വവ്വാലുകൾ രാത്രി സഞ്ചരിക്കുന്നത്.
(a) ശരി (b) തെറ്റ്
14. ഒരേ സ്ഥലത്ത് രണ്ട് തവണ മിന്നൽ അടിക്കുകയില്ല.
(a) ശരി (b) തെറ്റ്
15. കോപ്പർ അഥവാ ചെമ്പ് ഒരു ഉത്തമ വൈദ്യുത ചാലകത്തിന് ഉദാഹരണമാണ്.
(a) ശരി (b) തെറ്റ്
16. ഒരു സിമ്പിൾ പെൻഡുലത്തിന്റെ ആവൃത്തി കൃത്യമായി അളക്കുവാൻ സാധിക്കുകയില്ല.
(a) ശരി (b) തെറ്റ്

3. <u>വിട്ടുപോയ ഭാഗങ്ങൾ ഉചിതമായ ഉത്തരങ്ങൾ തിരഞ്ഞെടുത്ത് പൂരിപ്പിക്കുക.</u>

17. ശബ്ദം ..... യൂണിറ്റുകൾ കൊണ്ട് അളക്കുന്നു.
(a) db(b) w/m2 (c) c (a) F
18. സെക്കൻഡിൽ ഒരു തരംഗം എന്ന രീതിയിൽ സഞ്ചരിക്കുന്ന തരംഗത്തിന്റെ ആവൃത്തി ..... ആണ്.
(a) 1Hz. (b) 2Hz. (c) 0Hz. (d) 3Hz
19. ഒരു ഭൂചലനം ഉണ്ടാകുമ്പോൾ ..... തരംഗങ്ങൾ ഉണ്ടാകുന്നു.
(a) റേഡിയോ തരംഗങ്ങൾ (b) ഇൻഫ്രാസോണിക് തരംഗങ്ങൾ
(c) അൾട്രാസോണിക് തരംഗങ്ങൾ (d) എക്സ് റേ തരംഗങ്ങൾ
20. ആവൃത്തി : പിച്ച് :: ഉച്ചത് .....
(a) തീവ്രത (b) ടോൺ (c) കമ്പനം (d) ആയതി
21. ശബ്ദം ഉപയോഗിച്ച് ദൂരം അളക്കുവാൻ ഉപയോഗിക്കുന്ന ഉപകരണം
(a) RADAR (b) SONAR (c) INSAT (d) SCAN
22. ചന്ദ്രനിൽ ഒരു പൊട്ടിത്തെറി സംഭവിച്ചാൽ, ശബ്ദം കേൾക്കുവാൻ സാധിക്കില്ല. കാരണം ചന്ദ്രനിൽ ..... ഇല്ല
(a) വെള്ളം (b) വായു (c) അഗ്നി (d) ആകാശം
23. വൈദ്യുത ചാർജ്ജുകൾ സംഭരിക്കുവാൻ കഴിവുള്ള ഉപകരണമാണ് .....
(a) റെസിസ്റ്റർ (b) ഇൻഡക്ടർ (c) കപ്പാസിറ്റർ (d) കാന്തം
24. വൈദ്യുത ചാർജ്ജ് ഒരു ..... അളവാണ്.
(a) സദിശ (b) അദിശ (c) ചാർജ്ജുള്ള (d) ചാർജ്ജില്ലാത്ത
25. പ്രേരണം വഴി ചാർജ്ജ് ചെയ്യപ്പെടുന്ന പ്രക്രിയയിൽ ചാർജ്ജുകൾ കൈമാറ്റം ചെയ്യപ്പെടുന്നത് ..... വഴിയാണ്.
(a) തൊടുന്നത് (b) സമ്പർക്കം
(c) സമ്പർക്കമില്ലാത്ത (d) ഇവയൊന്നുമല്ല
26. ഒരു ട്യൂണിംഗ് ഫോർക്കിന്റെ ആവൃത്തി 256 Hz. ആണ്. ഇതിന്റെ അർത്ഥം അത് കമ്പനങ്ങൾ ഒരു സെക്കൻഡിൽ ചെയ്യുന്നുവെന്നാണ്.

4. <u>ചേരുംപടി ചേർക്കുക</u>

	കോളം എ	കോളം ബി
27.	ചാർജ്ജിന്റെ അടിസ്ഥാന യൂണിറ്റ്	ഫാരഡ്
28.	കൂടിയ ആവൃത്തിയിലുള്ള ശബ്ദ തരംഗങ്ങൾ	ശബ്ദ മലിനീകരണം
29.	ആറ്റത്തിനകത്തെ ചാർജ്ജില്ലാത്ത വസ്തു	അൾട്രാസോണിക്
30.	കപ്പാസിറ്റൻസിന്റെ അടിസ്ഥാന യൂണിറ്റ്	ഹെർട്സ്
31.	എയർ ഹോൺ	കൂളമ്പ്
32.	ആവൃത്തിയുടെ അടിസ്ഥാന യൂണിറ്റ്	ന്യൂട്രോൺ

5. <u>ഒറ്റയാനെ കണ്ടെത്തി വട്ടമിടുക</u>

33. പ്രോട്ടോൺ, ന്യൂട്രോൺ,. ഇലക്ട്രോൺ, ശബ്ദം
34. മരം, ഇരുമ്പ്, റബ്ബർ, പ്ലാസ്റ്റിക്
35. ആൺ ശബ്ദം, കുയിൽ ശബ്ദം, ചിവീട് ശബ്ദം, പെൺ ശബ്ദം
36. ശബ്ദം, വൈദ്യുതി, താപം, ദോലനം
37. എർത്ത് കമ്പി, പ്ലാസ്റ്റിക് കേബിൾ, ലൈവ് കമ്പി, ന്യൂട്രൽ കമ്പി
38. ഇൻഫ്രാസോണിക്, അൾട്രാസോണിക്, മനുഷ്യന് ശ്രവണസാധ്യം, ഇടിമുഴക്കം
39. ഉച്ചഭാഷിണി, എയർഹോൺ, മഴയുടെ ശബ്ദം, വാഹന ശബ്ദം

40. ഗോൾഡ് ലീഫ് ഇലക്ട്രോസ്കോപ്പ്, പേപ്പർ ഇലക്ട്രോസ്കോപ്പ്, അലുമിനിയം ഫോയിൽ ഇലക്ട്രോസ്കോപ്പ്, മൈക്രോസ്കോപ്പ്
41. പോസിറ്റീവ്, വൈദ്യുതി, നെഗറ്റീവ്, ന്യൂട്രൽ
42. ഉച്ചത, ശബ്ദം, പിച്ച്, ആവൃത്തി

6. ഉദാഹരണം കണ്ടെത്തുക

43. മനുഷ്യനിർമ്മിതമായ ശബ്ദം
    (a) വയലിൻ ശബ്ദം (b) മഴയുടെ ശബ്ദം
    (c) ഇടിമുഴക്കം (d) വെള്ളച്ചാട്ടത്തിന്റെ ശബ്ദം
44. ഒരു ഉയർന്ന പിച്ചുള്ള ശബ്ദം
    (a) കുയിൽ ശബ്ദം (b) താറാവിന്റെ ശബ്ദം
    (c) ആടിന്റെ കരച്ചിൽ (d) എലിയുടെ ശബ്ദം
45. സ്ഥിത വൈദ്യുത ചാർജ്ജുകൾ അളക്കുവാൻ ഉപയോഗിക്കുന്ന ഉപകരണം
    (a) മൈക്രോസ്കോപ്പ് (b) ടെലിസ്കോപ്പ്
    (c) ഇലക്ട്രോസ്കോപ്പ് (d) കേലിടോസ്കോപ്പ്
46. ശബ്ദം ഇരട്ടിപ്പിക്കുന്ന അഥവാ കൂട്ടുന്ന ഉപകരണം
    (a) സ്കാനർ (b) പ്ലോട്ടർ (c) ആംപ്ലിഫയർ (d) മൈക്രോഫോൺ
47. ശബ്ദ പ്രതിഫലന തത്വത്തിൽ പ്രവർത്തിക്കുന്ന ഒരു ഉപകരണം
    (a) പാൻ ഫ്ളൂട്ട് (b) വിസിൽ
    (c) സ്റ്റെതസ്കോപ്പ് (d) ഇലക്ട്രോസ്കോപ്പ്
48. ഒരു ഇൻസുലേറ്ററിന് ഉദാഹരണം
    (a) ചെമ്പ് (b) അലുമിനിയം (c) മരം (d) വെള്ളി
49. ഒരു കുറഞ്ഞ പിച്ചുള്ള ശബ്ദം
    (a) താറാവിന്റെ ശബ്ദം (b) പെൺ ശബ്ദം
    (c) ചീവീട് ശബ്ദം (d) വിസിൽ ശബ്ദം
50. മനുഷ്യന് ശ്രവണസാധ്യമായുള്ള ശബ്ദ ആവൃത്തി
    (a) 10 Hz. (b) 25000 Hz. (c) 14 Hz. (d) 250 Hz.

Appendix - VI

EXPERIENTIAL LEARNING PACKAGE FOR SOUND & STATIC ELECTRICITY (ELPSS)

Prepared by

Sandhya Kumar & Dr. H. Indu

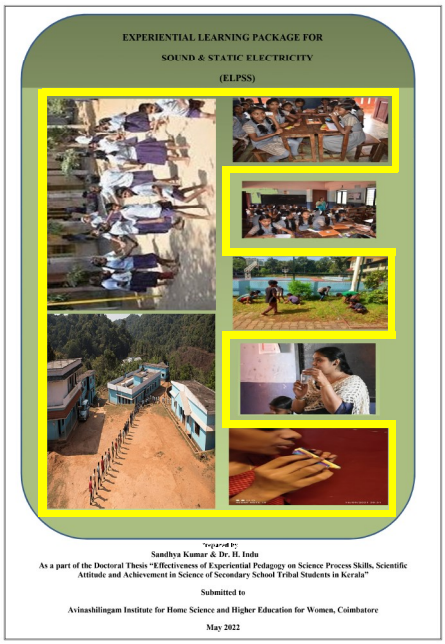
As a part of the Doctoral Thesis "Effectiveness of Experiential Pedagogy on Science Process Skills, Scientific Attitude and Achievement in Science of Secondary School Tribal Students in Kerala"

Submitted to

Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore

May 2022

(Attached in the Pouch)



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EXPERIENTIAL LEARNING PACKAGE FOR SOUND & STATIC ELECTRICITY (ELPSS)

3.1. The package ELPSS

This experiential learning package contains different modules for learning sound and static electricity through experiential learning practices. The experiential learning practices include all those teaching learning experiences that will incorporate among the students, ability to think, discuss and to come into conclusions by their own. These experiences help them arrive at different definitions and approach the situational experience in different angles.

The modules in sound include experiences and activities in understanding sound definition and concepts through practical experiences. The students will be able to relate their previous experiences to the content related activities and tasks that are given to them as an experiential learning practice.

The modules in static electricity include the learning experiences that will help them understand the application and the potential dangers of static electricity through practical experiences. The module administration in them will help the students to define static electricity and its related concepts practically.

The experiential learning package in sound and static electricity (ELPSS) is designed to meet the educational needs and demands of secondary school students belonging to the age group 12-14 years. The module is best suited to the students who would love to explore the nature and surroundings in and near to them since most of the examples and experiences provided have connection with the experiences that directly or indirectly involves in the elements of nature.

3.2 The Experiential Learning Package

The package is developed on the basis of the experiential learning practices put forward by David A Kolb in his Kolb's experiential learning theory.

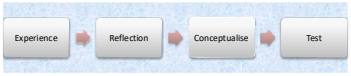
The experiential learning theory as proposed by David A Kolb suggests the entry to an experience from four different entry points. One can enter the experiential learning cycle from any of these entry points. These are described as:

Kolb states that any type of learning involves the acquisition of abstract concepts and newer experiences that can be applied in a varied range of novel situations. Here, David A Kolb is of the opinion that novel experiences are required as an impetus for the development of new concepts. The internal cognitive processes of the individual are involved deeply in the learning process of him and the experiences that he receives will help strengthen the learning process making it meaningful and permanent.

The experiential learning cycle is represented using the four-stage learning cycle in which the learner 'touches all the bases of learning'. This is starting from observing a learning experience and finally actively doing the experience by oneself and applying the same to different situations sharing the same concept or theory.

Concrete experience refers to a new experience or a novel situation or a modification of the existing experience or knowledge of the individual. Reflective observation is reviewing or reflecting on an experience that has been observed by the individual. It helps the individual to check and understand whether there exist any inconsistencies between the novel experience and his understanding. Abstract conceptualisation refers to the formation of a new idea or a modification of the existing idea that the person as learned from his experience. Active experimentation refers to the idea in which the learner starts applying the learned experiences to new and different situations outside the world and see what happens as the result.

According to Kolb effective learning happens when an individual can process the four different stages efficiently in the process of learning.



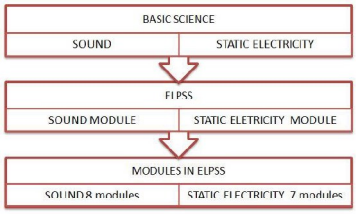
Kolb (1984) explain that each stage is mutually supportive to the other stage and is acting as a feed to the next. According to him, an individual can enter the cycle at any stage and follow it through its logical sequence. However complete learning happens only when the learner can execute all the four stages in the cycle. Therefore it can be inferred that no one stage in the learning cycle is effective enough to stand separately as a learning model of its own.

Educational Implications

The Kolb's learning cycle and the learning styles can be effectively used by the teachers to enhance and to develop novel learning opportunities to their students provided the activities or the experiences allocated to the students are best suited to them according to their needs and cognitive levels. Also learning styles can be enhanced by the continuous and rigorous practice of experiential learning method of teaching learning

3.3 Structure of ELPSS

This package ELPSS contains in total 15 modules covering two chapters from secondary school basic science textbook published by SCERT Kerala. The two chapters selected for the package construction and implementation was Sound and Static Electricity from Class 8 Basic Science. This can be effectively used by the students and the teachers by following experiential teaching learning practices. It contains activities and experiments from daily life situations and is easy for the students to comprehend and develop the concept of sound and static electricity.



3.4 Procedure for the development of the ELPSS

ELPS is designed according to a specific framework which has been exclusively designed for the purpose of teaching and learning through experiential learning methods. The modules are designed so that the students get to experiment with the working principles behind a phenomenon. It has enough experiences that help the students to understand the scientific concepts through toys and play way method. Each module has a particular framework that consists of the below mentioned sub headings.

1. Module Title
2. Module Duration
3. Module Overview
4. Learning Outcomes
5. Content
6. Theme and Subtheme
7. Pedagogical Strategy (Experiential Strategy)
8. Activity
9. Feedback
10. Evaluation

3.5 Phases in the preparation of ELPS

Sound- 8 modules

MODULE TITLE	1.Sound an experience	2.Sound characteristics	3.Vibrations and sound	4.Musical Instruments	5.Different sounds
MODULE DURATION	2 hrs	2 hrs	2 hrs	3 hrs	2 hrs

MODULE OVERVIEW	Classification of sound. Definition of sound.	Properties of sound. Occurrence of different sounds	Higher frequencies produce more sound than lower frequencies.	Nature of the sound produced by different materials Frequency loudness and pitch of sound	Different sounds produce different hearing experiences.
LEARNING OUTCOME	To classify sound sources. To define sound.	To understand simple pendulum To define frequency	To experiment with vibrations of sound. To understand the difference between a vibration and an oscillation.	To understand the characteristics of sound To construct low cost musical instruments	To experience different kinds of sounds
THEME	Sounds that we hear everyday	Natural frequency	Woodworks, drums and percussion instruments	Fun filled musical instruments.	Musical instruments from nature
SUB THEME	Sources of sound	Simple pendulum	Higher frequency vibrations	Balloon horn, Ikatara	Tribal musical instruments
EXPERIENTIAL STRATEGY	Narration, Discussion, Identification, Poster making	Observation, Experimentation, Discussion, Group work	Experimentation, Group work,	Model making, Experimentation	Group work, Singing, Dancing, Discussion, Demonstration
ACTIVITY	Classification of sound The experience of sound	Making of simple pendulum. Experimenting with different lengths in a simple pendulum	Dancing light experiment Hacksaw blade experiment	Balloon horn making Iktara making	Singing songs, discussing on their festivals and customs
FEEDBACK	Classification and definition done correctly	Model making was done perfectly. The frequency calculation was understand clearly	Great fun was seen while doing the dancing light experiment. Understood the concept of higher frequency vibrations.	Students identified the main vibrating and the connected vibrating parts of the sound sources.	Students were much familiar with the chosen tribal instruments and actively discussed about the same.
EVALUATION	Name some sound sources	Define frequency of a	Differentiate an oscillation	What are the characteristics	How can one experience

	Define sound	simple pendulum What is the unit of frequency	ad a vibration How do vibrations produce sound	of sound? Do the sound characteristics vary upon change in frequency of the sound source?	different sounds?

MODULE TITLE	6.The wonder world of sound	7.Travelling with sound	8.Healthy peaceful environment
MODULE DURATION	4 hrs	4 hrs	2 hrs
MODULE OVERVIEW	The sound depends upon natural frequency of the sound source which in turn depends upon the nature, length, area, tension of the material of the source	Sound needs a medium to travel. Human ear is the organ in human beings that helps us to hear sounds. There are some limits of audibility in human beings.	Noise pollution hampers not only the physical health of living beings but also the mental health of them. There must be measures adopted to eradicate noise pollution for a healthy peaceful environment.
LEARNING OUTCOME	To find out the factors depending natural frequency	To understand the medium of propagation To find out the limits of audibility in human beings To draw a model of human ear	To understand about noise pollution To understand the measures that must be adopted for the eradication of noise pollution
THEME	Nature of sound- Loudness ad Pitch	Propagation of sound	Noise pollution
SUB THEME	Dependence of natural frequency	Hearing and limits of audibility	Noise pollution and its adverse affects, Measures to reduce it
EXPERIENTIAL STRATEGY	Experimentation, Discussion	Experimentation, Drawing, Model making, Discussion.	Poster making, Role playing, Collage making
ACTIVITY	Rubber band instrument Plastic Pipe drum Straw organ	Toy telephone, Stethoscope model Human ear model Model on limits of audibility	Poster on noise pollution Notice on measures to eradicate noise pollution
FEEDBACK	Students were able to write down the factors that influence the natural frequency of the sound	Students enjoyed the toy telephone activity and were able to understand that a medium is necessary for sound to	Students made posters that clearly depicted noise pollution. They prepared good notices n measures for

		propagate.	eradication of noise pollution.
EVALUATION	What are the different factors that influence the frequency of the sound source?	How do sound travel? Are there any limits of hearing to human beings? Experiment with your own '*Jal tarang*'	What are the adverse effects of noise pollution and what all are the measures to eradicate noise pollution?

Static Electricity- 7 modules

MODULE TITLE	1. Electrical energy in nature	2. Matter, Molecules, Atoms	3. Detecting the presence of static charges	4. Avoidance of electric shock	5. Types of charge transfer
MODULE DURATION	2 hrs	2 hrs	2 hrs	2 hrs	2 hrs
MODULE OVERVIEW	Electrical energy is very important form of energy in everyday life. Current electricity is used here but the electricity that is available from nature is in the form of static electricity which is discussed here.	Matter is made up of molecules and molecules are made by joining atoms. An atom consists of protons, neutrons and electrons.	Electroscope is an instrument to detect the presence of static or stationary charges. The activity to neutralise the charge on a body is known as discharging.	Earthing of a body is done in order to avoid an electric shock by neutralising the charge on the body completely.	The process of conduction is taking place through contact between bodies while the process of induction takes place without any contact between the bodies.
LEARNING OUTCOME	To understand the concept of electrical energy To understand the concept of attraction and repulsion To understand the different type of charges	To understand the structure of atoms To differentiate between proton, neutron and an electron	To understand what is an electroscope To construct a model electroscope To experiment with the electroscope	To understand the concept of earthing To understand how and why earthing is done To symbolize the earth in a circuit	To differentiate conduction and induction in charge transfer To define electrostatic induction
THEME	Charges in nature	Structure of atom	Electroscope	Earthing	Electrostatic induction

SUB THEME	Properties of charges	Characteristics of particles inside an atom	Charging and discharging of an electroscope	How earthing is established in a circuit	Charging by conduction, charging by induction
EXPERIENTIAL STRATEGY	Observation, Group work, Experimentation, Nature walking	Model making, Role playing, Drawing	Experimentation, Discussion	Nature walking, Experimentation, Discussion	Nature observation, Experimentation, Discussion
ACTIVITY	Paper and scale experiment Balloon and flannel experiment	Model of structure of atom Discussion on characteristics of proton, neutron and an electron	Model of a paper electroscope Experimenting with the paper electroscope	Identifying the common colour code of earth, live and neutral wires	Charging by friction Charging by conduction Charging by induction
FEEDBACK	The students were able to understand the properties of electrical charges by their own. Later they were told about the unit of electrical charge and the nature of electrical charge.	The students were engaged in the model making of structure of atom. They were able to understand the properties of each particle inside an atom through the role play	The students actively engaged in making the model of a paper electroscope and experimenting with it.	The students were able to understand the importance of earthing done in all buildings with electricity	The students were able to clearly differentiate between conduction and induction and they were able to arrive at a definition for conduction and electrostatic induction
EVALUATION	What are the properties of electric charges? What type of quantity s an electric charge and what is the unit of electric charge?	What are the particles present inside an atom? What are the characteristics of the particles inside an atom?	What is an electroscope? How is discharging done in an electroscope?	What is the importance of earthing?	What do you mean by electrostatic induction?

MODULE TITLE	6.Conservation of electric charges	7.The natural source of static electricity
MODULE DURATION	2 hrs	3 hrs
MODULE OVERVIEW	With the arrangement of a capacitor, the electric charge can be stored for a very long time. Distribution of electric charge on a conductor will only be on its surface	Lightning is the electric discharge between the charged clouds in the atmosphere or between the charged clouds and the earth. A lightening conductor will help buildings from the potential dangers of lightening.
LEARNING OUTCOME	To define a capacitor To make a model of a capacitor To understand the concept of distribution of electric charge	To understand the concept of lightning To understand the measures to prevent the potential dangers of lightening
THEME	Storage and distribution of electric charges	Thunder and lightening
SUB THEME	Capacitors, Charge distribution	Dangers of lightening and ways to prevent
EXPERIENTIAL STRATEGY	Model making, Discussion	Nature walking, Discussion, Notice preparations
ACTIVITY	Capacitor model Charge distribution model	Areas where lightning rescue conductor is set up Poster to prevent the dangers of lightening and bursting the lightning myths
FEEDBACK	The students were able to understand in which type of surfaces the charge gets accumulated high and less which in turn will help them in preventing themselves from an electric shock.	The students were able to list down many points that will prevent the dangers of lightening
EVALUATION	What is a capacitor? In which type of materials the charge distribution will be high?	What is thunder and lightning? How can one prevent himself from the dangers of thunder and lightning?

SOUND

MODULE 1: SOUND AN EXPERIENCE

MODULE DURATION: 2 hrs

MODULE OVERVIEW:

The module on sound an experience deals with the different classification of sound and hence to arrive at a definition of sound. This module is prepared in order to understand and comprehend what is sound and how sound is formed, what are the characteristics of sound and how sound is propagated. The module also aims in classifying the different sound sources and to differentiate based on their characteristics.

LEARNING OUTCOMES:

- To classify the different sources of sound
- To define sound

Specific Outcomes:

- To recall the incidents where the pupils recollect their past incidents in which their sound experience was memorable and beautiful
- To review their sound experiences
- To understand the nature of sound
- To analyse the different components in sound propagation

CONTENT:

Sound is an auditory experience that is experienced by all living organisms. It can be experienced by sensory organs of hearing called as ears present in each living organism. The malfunctions of the ears result in the loss of hearing ability in these organisms. Hence ears are regarded as a very important sense organ among the five organs of senses in human beings.

Sound sources are broadly classified in to man-made sound sources and natural sound sources. Sound is an experience that is experienced by all living organisms that are having sense organs of hearing. The sound gives the organisms an auditory experience for which they are able to respond and react. A sound is formed by the vibration of objects. The vibrations result in sound waves which travel through a medium and receive the ears of a receiver. So, the sound can propagate only if a medium of propagation is present. It needs to have a source that produces vibrations and a receiver to receive the sound waves. Those sources that produce sound are called as sound sources. Basically, these sources of sound are classified into man-made sound sources and natural sound sources. The sound that are produced from the natural sources are referred to as natural sound sources and the sound that are produced from the man-made sources or the artificial sources are referred to as man-made or artificial sound sources.

THEME AND SUB THEME

Theme: Sounds that we hear everyday

Sub theme: Sources of sound

EXPERIENTIAL STRATEGY

Concrete experience stage

Students are divided into four groups and are made to discuss upon their sound experiences and list it down. Leader from each group reads aloud and consolidates their experiences. The students are made to keep a record of the nature of sound in each experience and they are motivated to arrive at a definition for sound.

Reflective Observation stage

They are given certain pictures or flash cards to understand the different sound sources. They are made to classify them as man-made sound sources and natural sound sources.

Abstract Conceptualisation stage

The students are asked to create a poster depicting different types of sound sources and classify them as man-made and artificial sound sources

Active Experimentation stage

After the poster making, they are given a brainstorming session to evaluate on the different components in the propagation of sound. How sound is travelling or how it is being propagated from person to person or between living organisms. The students are encouraged to list out the components for sound propagation. One person from each group was asked to read out their views and explanations in the sound propagation.

ACTIVITY

Activity 1:

Students are asked to narrate their sound experiences to the whole class and made to discuss in groups how are the sources of sound classified in to. They are shown some pictures and flash cards of some musical instruments like veena or sitar or a waterfall in order to easily identify the different classification of sound sources.



Activity 2:

Students are asked to list out the experiences of a mosquito bite or how do mosquitoes bite. Do they hear mosquitoes or any other insects buzzing around? How the buzzing of insects are experienced by them? Students are made to discuss their experiences and list out the means by which they experience a mosquito buzz.


Similarly an experience of a melodious music. How they experience a melodious music from a radio, computer or any other similar device. They are asked to narrate their experiences on these two situations and then finally list out what all are the essential components of a sound to be experienced.

FEEDBACK:

The students were able to classify the following sound sources and make a poster of the same.

MAN-MADE SOUND SOURCES	NATURAL SOUND SOURCES
Horn	Water fall
School bell	Thunder
Toys	Rain
Whistle	Wind
Sounds of vehicles	Sounds of animals and birds
Sounds of musical instruments	Sounds of ocean, conches, shells etc.

The students were discussing about the propagation of sound and they came in to different conclusions. From these conclusions the following idea was consolidated. For the sound to propagate, a sound producing source, a medium of propagation and a receiver is necessary.

EVALUATION

Sound needs a medium of propagation and it can be air, water or any object. The speed of sound differs in different mediums and hence the receiving end will see different auditory experiences through each medium of propagation. The sound sources can be natural or man-made and that also depends upon the intensity of the sound.

Name some sources of sound

Define sound

MODULE 2: Sound characteristics

MODULE DURATION: 2 hrs

MODULE OVERVIEW:

There are different kinds of sound sources in the world. Each sound source produces different sound. What may be the reason for this difference in sound? Why do different sound sources make different sounds? A paper whistle makes a different sound while a paper toy makes a different sound. Both are made up of paper but make different sounds. The reason for this difference is to be studied and understood.

LEARNING OUTCOMES:

- To understand simple pendulum
- To define frequency

Specific Outcomes:

- To understand the occurrence of different kinds of sounds
- To understand about natural frequency
- To find out the natural frequency of a pebble suspended from a string of a fixed length
- To experiment with different lengths
- To define an oscillation
- To understand the unit of frequency

CONTENT:

Sound is produced by the vibrations of the sound sources and these vibrations may be the sum total of all the vibrating parts inside a sound source. The properties of a sound source are different from another sound source.

The frequency of a sound source will be different for different sound sources and this is the reason for the different sounds produced by sources of sound. When a body is set to vibration, it vibrates with a particular frequency of its own and this frequency is called as its natural frequency. The reason for the occurrence of different sounds is due to the difference in natural frequencies of the sound sources.

THEME AND SUB THEME

Theme: Natural Frequency

Sub theme: Simple Pendulum

EXPERIENTIAL STRATEGY

Reflective Observation Stage

Students are given a situation to make swing of two different lengths. They observe the difference in the speed of the two swings and come to different conclusions.

Concrete Experience Stage


The students find the similarity between a simple pendulum and that of the swing. They get to experiment with simple pendulum after they experience difference in speeds while swinging in the swing.

Abstract Conceptualisation Stage

They arrive at different conclusions regarding the same and try to formulate why the difference in speeds occur for different lengths of the swings. The concept of number of vibrations per second was stressed during this stage.

Active Experimentation Stage

The students got involved in experimenting with the different lengths of the simple pendulum and finding out the frequency of each of the pendulum with different lengths.

ACTIVITY

Activity 1

Compare two swings of different lengths that is one short and one long say for example one of 4 metres and another of 5 metres. Which one is the swing in which we can swing faster? Which one is dangerous? Discuss in groups and come to a conclusion. Why babies are kept to sleep in low hanging cradle swings? What could be the reason for that? Can you come to a conclusion? The students are asked to find out answer by group discussion and the following activity of changing the length of simple pendulum.

Activity 2

Suspend a small pebble from a string of length about 50 cms. Move this pebble slightly towards one side and release. The pebble can be seen moving to and fro. This type of motion is called as an oscillation. This arrangement is called as a simple pendulum.

The movement of the simple pendulum can be equated similar to the movement of a swing of a particular length. The number of oscillations that a simple pendulum or a swing can make in a second is called as its frequency.

Now, using a stop clock find out the frequency of the simple pendulum of length 50 cms that was just made and tabulate the results.

Change the length of the simple pendulum to 60 cms and 80 cms and tabulate the results to find out the frequency. Then discuss, what is the relationship between the length of the pendulum and its frequency?

Students are asked to find out the frequency of the simple pendulum by changing the length of the simple pendulum and are asked to record their results in a table.

FEEDBACK:

The students were actively engaged in making the model of the simple pendulum. There were mixed responses when asked which swing, the longer one or the shorter one is dangerous. The students were able to tabulate the results and hence find out the frequency of the simple pendulum.

Activity 2: length of simple pendulum is 50 cms

Sl. No:	No: of oscillations(n)	Time(t)	Frequency(f)=n/t
1	10	14	0.714
2	15	21	0.714
3	20	28	0.714

Activity 2

Sl No:	No: of oscillations(n)	Time (t)	Frequency(f)=n/t
Pendulum length= 60 cms			
1	10	16	0.625
2	15	24	0.625
Pendulum length= 80 cms			
1	10	18	0.555
2	15	27	0.555

The students observed that as the length of the pendulum increases, the frequency decreases.

The number of oscillations produced by a simple pendulum in a second is called as its frequency and the unit of frequency is hertz (Hz).

EVALUATION

The swings are a practical example of a simple pendulum. The lower the swing, the lesser is the danger of a fall as it has a smaller frequency. The higher the swing, the greater is the danger of a fall as it has a higher frequency.

Define frequency of the simple pendulum?

What is its unit?

MODULE 3: VIBRATIONS AND SOUND

MODULE DURATION: 2 hrs

MODULE OVERVIEW:

Higher frequency vibrations can be heard while a lower frequency oscillation cannot be heard. Hence the sound of an oscillating simple pendulum cannot be heard while a buzzing bee can be heard. The buzz of a bee is heard because the bee flaps its wings at a speed of approximate 200 flaps per second and hence it can be heard.

LEARNING OUTCOME:

- To experiment with vibrations of sound sources
- To understand the difference between a vibration and an oscillation

Specific Outcomes:

- To understand that vibrations can be heard
- To understand that vibrations produces movement
- To understand about natural frequency of each sound sources
- To analyse the difference in sounds when frequency differs

CONTENT

The frequency of the simple pendulum is low and hence its sound cannot be heard even though the pendulum is having a to and fro oscillating motion. The vibrations produced by a fixed hacksaw blade can be heard because it has a higher frequency than a simple pendulum. A tuning fork of different frequencies produces different sounds because they produce different vibrations. Both oscillation and vibration are the to and fro motion of the body from its mean position, but the number vibrations per second are more in number when compared with that of oscillations. This is the reason why the vibrating sources produce more sound than the oscillating bodies.

THEME AND SUB THEME

Theme: Wood works, Drums and other percussion instruments

Sub theme: Higher frequency vibrations

EXPERIENTIAL STRATEGY

Concrete Experience Stage

The students participated in the Kerala State Tribal School Kalotsavam (Cultural Fest) 2018 and they were practicing the traditional percussion music instrument. They were asked about the sound that comes from the percussion instruments. The students are divided in groups and asked about traditional drum like percussion instruments. How do they produce sound while striking the diaphragm of the instrument? The drums are beaten for festivals and are an inevitable part of our music tradition. How do they produce sound? The students are asked to discuss in groups and share their experiences of seeing a festival or playing a drum.

Reflective Observation Stage

The students were able to understand the concept of vibrations and its relationship with the production of sound. Different percussion instruments produce different sounds of varying intensities depending upon the vibrations it produces on striking the surface of the instruments.

Abstract Conceptualisation Stage

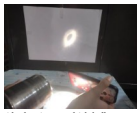
The students try to understand the difference in the varying intensities of the percussion instruments. The strong vibrations and the soft vibrations of the same sound source produce different sounds. The reason for this is arrived at.

Active Experimentation Stage

This stage was carried out by the students by actively involving in the experiment with the hacksaw blade. The larger vibrations of the blade produce more sound than the smaller vibrations. They repeated the experiment with varying blade lengths.

ACTIVITY

Activity1: Dancing light experiment



After the sharing of experiences, the students are advised to make diaphragm by tying a piece of balloon on one end of a piece of pipe of about 10 cms in diameter. Fix a small mirror on the diaphragm. Arrange a laser torch in such a way that the light beam from it is incident on this mirror. Make suitable adjustment so that the reflected beam falls on the screen. Now try to produce sound by hitting the balloon diaphragm with a thin mid rib of a coconut leaf. Observe the light incident on the screen after its reflection from the mirror. Also try placing a music say a speaker inside the pipe on which balloon is fastened and try to play the music through it from the music payer. Can you see the dancing light of the laser torch?

Students are asked to write down their experiences after doing the experiment and then conclude why drums can make sound.

Activity 2: Hacksaw blade experiment

Have you seen carpenter working with hacksaw blades? Have you ever noticed the vibration of hacksaw blade when the carpenter saws wood? How it makes sound while vibrating? Discuss in groups. Fix a hacksaw blade on to one end of a table. Set the free end to vibrations. Record your experience. Is it different from the oscillatory motion of the simple pendulum? Is it less than or greater than the frequency of the simple pendulum? Discuss and record your experiences.

Now from the tuning fork box select tuning forks of different frequencies. Set the tuning forks into vibrations and observe the differences in sound. Observe the vibrations produced in a tuning fork can move objects like a pith ball suspended from a string.

FEEDBACK

The dancing light experiment was performed with great fun and enthusiasm. The students came into conclusion that the vibrations produce sound and can produce sound waves. The movement of the balloon made the light from the laser torch to dance on the screen. The frequency of the hacksaw blade was greater than the frequency of the simple pendulum. Hence the sound from the hacksaw blade was heard and the pendulum produced no sound. That is it vibrated more times per second when compared to a simple pendulum. The tuning forks of different set frequencies produced different sounds.

EVALUATION

Sound is produced by the vibrations of bodies and it can also make objects vibrate. The sound produced by higher frequencies can be heard while lower frequencies sound cannot be heard. There occurs a difference in sounds in accordance with the increase in frequencies. When a body is set to vibrations, it vibrates with a particular frequency of its own and this is called as its natural frequency.

Is there any difference in the intensity of the sound when number of vibrations per second is more?

How do vibrations produce sound?

MODULE 4: MUSICAL INSTRUMENTS

MODULE DURATION: 3 hrs

MODULE OVERVIEW

The surfaces held tight and closely tied produces sound on vibration. The frequency of the vibrations depends upon the surface area of the surfaces producing vibrations. The sound produced thus varies in intensity and loudness.

LEARNING OUTCOMES

- To understand the characteristics of sound
- To construct low cost musical instruments

Specific Outcomes

- To experiment with the characteristics of the sound
- To construct low-cost musical toys with easily available materials
- To understand the process how a musical instrument produces sound

CONTENT

Sound has different characteristics. The characteristics of the sound differs with respect to the materials chosen, the surface area of the materials, the nature of the materials, the tightness of the materials upon vibration, medium and many other factors. The characteristics of the sound can easily be studied from the toys that can be made from easily and readily available materials. These experiments arouse fun and curiosity among the children and are very helpful in instilling scientific thinking and to develop a positive

attitude towards studying science. The main characteristics of the sound such as frequency, loudness and pitch, are studied in this module through two different activities like, to make an ektara and to make a balloon horn.

THEME AND SUB THEME

Theme: Fun filled musical instruments

Sub theme: Balloon horn, Ektara

EXPERIENTIAL STRATEGY

Reflective observation stage

The students are asked to narrate their own experiences about festivals and music fests. They then are motivated to talk about the various musical instruments that they have seen in a festival. How do these instruments produce sound? Are there wind instruments, string instruments or any other? They are asked to reflect upon their observations about the many types of musical instruments they are familiar with.

Concrete experience stage

They are given materials for making a balloon horn and an ektara. They are given time and instructions for making the instruments and to play with them.

Abstract conceptualisation stage

Here the students experiment how the sound is produced from both the instruments by blowing up the balloon in the horn and by striking the string of ektara.

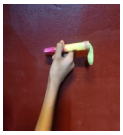
Active experimentation stage

The students are motivated to experiment with different diameters of PVC pipes to see the differences in sound that the instrument produces.

ACTIVITY

Activity 1: Balloon Horn

Materials: PVC pipe ($3 \times 1\frac{1}{2}$)", a balloon, pen body without a refill, strings



Cut both sides of the balloon and fix to one end the PVC pipe and to the other end the body of the pen body. Tighten both ends with strings. The balloon should have a minimum elasticity. The balloon should be stretched to a particular limit. The balloon horn is ready. Place the PVC pipe in perpendicular direction to the balloon and the pen body. Now from the end where the pen body is fixed, air can be blown inside and that creates a sound. Place your fingers on the surface of the balloon while air is blown inside. Do you feel balloon vibrating? What can you conclude from this?

Repeat the activity using different PVC pipes of varied diameters. Note down the experiences. Also, what happens if the balloon elasticity or stretching is altered?

Activity 2: *'Ektara'*

Materials: One medium sized coconut shell, thin bamboo stick of 40 cms length, two rubber bands, pocket knife, balloon.

Take the coconut shell and pierce a hole on two sides using a pocket knife. The two holes must be exactly opposite to each other. Pierce two holes in the two edges of the bamboo stick also. Insert the bamboo stick through the holes pierced in the coconut shell in such a way that one end of the bamboo stick should extend beyond the coconut shell to 5 cms. Cover the mouth of the coconut shell using a balloon. Then insert a small thin wire or a long rubber band through the holes in the bamboo stick and place it perpendicular to the mouth of the coconut shell and tie it tightly in the edges. Insert a small piece of cardboard between the balloon surface and the wire tied in order to act as a support as shown in the figure. Now to make the bow to sing music in the toy violin, use a bamboo stick and pierce holes in its edges. Bend it a little and insert a wire or a rubber band and tie it in the edges. The musical organ Ektara can be played as a violin. The rubber band vibrates and a sound of a fixed frequency can be heard on striking the rubber bands of Ektara and the bow

FEEDBACK:

The students enjoyed doing the activities and were engaged in making the sound toys. The concept of how sound is produced was understood by the students. The vibrations produced by materials make sounds. The concept was made clear through the activities.

Definition of the sound was arrived after discussion. Sound is something that produces the sensation of hearing in our ears. Sound is caused by vibrations of a source and with the help of a medium the sound receives the hearing organs of the receiver. The number of vibrations the sound source makes in a second is referred to as the frequency of the sound source. The sharpness of the sound heard by the receiver is called as pitch. Loudness is the measure of the audibility of a person. Both loudness and the pitch depend on the frequency of the sound source. For the propagation of sound three things are thus essential which is source, medium and a receiver was experimentally verified. A table was discussed among the students which detailed the source of sound, the main vibrating part and the connected vibrating parts of the sound sources.

SOURCE OF SOUND	MAIN VIBRATING PART	CONNECTED VIBRATING PARTS
Balloon horn	Balloon	Air, PVC pipe, pen body
Ikthara	String/ rubber bands	Bamboo sticks, coconut shell

EVALUATION

Sound is a form of energy which is produced by vibrations of a sound source and it is propagated through a medium which in turn is received by a receiver. Many musical organs can be the source of sound. The vibrations caused in the strings or the other materials used in the musical instruments vibrate to produce sound. The characteristics of the sound depend on the frequency of the sound source.

What are the characteristics of sound?

Do the sound characteristics vary upon change in frequency of the sound source?

MODULE 5: DIFFERENT SOUNDS

MODULE DURATION: 2 hrs

MODULE OVERVIEW:

Different sound sources vibrate in different ways or the parts of vibrations are different in different sound sources. These will produce differences in hearing also. The vibrating part of each sound source is different and this is the reason for the occurrence of different sounds in nature.

LEARNING OUTCOME:

- To experience different kinds of sounds

Specific Outcomes

- To experience the sounds of instruments that are nature friendly
- To experience the beauty of tribal music

CONTENT:

It has been verified from the experiences above that sound is produced by the vibrations created by a sound source. When the sound source stops producing the vibrations, the sound produced by it also ceases. Since mechanical energy is needed to start vibrations in the body producing sound, hence sound is a form of energy. During the vibrations, the mechanical energy is converted to sound energy. The vibrations produced in the body travel in all directions in the medium and produce vibrations inside the ear drum or any other receiving organ which are actually perceived as sound by the ear or the hearing device.

The sound produced from a source of sound would be the sum total of the vibration of the various parts related to that source. However, every sound source has a main vibrating part to produce sound and a connected vibrating part that vibrates along with the main part in the generation of sound.

THEME AND SUB THEME

Theme: Musical instruments from nature

Sub theme: Tribal musical instruments

EXPERIENTIAL STRATEGY

Concrete Experience Stage

The students are grouped into different groups and they are asked to sing their cultural song and they are asked to perform for the song. From each group the students come and perform thus making the experience of singing and dancing to the traditional songs an enjoyable one. They understand the beauty of the traditional songs and value their traditions and involvement of the traditional songs in the concept of sound and its propagation.

Reflective Observation Stage

They reflect upon their traditions and customs and narrated to the whole class about the various types of musical instruments that are still being used in their colonies especially on the occasion of marriages or any other important temple festivals in their locality.

Abstract Conceptualisation Stage

The students get ample opportunities for participating in 'Kalotsavam' competitions organised by Kerala State Government for promoting cultural values in children and to motivate the talented students in Arts and Culture. The students find out the importance of sound and music in every art form they are familiar with. They are very much familiar with the sounds of musical instruments used in cultural fests like 'tribal dances' and 'thiruvthirakkali'. They are asked to write down the various instruments they are familiar with and classify them as wind instrument, drum or any other type.

Active Experimentation Stage

Here the students were involved in identifying the instruments that were displayed to them by the researcher. All the instruments chosen were familiar to the culture and the traditions that the sample were selected from.

ACTIVITY

The students are shown different kinds of images, audio and video clips. They are also asked to sing different songs that they sing in their festivals or any other occasion. From each group a boy and a girl is asked to sing a song and using their hands clap and dance to the song. The remaining students in the group listen to the activity and after they perform, each member in the group discusses about the sound vibrations and how it reaches the ears of the receiver.

They are also shown some video and audio clips which show some festivals, musical instruments and celebrations. Different festivals use different musical organs and for different occasions different musical instruments are used. For example, a *'nadaswaram'* is used in a marriage ceremony whereas a *'kombi'* is used in a festival celebration. The difference in sounds is discussed in detail. The students are asked to arrive at conclusions about the different vibrations produced in these instruments. How the sound sources vibrate? Is there any definite pattern for vibrations? How many vibrations are noted in a second? Is this unique? Likewise, questions are discussed in group wise and then consolidated.

Some of the tribal musical instruments are discussed in detail here as the sample belongs to the tribal students in Kerala. *Paikanar Vadyam, Kogal, Mazha mooli, Angkulang*

Paikanar Vadyam: It is made out of a group of 10 small *'chenda'\' Chenda'* is a drum like percussion instrument). Also called as *'Djembe'*. The small chenda or drum like percussion instrument is called as *'Udaram'* which was the traditional musical instrument of *'Paikanar'*, the legendary mythical hero of Kerala history. It is made up of a wooden cylinder with two skin heads on each side, that are tightened using skin laces of a cow or a bull. It resembles a *'mridangam'* a traditional Kerala percussion instrument. It is played by drumming with hands and is commonly used among tribes for their festivals and the word *'Maram'* is literally referred to as 'trees' in South Indian languages.

Kogal: It is a traditional musical instrument similar to flute. The mouth piece is made from a type of bamboo and that forms the main part of the *'Kogal'*. Similar types of instruments are now available in plastic forms but the authentic one is the bamboo one which is used mainly by the community in their festivals.

Mazha mooli: The word meaning denotes 'rain hummer'. It is made up of bamboo, by striking spike into its nodes and putting some peas into it. It can produce the sound of rain and streams. The nodes inside the instruments are patterned in such a manner that it is similar to DNA structure because sound will not be heard if it is placed straight.

Angkulang: It is made up of hanging bamboo sticks with different perimeters. There are different variations of this instrument. The number of bamboo sticks are increased or decreased according to the sound required.

Apart from these, there are hundreds of such instruments with minor variations in their construction which are predominantly used by the tribal natives in Kerala and the musical traditions of these marginalised groups are extremely fascinating and interesting to research.

FEEDBACK:

The group activity was performed by the students in a very good manner. All of the students enjoyed performing the activity. They sang their traditional music and the session was truly an enjoyable one. After the group activity, the video and the audio clips were played which also aroused interest and curiosity among the students. As they were familiar with the instruments shown, it was convenient to come to conclusion about the concept of sound characteristics such as frequency, pitch and vibrations.

The students were then asked to complete a table and identify the main vibrating part of each sound source. The table was completed by the students as a group activity. Each group completed the table and one student from each group was selected to explain the table completion. The activity was performed well and the concept was well conceived. The table that was discussed in the class is completed and shown.

SOURCE OF SOUND	MAIN VIBRATING PART	CONNECTED VIBRATING PART
The voice box (larynx)	Vocal cords	Throat, lips, tongue, cheeks etc.
Flute	Air column	Flute body
Drums	The diaphragm	The frame
Violin	Strings	Frame

EVALUATION

Objects that produce sound are referred to as sources of sound. The sound produced from a source of sound would be the sum total of the vibration of the various parts related to the source. However, every sound source has a main vibrating part and an allied or connected vibrating part to produce sound. Every sound source produces different sounds of different and varying frequencies.

How can one experience different sounds?

MODULE 6: The wonder world of sound

MODULE DURATION: 4 hrs

MODULE OVERVIEW:

Sound is produced due to vibrations produced in the sound source. Higher the vibrations of the sound source, higher the sound heard from the source. Different vibrations have different natural frequencies and hence the differences in sound. The sound depends upon the natural frequency of the body which in turn depends upon various factors of the body.

LEARNING OUTCOME

- To find out the factors depending natural frequency of a body

Specific Outcomes

- To understand the difference in sounds as the factors that depend on the natural frequency of a body differs

CONTENT

When a body is set into vibrations, it will vibrate with a particular frequency of its own. This frequency is called as natural frequency. The change in sound occurs due to the change in natural frequency of a body. Natural frequency of a body changes depending upon the differences in nature of the material the body is made up of, area of the vibrating surface, length of the vibrating surface, tension of the vibrating surface and the area of cross section in which the vibration occurs in the body. The buzzing sound of the mosquitoes and bees is the sound produced by the vibration in their wings. It is these vibrations that we hear as buzzing sound of mosquitoes or bees. Crickets produce high frequency sounds when their wings rub against each other. Due to the absence of crickets in Silent Valley, the place got such a name.

THEME AND SUB THEME

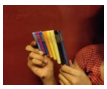
Theme: Nature of sound- Loudness and Pitch

Sub theme: Dependence of natural frequency

EXPERIENTIAL STRATEGY

Concrete Experience Stage

Here the students relate to the concept of simple sound toys that can be made from paper such as a simple paper tapper and a paper whistle. The students then understand the concept of the pan flute that they experiment with later.



Reflective Observation Stage

The students cut out different lengths of the sketch pens and start making the pan flute that they already know about. They started with an 8 cms length and thereby reducing the length of the sketch pens by 1 cm.

Active Experimentation Stage

The students understand that the natural frequency of the body depends upon various things such as length, nature of the material. The students set an experiment with the area to check the dependence of area on the sound production. That ended up in the making of PVC pipe drummer.

Abstract Conceptualisation Stage

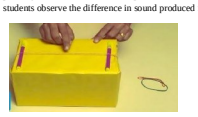
From the experiments they experienced by themselves, the students could conclude about the different factors that depend on the natural frequency of the sound sources. The group discussion among the students was the main strategy here so as to conclude the topic.

ACTIVITY

Activity 1: Rubber band guitar

Materials required: A hollow card board, an elastic rubber band, and a striker (optional)

Firstly, the hollow box and the solid box are covered with a chart paper in order to make it aesthetically pleasing. Then a rubber band is placed on both the boxes such that it is wound around the boxes. The students observe the difference in sound produced from a hollow cardboard box and a solid card board box.



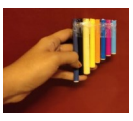
Activity 2: Plastic pipe drum

Materials required: PVC pipe with a diameter of cross section 10 cms, a balloon, 2 rubber bands or a wool thread to tie.

The pipe is held upright and a balloon is tied tightly over one open end of the pipe. Tie the balloon tightly so that it stretches maximum. This can be tied with help of a rubber band or a woollen thread. Now strike the pvc pipe drum with a pencil and see the sound difference in different diameter pvc pipes.

Activity 3: Sketch pen Pan Flute

Materials required: Sketch pens of different lengths, a cellophane tape.



Cut the sketch pens into different lengths. The starting sketch pen can be measured to 8 cms and cut its nib from its bottom. Next sketch pen can be cut from the bottom at 7 cms and then arrange all the sketch pens in increasing order of their heights. Any number of sketch pens can be taken. Here the students had taken 7 different sketch pen lengths. Stick them together and then paste a cellophane tape around them to tighten them and to maintain their position. Now the pan flute is ready and it can be used to play sound.

FEEDBACK

The students were able to understand that the sound depends upon natural frequency of the vibrating body which in turn depends upon the length, area of cross section, tension and the nature of the material of the body. They were able to tabulate the factors that influence the natural frequency of the body.

Factors influencing the natural frequency of the body
Nature of the body
Length of the body
Area of the vibrating surface
Tension of the vibrating surface
Area of cross section where the vibration happens

EVALUATION

Sound depends upon the natural frequency that in turn depends on the nature of the body, length of the body, area of the vibrating body, tension of the vibrating surface, area of cross section of the vibrating surface.

List the factors that depend upon the natural frequency of a body

MODULE 7: Travelling with sound

MODULE DURATION: 4 hrs

MODULE OVERVIEW:

Sound needs a medium to travel. Sound propagation depends upon the medium through which it travels. Sound travels through the medium and reaches the ears of the receiver. The human ear is the organ for hearing in human beings. There are different limits of audibility. A deaf person cannot hear and others should develop empathy towards the disabled person and help him in areas where he is weak. A hearing aid provides the sense of hearing for a deaf person.

LEARNING OUTCOMES

- To understand about sound propagation
- To find out the limits of audibility in human beings
- To draw a model of human ear

Specific Outcomes

- To understand the sound propagation through some models
- To study and list the limits of audibility in common animals and birds
- To understand why the difference in hearing is observed in humans and animals
- To study the hearing process in human beings

CONTENT

Loudness is the measure of audibility of a person. This depends on the frequency of vibration and the sensory ability of the ear. The unit of loudness is decibel (dB). This is measured using a device named as decibel meter. Sound needs a medium to travel. In vacuum, sound cannot be heard and this is the reason why astronauts use radio devices to communicate with one another. Sound travels not only through gases but also through liquids and solids. This means that sound travels through other materials also. Humans hear through ears which are the organ of hearing among us. The sound waves that reach the external ear pass through the ear canal and strike the eardrum. This causes vibration on the eardrum. The vibration of the eardrum sets a series of bones inside the ear to vibration. These vibrations are transmitted to cochlea of the inner ear through the oval window. Because of this, the cochlea fluid called as Endolymph vibrates and this stimulates thousands of nerve cells inside the cochlea and thus impulses are formed which reaches the human brain and from the brain response a human being can sense the sound.

Deaf people don't have the sense of hearing and one should be empathetic towards such people. Hearing aids solve the problem of hearing loss to an extent. It has a microphone, amplifier and a loudspeaker in it. The microphone converts sound energy into electrical signals. Amplifier enhances the electrical signals. Loudspeaker converts the amplified electrical signals into loud sounds and sends them to the eardrum of the receiver. A battery is also included to provide electricity needed for the working of the hearing aid.

Limits of audibility: A normal healthy human being cannot hear all types of sound. A Galton whistle sound is heard only by dogs and humans cannot hear the sound of it. Similarly a natural calamity like an earthquake is sensed by animals and birds easily but human beings cannot sense that. Bats can travel very easily in darkness but human beings cannot. All these happen because of the limits of audibility present for the sound receiving sense organs. A sense organ like ear has got a capacity of its own to identify different frequency sounds. This capacity of the ear is referred to as the limit of audibility of ear.

Sounds having frequencies greater than 20000 Hz are called as ultrasonic sound waves. Sounds having frequencies below 20 Hz are called as infrasonic sound wave. Both these sound ranges are not audible to human beings. A normal human being can hear the sound frequencies ranging from 20 Hz to 20000 Hz.

Frequency range	Name of the limit	Organisms that can hear in this limit
Below 20 Hz	Infrasonic	Earthquake tremors –Doves can hear
Between 20 Hz to 20000Hz	Human audible	Human beings can hear

Above 20000Hz	Ultrasonic	Scanning machines, SONAR for underwater searching of boats and submarine uses these sound waves- bats, rats and nocturnal moths can hear these sounds. Bats travel in night by tracing their sound reflection or echoes. This technique is called as echolocation by bats.

THEME AND SUB THEME

Theme: Propagation of sound

Sub theme: Hearing and limits of audibility

EXPERIENTIAL STRATEGY

Reflective Observation Stage

The students are asked about the sense of hearing and how the sound of a school bell reaches the ear of the students. The students respond by saying that the sound of the bell travel through the air and reaches their ears. The students then reflect upon the instrument called as *'Mani'* when they are shown a picture of the same. The instrument is used by the tribal population constantly in their marriage functions. The sound of the bell reaches the ears by travelling through air. Thus, the students reflect upon their own experiences of sound travel. They come to a conclusion that sound travels through air.

Concrete Experience Stage

The students experience the sound propagation through wood by striking under the wooden surface of the bench and asking one of the students among them to listen to the sound by placing his ears on the desk. Thus, an assumption is made out that the sound travels through materials also. Sound needs a medium to travel which can be air, water or solid.

Active experimentation stage

The students experiment the sound propagation through the toy telephone activity. One end of the toy telephone is placed on the ear of a student and the other end on the mouth of the student. The student whispers which can be heard clearly by the other student sitting at a distance from him. Thus, the students were able to comprehend the fact that sound only needs a medium to travel. It can be solid, liquid or gas.

Abstract Conceptualisation Stage

Here the students understand that hearing sounds of all frequencies are not possible in human ear. They draw the structure of human ear and understand the process of hearing. A human ear cannot hear the Galton whistle that are used by the animal trainers to train dogs and cats. A Galton whistle is very much familiar to these students as they live closer with the forest officials who always have a whistle with them for training their dogs who are a company to them in the forests. Hence the students easily get the idea of hearing all frequency sounds is not possible for human beings. This is because human ear does not have the capacity to hear all frequencies. This is called as limits of audibility and is different for different organisms.

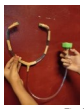
ACTIVITY

Activity 1 Toy telephone

Materials Required: Paper cups, a needle, a woollen thread

Pierce a hole on the bottom of the paper cups and tie a woollen thread and insert the same through the hole and tie both of the cups as a connecter. Place the mouth of one cup on the ear of a student and let the other student whisper something to the mouth of the other paper cup. Ask the students to observe how the sound travels. Were they able to hear the sound properly?

Activity 2 Stethoscope model



Materials required: Mason pipe, back top of a filler, rubber bands, a small cap with a hole in middle, balloon

Cut the mason pipe in to three different pieces, two of them in same length and one a longer one. Connect all three together in the shape of a stethoscope with the help of cellophane tapes. If needed a tongue cleaner or a metal wire can be pasted at the top end of the stethoscope for extra support. Fix the rubber back of the filler to the ends of the mason pipe where it is to be placed in ears to hear the heart beats. To the bottom of mason tube where the longer mason pipe is attached, connect a cap with a hole in the middle of it. The open end of the cap should be tied with a stretched balloon. The students engage in making the stethoscope and understand the propagation of sound through any medium.

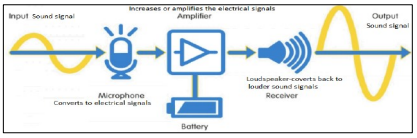
Activity 3 Human ear model

The students are divided in group and each group try to draw the picture of the human ear after understanding the process of hearing. A chart that displays the function of ear is displayed and the students try to draw the flow diagram of hearing process and then the structure of human ear.

Source of sound→vibrations in external ear→vibrations in spiral nerve cochlea→vibrations in liquid inside cochlea called as endolymph→vibrations in thousands of nerves inside internal ear→ impulses to brain→ sense of hearing experienced from brain

This chart is displayed and the students try to draw the structure of ear by their own.

The students are made to discuss about the hearing aids that are used by those people who cannot hear properly. The students are made to discuss about the components in a hearing aid. Afterwards a model picture of sound flow in a hearing aid is shown to the students.

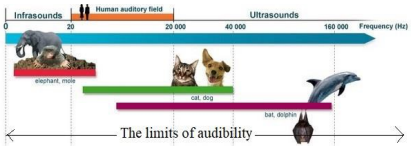


Activity 4: Limits of audibility

Here the students are exploring why the animals, birds can hear some sounds before a natural calamity while the human beings are not. Students are shown an ultrasonic pet repelling machine that demands that it can guard house from rodents due to the ultra sonic sound waves it generates.

Also, the students are told to recall the common incidents like insects, birds responding to time naturally. Before rain comes, the frogs croak, peacocks dance. Before any natural calamity, birds fly away from the place; they can sense it easily than human beings.

Similarly, a dog can hear the sound of Galton whistle which most of the dog trainers or the forest watchers carry along with them. Humans cannot hear its sound while dogs and cats can. This is put into discussion and thus students are asked to list out which are the noises that human beings cannot hear but animals a birds can. Later the model chart on limits of audibility is displayed and each of the sound frequency waves is explained along with its use.



FEEDBACK

Students enjoyed the activity of toy telephone, stethoscope model and the human ear drawing. They could list out the situations of sounds that are heard by animals and birds while humans cannot hear. They are able to comprehend about the sound propagation and the necessary things that are required for sound propagation.

Sounds that human beings cannot hear while the birds and other animals can
Earthquake tremors
Tsunami waves
Galton whistle
Pest repellent instruments

EVALUTION

Hearing is an ability of the individual to react and respond to sounds they hear. The hearing may be lost due to many reasons. One should be empathetic towards those persons who are unable to hear. Hearing aids are now very popular and have made a great progress in the medical field which has proven to be much helpful for many persons who are hearing disabled. Human beings cannot hear all sounds of different frequencies. There are some limits of audibility. Based on these limits of audibility, sound waves are classified into infra sonic, human audible and ultra sonic.

Experiment with your own *'Jal tarang'* and see how sound travel in water.

JAL TARANG instrument uses different levels of water in glass bowls and striking the glass bowls with the water with a glass rod striker.

MODULE 8 Healthy Peaceful Environments

MODULE DURATION: 2 hrs

MODULE OVERVIEW

Kerala is one of the places with the highest noise pollution in the world. Noise affects not only our physical health but also our mental health and emotional levels. It leads to high blood pressure, deafness, asthma and learning disabilities. Noise pollution must be reduced by planting more trees, reducing the usage of loudspeakers and by purposely making necessary changes n the life style of human beings. Such good measures must be adopted so as to reduce the harmful effects of noise pollution.

LEARNING OUTCOMES

- To understand what is noise pollution
- To understand what are the measures that can be adopted to reduce noise pollution

Specific Outcomes

- To create a poster on noise pollution
- To suggest measures to reduce noise pollution

CONTENT

Noise becomes unbearable when its intensity increases beyond limits. Our environment becomes noisy by both sweet music and by loud noises. We cannot hear our favourite songs very loudly for a long time. It will irritate us and will cause severe health problems. Noisy atmosphere adversely affects the mental and physical health and the working capacity of a person. The audible noise level is 80 db. But at times the loud speakers produce intolerable noises. Noise control instructions have been put up in the roads near schools, hospitals, courts and densely populated areas and in cities. In certain zones called as silent zones, the usage of loud speakers is prohibited.

The causes of noise pollution can be listed as follows:

- Noise from machines, motor vehicles, trains, aeroplanes and loud speakers.
- The sound of sirens in factories.
- The noise made by the old machines in factories.
- Excessive sound from loud speakers.
- Fireworks in temples, churches and mosques.
- Felling of trees.

The remedial measures for reducing the noise pollution can be listed as follows:

- Install new machinery in place of the old obsolete and worn out machines.
- Use new model engines in motor vehicles.
- Lubricate the machines from time to time.
- Control the use of amplifiers and loud speakers.
- Keep punctuality in switching on and off the machines and music systems.
- Plant trees.
- Use sound absorbents wherever possible.
- Avoid fireworks and crackers.
- Prohibit the use of air horns
- Reduce the usage of amplifiers and loud speakers.

Health Hazards caused by noise pollution

- Physical and mental health problems
- Hearing impairment
- Deafness
- Nervous system damages
- Increase in blood pressure
- Heart failure
- Insomnia
- Headaches and nausea
- Eye problems

THEME AND SUB THEME

Theme: Noise Pollution

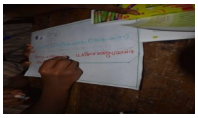
Sub theme: The adverse effects of noise pollution

EXPERIENTIAL STRATEGY

Concrete experience Stage

The students engage themselves in the poster making where they express their thoughts and ideas o noise pollution. How the noise pollution happens and what all are the primary causes for the same. The students draw different posters depicting the topic noise pollution.

Reflective Observation Stage



The students discuss about the adverse effects of noise pollution and they find many solutions to reduce the same. Many measures that can be implemented at the grass root level are discussed by the students. They are motivated to reflect upon their own experience in their locality and suggest measures to reduce noise pollution in their locality.

Active Experimentation Stage

Here the students are instructed to make pluck cards and notices that can be hung around the school to spread awareness on noise pollution and it adverse effects on humans among the students of their school. The notices hence prepared can be circulated in the whole school.

Abstract Conceptualisation Stage

The students understand the adverse effects of noise pollution and they can make a concept map depicting the evil effects of noise pollution. The concept map can be titles as according to their preference but the topic should be the evil effects of noise pollution. Later they can be asked to present the prepared concept map in detail to the whole class.

ACTIVITY

Activity 1: Poster making

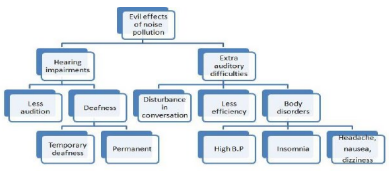
The students can be grouped and they can be asked to make a poster regarding noise pollution according to their creativity. The posters can be hung around the class or in the school to spread awareness on noise pollution among the whole students in school.

Activity 2: Notice making

Here the students may be asked to circulate notices in the entire school stating the measure that must be adopted to reduce the effects of noise pollution. The students can arrange a role play or a drama in the school stage that clearly states the adverse effects of noise pollution and the ways and means to reduce the same for a healthy and peaceful environment to live in.

FEEDBACK

The students engaged in the entire activities very well and they were able to make the concept map clearly.



EVALUATION

The audible noise level in 80db and the continuous hearing of sound above this level can cause various health problems like hearing impairment and irritation. The sounds above 100db can damage the ear receptors and can cause permanent deafness. It can also cause other ailments such as blood pressure, heart failures etc. Governments should take adequate measures to reduce noise pollution and to make the place a healthy and peaceful atmosphere to live in.

What are the adverse effects of noise pollution and what all are the measures that can be adopted to reduce the same?

STATIC ELECTRICITY

MODULE 9: Electrical energy in nature

MODULE DURATION: 2 hrs

MODULE OVERVIEW

Electrical energy is the most important form of energy in everyday life. Current electricity is used for this. Before knowing the usage of current electricity one should be familiar with the static electricity. Thunder and lightning are the natural phenomena due to static electricity. The basic theory behind static electricity is discussed in the module.

LEARNING OUTCOMES

- To understand the concept of electrical energy
- To differentiate the process of attraction and repulsion
- To understand the different types of charges

Specific Outcomes

- To understand the substances that can attract or repel charges
- To understand the properties of electric charges

CONTENT

Static electricity is formed much better when the air is dry or the humidity is low. When the air is humid, water molecules can collect on the surface of various materials. This can prevent the build up of electrical charges.

When two suitable substances are rubbed together, they acquire attractive property. Then they are able to attract other substances. Only a compatible pair of bodies, when rubbed, has the ability to attract other bodies. When two such objects are rubbed against each other, they acquire some electrical charges.

Matter is made up of molecules. Molecules are made by joining atoms. Proton, neutron and electron are the sub-atomic particles in an atom. Neutron does not possess any charge. Protons have positive charge and electrons have negative charge. In any atom, the number of protons and electrons are equal. So, an atom is electrically neutral.

All substances have electrons and protons. When a charged body is brought near another object a rearrangement of electrons takes place in it. Electrons move towards near end of the object, when a positively charged body is brought near to it. Objects attract each other due to the attraction of opposite charges. Electrons move towards the far end and the positive charges is formed at the near end, when a negatively charged body is brought near to it.

An atom gets positive charge on losing electron and negative charge on receiving an electron. On rubbing certain substances together, the electron transfer takes place from one body to another. The body that loses electron becomes positively charged and the body that gets electron becomes negatively charged.

Electrification or charging is the process of converting an object into an electrically charged one. If the electric charges produced in an object remains at the same place in it, then it is called as static electricity.

Charged bodies attract uncharged bodies. Unlike charges attract each other and like charges repel each other. The unit of electric charge is coulomb and the electric charge is a scalar quantity.

One coulomb is the unit amount of charge passing through a body in unit amount of time. One coulomb is equal to the charge of 6.25×10^{18} electrons.

$$I = \frac{Q}{t} \text{ or } Q = I \times t$$

Where I is the intensity of electric current measured in ampere A,

Q is the charge in coulomb C

And t is the time in seconds S

$$Q = n \times e$$

Here n is the number of electrons and

E is the charge of one electron and that is equal to $1.6X10^{-19}$ C

Therefore, $I = \frac{ne}{t}$

Or $n = \frac{Ixt}{e}$

Substituting, $n = \frac{1 A x 1 s}{1.6 x 10^{-19} C} = \frac{1}{1.6 x 10^{-19}} = 6.25 \times 10^{18}$ electrons

THEME AND SUB THEME

Theme: Charges in nature

Sub theme: Properties of charges

EXPERIENTIAL STRATEGY

Reflective Observation Stage

The students can be motivated reflect upon their experiences with static electricity. Students can be asked about the feeling they experience while wearing a nicely ironed shirt on them. How do the hairs stick on to the shirt on wearing it? The students' discus the same and can be asked to describe the attraction of their body hairs on to the shirt on wearing the same.

Concrete Experience Stage

The students can be asked to experiment with scale and paper bits. They can experiment with the bits of paper getting attracted to the plastic scale rubbed with woollen thread. Students can experiment continuously on different kinds of threads. They can experience by themselves on which case the charges get formed on the scale and thereby it attracts small bits of paper.

Active experimentation Stage

Here the students can experiment on balloon and hair. The students can be asked to experiment on rubbing an inflated balloon with a socks and then placing it near their hair. Let the students experience by themselves what happens to their hair. Students can then be asked to experiment on different types of hair, like wet hair, oiled hair and dry hair. They can experience for themselves on which type of hair the charge attraction take place. The students actively get involved in experimenting why the hair strands get attracted to the balloon end where the woollen socks were rubbed.

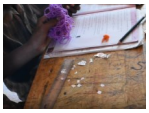
Abstract Conceptualisation Stage

The students can try to define the static electricity by their own. They can discuss with their group members and the students are asked to write down the properties of charges. How these charges get accumulated on bodies and what is actually static electricity? The students can try to conceptualise the charge attraction repulsion theory and can then connect it with static charges.

ACTIVITY

Activity 1: Paper and scale experiment

Materials required: small bits of paper, a 30 cm long plastic scale, a woollen thread roll



The students can be asked to rub the plastic scale on the woollen thread roll and then bring the plastic scale near to the bits of paper. They are asked to see what happen to the paper bits and to note down their observations. They are asked to rub with many threads and see which one is attracting the paper bits more. The experiment can be repeated several times with changing objects such as plastic pen, nylon thread roll, flannel cloth, cotton thread etc.

Activity 2: Balloon and flannel experiment

Materials required: Balloon, flannel cloth

Suspend two inflated balloons in such a way that they touch each other. Place a flannel or a woollen thread roll between them and rub the two balloons on it. They are asked to observe the balloons after moving the flannel.

FEEDBACK

The students list out those pair of bodies that get attracted to each other.

PAIR OF BODIES THAT ATTRACTS EACH OTHER
1. Paper bits and plastic scale
2. Balloon and hair
3. Oppositely charged balloons

They listed out the properties of electrical charges and later the unit of electrical charge and the nature of electrical charge were discussed in detail.

EVALUATION

When a metal rod or metal scale is rubbed against wool, it does not attract paper bits but a plastic scale, comb or pen is rubbed against wool and brought near paper bits, it attracts them. Thus it can be concluded it is difficult to charge objects made of metals by rubbing. Though the metal surface is electrified on friction the charge is spread immediately to other parts as it is a conductor. So it can be concluded that the static electric charge is not formed on metals.

What are the properties of electric charges?

What type of quantity is an electric charge and what is the unit of electric charge?

MODULE 10: MATTER, MOLECULES, ATOMS

MODULE DURATION: 2 hrs

MODULE OVERVIEW

Matter can be a solid, liquid or gas. All matter is made up of atoms and molecules. Atom is electrically neutral since the number of electrons and protons inside an atom is equal. Neutrons do not possess any electrical charge. The module discusses on the structure of atom and the charges each sub atomic particle contain.

LEARNING OUTCOMES

- To understand the structure of atoms
- To differentiate between proton, neutron and an electron

Specific Outcomes

- To make a model on structure of atom
- To understand the charges on each sub atomic particle

CONTENT

Proton neutron and the electron are the sub atomic particles inside an atom. The proton and neutron is inside the atom while the electron revolves around the atom in special orbits. The number of protons and the number of electrons in an atom is equal and this gives the atomic number of the atom.

Eg: Oxygen has an atomic number 8. This means that there are 8 protons and 8 electrons inside an oxygen atom. The filing of 8 electrons is in such a way that 2 electrons are placed in the first orbit and the remaining 6 electrons in the second orbit.

On rubbing certain materials with suitable other materials some materials lose charge while others gain charge. This charge is nothing but electron transfer. As electrons are outside the atom, on rubbing electron transfer takes place between materials. Thus the number of electrons may increase or decrease depending on the materials that come into contact with each other. This charge acquisition due to contact such as rubbing is called as electron transfer by contact or charging by contact. The number of protons inside the atom is unchanged while this happens.

The electron is negatively charged and the proton is positively charged thus making the atom electrically neutral. On rubbing or on electron transfer, atoms become charged on the gain or lose of electrons. An atom that loses electrons gets a positive charge and an atom that gains electron gets a negative charge.

THEME AND SUB THEME

Theme: Structure of atom

Sub theme: Characteristics of particles inside an atom

EXPERIENTIAL STRATEGY

Concrete Experience stage

Here the students are told that the electrons revolve in certain fixed orbits. The students experience the idea of orbits during the sports meet. The students who compete in running races are arranged in separate tracks as for different electrons. Here in each track only one student stands but for relay races, four students of the same team stand in a track and pass the baton to the other and completes the race. This is experienced by the students and thus the idea of orbits can be made clear.

Reflective Observation Stage

Here the students can be asked to reflect their experience on playing the message passing game where the group members stand in a circle joining their hands and the catcher stands in the middle of this circle. The students who are standing in the circle can be treated as electrons and the catcher inside as an atom having protons and neutrons inside it. They also can relate the concepts to the solar system where the planets revolve around the sun are treated as electrons and sun as the atom that is standing stationary in the centre.

Active Experimentation Stage

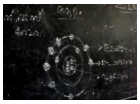
The students by considering the example of Oxygen atom try to draw the model of the atom by their own. They are told that the first shell can have a maximum of two electrons and the second and third shell can have a maximum of eight electrons each. Here they try to arrange the atoms in the prescribed order of 2, 6 since the atomic number of the Oxygen atom is 8.

Abstract Conceptualisation Stage

The students can be asked to discuss about the properties of electrons, protons and neutrons and write it down in their notebook. They can be asked to come and draw the model of a simple atom of atomic number below 10 on the black board.

ACTIVITY

Activity 1: Model of structure of atom



The students are asked about the game of message passing where the catcher stand in the middle of the circle and the other group members stand in a circle rounding the catcher by joining their hands with each other. The students are thus made familiar of the orbits where electrons revolve and the catcher is the atom who is in the centre and has protons and neutrons in it. The students who join their hands are referred to as electrons and the catcher who is standing in the centre as the atom having protons and neutrons.

The oxygen atom is discussed in detail and the students are told about the way of arranging the atoms in orbits. Then they are asked to draw the model of the oxygen atom by their own.

Activity 2: Characteristics of proton, neutron and an electron

A discussion on protons, neutrons and electrons can be conducted among the students based on the previous activity. The students are asked to tabulate the properties of the sub atomic particles. Students can be asked to discuss in groups and consolidate the properties and initiate a role play of proton, neutron and an electron. They can hold pluck cards showing the properties of the proton, neutron and electron and enact a role play in the class.

FEEDBACK

All the students were actively engaged in drawing the model of atom and making a model using bangles and beads. The students were able to list out the properties of the sub atomic particles and record their observations in the table. Also the characteristics of proton, neutron and electron were discussed and a role play was enacted in the class.

SUB ATOMIC PARTICLES	PROPERTIES
Proton	Positively charged and has mass Charge of a proton is 1.6×10^{-19} coulombs in magnitude Found inside the nucleus of atom Redistribution of charge does not take place Atomic number is decided by the number of protons Number of protons equals the number of electrons
Neutron	No charge but has mass Found inside the nucleus of atom
Electrons	Negatively charged and has mass Charge of an electron is 1.6×10^{-19}coulombs in magnitude Redistribution of charge takes place Revolves in fixed orbits outside the nucleus of atom Specific orbits can take only fixed number of electrons in it.

EVALUATION

If two bodies attract each other it cannot be said that both of them possesses charge. But if the bodies repel each other, it can be evidently told that both the bodies possesses like charges. So repulsion and not attraction, is the means by which it can be confirmed whether bodies possesses charge or not.

What are the particles present inside an atom?

What are the characteristics of the particles inside an atom?

MODULE 11: DETECTING THE PRESENCE OF STATIC CHARGES

MODULE DURATION: 2 hrs

MODULE OVERVIEW

In order to know whether a body is charged or not, apart from the repulsion technique another instrument is present with which it can be told whether the body has charge or not. This instrument is called as an electroscope. It can detect the presence of stationary charges. This module deals with the making of a low cost electroscope with locally available materials.

LEARNING OUTCOMES

- To understand what is an electroscope
- To construct a model electroscope
- To experiment with electroscope

Specific Outcomes

- To make the students develop curious towards charge flow
- To make them aware of the ways by which charge flow happens

CONTENT

Electroscope is an instrument that is used to detect the presence of static electric charges. An electroscope has the following parts

- Metal sphere
- Glass jar
- Metallic conductor
- Metal leaves (Based on the built of electroscope there can be several types of leave such as gold, aluminium foil or paper)

A charged electroscope can be neutralised or made charge less. This can be achieved by connecting the free end of a metallic wire having the other end buried deep in earth to the electroscope which is to be neutralised. The activity to neutralise the charge on body is known as discharging.

THEME AND SUB THEME

Theme: Electroscope

Sub theme: Charging and discharging of an electroscope

EXPERIENTIAL STRATEGY

Concrete experience stage

The students can be asked about their experience of getting electric shock from stationary objects that are not connected with current electricity circuits. The students can be asked of getting electric shocks from metallic door knobs when they touch them by wearing a woollen socks after walking on a floor carpet. They might have experienced static shocks when they touch metal bars on windows during thunder or lightning.

Reflective observation stage

The students can be asked to list down many other situations they have felt a static electric shock. They can be asked to make a comparison between static electric shock and the actual current electric shock.

Active experimentation stage

Here the students can be made to make a model of a paper electroscope with which one can easily detect the presence of static electric charges. They can be asked to experiment with aluminium foil leaves instead of paper. Also they can be motivated to experiment with the electroscope by connecting the metallic conductor at the top to a wire which is buried deep inside earth. They can note down their observations in their notebook.

Abstract Conceptualisation Stage

The students can be made to work on electroscope and practically be helped in solving the problems based on the electroscope. They can be given some worksheets that include the construction, labelling and the questions regarding the charge formation in an electroscope. The questions can be answered by the students by discussing in their group.

ACTIVITY

Activity 1 Model of paper electroscope

Materials required: One transparent plastic bottle, a copper wire, cardboard, paper strips, straw, cellophane tape.

Cut the cardboard in such a way that it covers the bottle. Make a hole at the centre of the cardboard and fix the straw by inserting some portion of it through the hole. Place the copper wire through the straw and bend both the ends of the wire. Hook two paper strip pieces of same sizes in one end which is to be inserted inside the plastic bottle. The other end can be cold above the cardboard lid in the form of a coil so that it is easy to place any object that is to be tested for the presence of static electricity charges.

The students can be motivated in making an electroscope of their own for them to experiment with the static charges

Activity 2: Experimenting with the paper electroscope

Charge a plastic scale by rubbing on dry hair. Place the scale on the coiled end of the electroscope and observe what happens to the paper leaves inside the plastic bottle.

The students can be asked to experiment how the electroscope can be made charge less or neutralised once it is charged by any object. What are the methods by which they can remove the charges from a previously charged electroscope? The students can discuss in groups and motivated to find an answer and record it in their note books.

FEEDBACK

The students found it very interesting to study the concept of electroscope and to model an electroscope from the locally available materials. They were able to correctly tell that an electroscope can be neutralised or made charge less by connecting the metallic conductor of the electroscope to a conducting wire whose other end is deeply buried inside earth.

EVALUATION

Electroscope can be used to find the presence of static electric charges. The electroscope can be neutralised or made charge less by connecting it with earth. There can be many types of electroscopes such as gold leaf electroscope which is commonly found in science labs, aluminium foil electroscope or paper electroscope, both of which are very common and are easy to make from locally available materials. What is an electroscope?

How is discharging done in an electroscope?

MODULE 12: AVOIDANCE OF ELECTRIC SHOCKS

MODULE DURATION: 2 hrs

MODULE OVERVIEW

Earthing a body is very essential to avoid electric shock. In all household and commercial electricity connections, earthing is done practically to protect the buildings from short circuits. The module is dealing with the potential benefits of earthing.

LEARNING OUTCOMES

- To understand the concept of earthing
- To understand how and why is earthing done

Specific outcomes

- To understand how an earth is connected
- To symbolize earth in electrical circuits

CONTENT

The procedure of connecting a body to the earth using any metallic conductor is known as earthing. When a charge body is earthed, electrons pass from the earth to the body or form the body to the earth so as to neutralise the charge on the body completely. The earth gives or receives electrons at any time and at any quantity. Hence earth is sometimes referred to as an electron bank. The symbol of earth is as shown.

Electrons flow from earth to the body when a positively charged body is earthed and when a negatively charged body is earthed, electrons will flow from the body to the earth.

THEME AND SUB THEME

Theme: Earthing

Sub theme: Earthing established in a circuit

EXPERIENTIAL STRATEGY

Concrete experience stage

The students are taken to the school ground to see the big earthing pit and to find out how the earthing is established in the school building. The student can find the earthing pit and the connection with which it is connected to the entire school circuits for the avoidance of electric shocks. They can be instructed to see the long pole commonly used to identify the earth pits. After that the students can be given opportunities to find out the common colours of the wires that are used for electrical connection. They are asked to identify the earth wire from it.

Reflective observation stage

Here the students can be given opportunities to examine the electroscope they had made previously and to experiment it with the earthing procedure in order to neutralise the electric charges in the electroscope. Hoe the neutralising of electric charges are given in the electroscope can be verified at this stage.

Active experimentation stage

The students can be taken for a walk to find out the earth pits inside the school compound. In total how many earth pits were dug in their school. They can find out the number and thus understand that in larger buildings a single earth pit cannot incorporate the whole connections of a larger area like schools and commercials.

Abstract conceptualisation stage

The students can be asked to symbolize earth in electrical connection circuits. They can be asked for the reason why earthing is important for all the buildings that has got an electrical connection.

ACTIVITY

Identifying the common colour code of earth, live and neutral wires

The students can be taken for a visit in entire school and they are left to examine the main switch boards of the school. They can be asked to identify the wires inside main switch board. How many colours of wire are used inside switch board? They are left to identify which will be the earth wire, which one is live wire or phase wire and which one is neutral wire.

The students can record their observations in their note books.

FEEDBACK

The students identified that there are three common coloured wires used inside every switch board. Many students guessed that the earth wire will be in green colour and that is the common electrical colour code of earth wire. Red is used to change legs and it carries live electrical connection. Black or blue is also used as another phase wire. The neutral wire is white in colour

EVALUATION

Earthing process helps the buildings from getting electricity shocks or short circuits. There are always three wires used in every household or commercial electricity connections and they are red, blue/back and green. Red denotes the phase wire or the live wire, the green is neutral and the blue/black refers to the earth wire.

What is the importance of earthing?

MODULE 13: TYPES OF CHARGE TRANSFER

MODULE DURATION: 2 hrs

MODULE OVERVIEW

There are basically two types of charge transfer, charging by conduction and charging by induction. The module tries to explain the process of charge transfer in both the cases through simple and practical examples.

LEARNING OUTCOME

- To differentiate between the process of charging by conduction and charging by induction

Specific outcome

- To define electrostatic induction

CONTENT

An atom is electrically neutral due to the presence of equal number of protons and electrons. When a body needs to be charged, the electron distribution inside the atom should be altered or in other words a redistribution of electrons takes place when an atom gets a charge. The process of electron transfer in an atom makes the atom positively or negatively charged. There are basically three methods of charge transfer.

a. Charging by friction
   Here the bodies that acquire charges are mainly insulators. A plastic comb gets charges from dry hair and it attracts bits of paper. This is due to the charges acquired on the comb due to friction with dry hair.
b. Charging by conduction
   Here the bodies that acquire charges are mainly conductors. Using a metal rod can be dangerous to pluck fruits from trees since there is a high chance of getting a massive electric shock when the rod comes in contact with the live electrical cable wire moving overhead to the buildings. This is because a metal rod is a good conductor of electricity and when it comes in contact with the live electrical cable, electricity takes the shortest route to earth and hence passes through our body which leads to a massive electric shock and death of the person.
c. Charging by induction
   Here any conductor gets charge due to the presence of charged bodies that are kept near to an uncharged conductor without any contact with the charged body. The uncharged conductor gets charge from the charged bodies kept near to them through the process of induction. The charging by induction process happens when the charged particle is held close to an uncharged conductor which is grounded on a neutrally charged material. Here the uncharged conductor gets the opposite charge of that of the charged body kept near to it during the process of induction. Through induction process only conductors can be charged.

During thunder and lightning it is unsafe to sit near open windows or open doors because there is a high risk of getting electric shock because of the charge accumulation in doors, windows and even through the metal wires in concrete. The doors and the glass can explode because of the charge accumulation in it. Thus lightning is considered as a giant static electricity shock.

FEEDBACK

The students were able to list out the differences in the charging process like charging by friction, conduction and by induction. They were able to understand the difference in charge polarisation happening during the process of electrostatic induction.

EVALUATION

During the process of charging by friction, the two bodies come into contact and this process can charge even insulators. During the process of charging by conduction, the two bodies come into contact and this process can charge conductors better. During the process of charging by induction, the two bodies don't come into contact with each other but still gets charged. Induction process can happen only in conductors but the other two methods work both in conductors and in insulators.

What do you understand by electrostatic induction?

MODULE 14: CONSERVATION OF ELECTRIC CHARGES

MODULE DURATION: 2 hrs

MODULE OVERVIEW:

When a conductor is placed near a charged body, opposite charge would be induced o the surface of the conductor facing the charged body. Hence the charge on the electroscope remains for longer duration because of the attraction of these charges. A capacitor is constructed considering this principle as the basis.

LEARNING OUTCOME

- To define what is a capacitor
- To make a capacitor model
- To understand the concept of distribution of electric charges

Specific Outcome

- To understand the concept of conservation of electric charges

CONTENT

A capacitor is a parallel arrangement of two metallic plates kept near to each other leaving a small gap between them. This is left purposely so that the plats get charged through the process of charging by induction. With such an arrangement, the electric charges can be stored or retained inside a capacitor for longer time and duration. This is because of the electric field that is formed in between them. This device that can store electric charges in this manner is called as a capacitor.

In order to increase the ability of storing electrical charges in a capacitor with fixed plate area, suitable insulators are placed in between these plates. Such plates are referred to as dielectrics. Some examples of dielectrics include paper, air, polyester etc. Capacitors are usually known by the dielectric that are inserted between the plates such as paper capacitor, air capacitor etc.

The ability of a capacitor to store charge is known as capacitance and the unit of capacitance is farad (F).

1 F= 10^6 microfarad and 1F=10^{12}picofarad

MODULE 15: THE NATURAL SOURCE OF STATIC ELECTRICITY

MODULE DURATION: 3 hrs

MODULE OVERVIEW

Lightning is the electric discharge between charged clouds in the atmosphere or between the charged clouds and the earth surface. The module explains the lightning and the methods by which lightning strike can be avoided.

LEARNING OUTCOME

- To understand the concept behind lightning
- To understand the measures to prevent the potential dangers of lightning

Specific Outcome

- To understand how accidents happen during lightning

CONTENT

During a rainy season thunder and lightning is common and might have frightened people. Even today people get accidents because of thunder and lightning. Lightning is actually the electric discharge between charged clouds in the atmosphere or between charged clouds and the earth surface.

There are many explanations regarding thunder and lightning. The electric discharge happens due to the accumulation of charges in the clouds. The upper part of the clouds, which is in higher altitudes from the ground of earth, gets very much cooled and forms ice. During strong winds, these particles come in contact with each other and get charged due to friction. This charging due to friction happens because of the electron transfer between the particles. The articles which gain electrons remain at the bottom and those which lose electrons remain at the top. In this way thousands of coulomb charges are accumulated inside the clouds.

Such a huge amount of charge is more than enough to change the air which is actually an insulator in to a conductor. Light is produced due to the flow of thousands ampere current through the air which is now a conductor in a very short time. This is lightning. Thunder is the trembling that occurs because of the limitless expansion of air at a very high temperature.

Benjamin Franklin named the electric charge as positive and negative. It was his world famous kite flowing experiment on kite flying that led to the conclusion that lightning is the flow of charges.

Lightning rescue conductor

Lightning rescue conductor is a device used to protect tall buildings, towers from lightning strikes. This is a thin copper with pointed tips and it is arranged in such a way that the pointed tips are higher than the building and the lower end is immersed deep into the earth. The electric discharge concentrates at the pointed tips of the lightning rescue conductor during lightning. Since it is a good conductor and is properly earthed, the electric discharge gets neutralised.

Lightning rescue conductor works on the principle of charging by induction. When a large quantity of negative charge gets accumulated in clouds, due to the process of electrostatic induction large quantity of positive charge is produced at the pointed ends of the lightning rescue conductor and negative charges at the bottom of the conductor. This happens due to the flow of electros from earth to the lightning rescue conductor through the earthed part of the conductor. This neutralises the high amount of negative charge from the clouds reaching the pointed ends of the conductor through air. In this manner, the possibility of a lighting strike is eliminated.

When positive charge gets accumulated in the clouds, negative charge would be induced at the pointed ends of the conductor and positive charges at the bottom of the conductor. This also neutralises the positive charges reaching the pointed ends of the conductor from the clouds and hence eliminating the risk of lightning strike.

The lightning rescue conductor is earthed well in order to supply or receive sufficient quantity of electrons from the bottom portion of it.

It is always advisable to sit indoors during a lightning. If a person is standing outside during a lightning, opposite charges get accumulated on the hair strands of the person and due to this the hair is pulled upwards like a spike. The lightning is bypassed through the body of the person to reach the earth and hence the person gets a lightning shock and gets injured critically.

Measures to protect people from lightning

- Do not operate electrical equipments
- Do not lean towards the wall of the houses
- Do not stand holding the window bars or grills of the house
- Do not stand beneath tall trees
- Do not take shelter under isolated trees

The primary steps to be adopted when a person is struck by lightning

- The person should be helped to rest in a place with good air circulation and ventilation
- The person should be gently massaged in order to prevent blood clotting
- The person should be given artificial respiration
- The person should be given CPR (Cardiopulmonary resuscitation)
- The person must be given medical assistance as early as possible.

THEME AND SUB THEME

Theme: Thunder and lightning

Sub theme: Dangers of lightning and ways to prevent

EXPERIENTIAL STRATEGY

Concrete Experience Stage

The students can be taken to the top of the school building where the lightning rescue conductor is installed. They can see the pointed tips of the conductor, how it is being connected to earth. The students can be taken with due care and attention to the top of the building

Electrostatic induction is the process of redistribution or accumulation of electrical charges in a body as a result of the presence of another charged body without any physical contact between the two. It works for only short distances. It happens due to the presence of static electric charges. The effect of electrostatic induction is maximum in insulators.
In real life, the charging by induction process is used in charging microphones, smart phones etc. by placing the phone on the dock charge transfer induction process happens between dock and phone.
Other practical example of induction is that of induction cook tops. The method of induction is used to charge the copper coil inside the induction cook top. The charge transfer takes place to the cook top surface and heats the vessels and cooks the food.

THEME AND SUB THEME

Theme: Electrostatic induction

Sub theme: Types of charging

EXPERIENTIAL STRATEGY

Concrete experience stage

The students can be asked for electric fences that are used for protection of farms and domestic animals from wild animals. Elephants and other animals will dare to come inside or touch such fenced farms and pet houses. The students can be taken for a nature walk where electric fence is used and to understand the process of charging and charge transfer clearly.

They can also be showed the picture of birds getting electric shock from overhead electric cables and asked about their experiences on the same. A discussion can be carried out in the class as why did the bird die. Some birds easily sit on the cable while some birds die and what is the reason for the same.

Reflective observation stage

The students can be taken for a walk in the school campus and to see how the school vegetable garden is protected from animals. They can see the type of fencing used in the school so that the plants are able to get sunlight but are protected from animals like pigs, cows and goats from entering the garden. The type of fences can protect the garden from attack of stray animals.

Active experimentation stage

Students can compare the experiments carried out with the plastic scale and paper bits and the electroscope. In the paper scale experiment the scale got charges due to friction but in the electroscope, the leaves got charge by keeping a charged object near to the conducting end of the electroscope. They can experiment the electroscope experiment to understand the process of induction properly.

When a metallic substance is charged, the charge is distributed in a special fashion. The charge will be distributed only on the surface of the conductor. The amount of charge would be more at the pointed ends of the metallic conductor.

THEME AND SUB THEME

Theme: Storage and distribution of electric charges

Sub theme: Capacitors, Charge distribution

EXPERIENTIAL STRATEGY

Concrete experience stage

The students are asked about tuning a radio. They have had experience in changing channels in a radio to receive broadcast from different radio stations. A radio can be brought inside the class and the students can be asked to tune the radio to different channels. They then can initiate a discussion in their group in order to know how different channels can be heard from a radio. What is the principle behind the tuner used in the radio?

Reflective observation stage

Here the students can open up and see the variable capacitor used inside the radio as a variable capacitor. The inductor coil and the variable capacitors used inside the tuner can be seen and when the user tunes the tuner he or she is actually changing the frequency of the circuit used inside the tuner. The students are carefully let to observe the inside arts of the radio.

Active experimentation stage

The students can be given real capacitors that are used in electrical circuits to understand the various types of capacitors. In practical electrical circuits many capacitors are used ranging from capacitors of capacitance of small pico farads to capacitors of capacitance of large farads. They are made to explore the different types and think of why each one has got a separate name like paper capacitor, electrolytic capacitor etc.

Abstract conceptualisation stage

Here the students can be asked to discuss about how charge is distributed on a conductor surface. The students can experiment with a candle flame. Here the students can be asked how the light is spread in the flame and which point of the flame is the hottest point and easy to light another object? Similarly, the conductor can be imagined and now they can be asked to think how electrical charges are distributed on a conductor?

Abstract conceptualisation stage

Here the students can be asked to formulate a definition for electrostatic induction by their own. From the experiments they did and from the experiences they got they can be asked to list out the different types of charge transfer.

ACTIVITY

Activity 1: Charging by friction

Materials required: Plastic scale, Woollen thread roll, bits of paper

Rub constantly the plastic scale with the woollen thread roll. Bring the scale near to the bits of paper. See the paper pieces jumping towards the scale. Not down the observations in the notebook. Why the scale got charged and what was the process that was used to make the scale charged? Instead of woollen thread roll if the scale was rubbed in dry hair what is the observation? Will the paper pieces jump to the scale? What is the reason for the charge accumulation in scale?

Activity 2: Charging by conduction

Materials required: A hot iron box, clothes

Place the hot iron box on the clothes and see whether the clothes get neatly ironed and are free from their folds and shabbiness. How the clothes got neatly ironed? A discussion can be carried out in the class. If the iron box didn't touch the clothes and it was just kept near to the clothes will the clothes get ironed properly? How did the iron box get charged and hot? How the charge transfer is taking place to the clothes that is ironed? Freshly ironed clothes have charges accumulated in it. How do these charges get inside the clothes? A discussion can be held in the class and the students can be asked to note down their observations in their note books.

Activity 3: Charging by induction

Materials required: A paper electroscope, a plastic scale

Rub a plastic scale constantly on dry hair and bring the plastic scale near to the electroscope model. What happens to the paper strips inside the electroscope? Now repeat the same experiment by touching the conducting end of the electroscope by your hands but without removing the plastic scale. Now what happens to the leaves of the electroscope? Now after releasing the hands take the plastic scale away from the conducting end of the electroscope. Observe the leaves in each case and note down the observations.

ACTIVITY

Activity 1: Model of a capacitor

Materials required: Children's moulding clay

From the practical experience of seeing different types of capacitors the students can be asked to model different types of capacitors with the moulding clay which is provided to them. As the capacitors have different names depending upon the materials used inside the capacitor, the moulded capacitors can be given names based on the colour of the moulding clay.

Activity 2: Drawing the model of charge distribution in a conductor

Materials required: Candle, Match stick

Light the candle and see the flame of the candle. How does the flame appear? Observe how many parts are there in a candle flame. How the heat is spread in the candle flame? Which part of the candle is the highest heat producing part? Note down the observations in the note book.

Now compare the same concept with that of a conductor and try to draw the charge distribution on a conductor surface by dotted lines

FEEDBACK

The students were interested in making the models of the capacitor and giving names to the different coloured capacitor models. They understood that there are different types of capacitor based on the material that it is made up of. They also understood that the charge spreads only on the surface of the conductor as in the case of a candle flame. Only the flame is hot and the other parts are not. Also the charges are concentrated mainly on the pointed sharp ends of the conductor. Like in a candle flame the tip of the fame is hotter than the bottom end of the flame near the wick of the candle.

EVALUATION

A capacitor is an arrangement to store electrical charges for a long time. In order to discharge the capacitor, it just needs to be connected to earth. The electric charge spreads only on the surface of the conductor and not inside of it. Thus a hollow metallic sphere and a solid metallic sphere of same radii possess the same charge if given charge under same potential.

What is a capacitor? In which type of surfaces, flat surfaces or pointed end surfaces the charge distribution will be high?

Reflective Observation Stage

They can be asked to note down the peculiarities of the lightning rescue conductor, the material by which it is made up of, the procedure by which it is earthed, the approximate length of the conductor and similar other details. They can thus reflect upon their experiences and can be asked to list down other situations and places where such lightning rescue conductors are used.

Active Experimentation Stage

The potential dangers of lightning can be analysed in this stage. The Moro Rock death can be analysed in this stage. The brothers who went to the national park were struck by lightning from the top of the Moro Rock. When lightning struck the Moro Rock, the hairs of two brothers were stuck upwards as if pulled by something and thus the two brothers got lightning struck. The image of the Moro Roc and the Moro Rock brothers who had accident from the place can be shown in the class and can be asked to find out the reason why the brothers got accident.

Moro Rock, Sequoia National Park, California, United States

Abstract Conceptualisation Stage

The students can be asked to list down the methods by which lightning attack can be prevented. They can be asked to make a poster on the same and can spread awareness among the students of other classes as well. The poster must include the methods that can be adopted by the people to prevent lightning damages and lightning accidents. It must also include about the first aid that can be given to people who got struck by lightning.

ACTIVITY

Activity 1: Listing down the areas where lightning rescue conductors are established in and around their surroundings

The students can be asked to list down the situations and places where the lightning rescue conductors are used commonly in and around their surroundings. They can make a list by discussing with their group members.

Activity 2: Poster on prevention of lightning accidents

The students can be asked to make a poster group wise on the topic of methods and means of preventing lightning accidents on people. How people can rescue themselves from being struck by lightning. They can include the common myths of lightning and the correct explanation of the myth and bursting it.

FEEDBACK

The students listed down the different places where the lightning rescue conductors were used and noted their discussion results in a table. The students also recorded their observations of methods to prevent lightning attacks and created a poster. They tabulated the common myths behind lightning and the exact explanation of the myth was also provided.

PLACES WHERE LIGHNING RESCUE CONDUTORS ARE USED
Schools, Colleges and other institutions
Shopping Malls
Towers
Tall buildings
Flats and apartments
Forest range bungalows
Palaces
Big Temples, Mosques, Churches

Lightning Myth	Fact
Lightning never strikes the same place twice	Lightning strikes same place twice if it a tall, pointed, isolated place or object.
If there is no rain you won't get lighting strike	Lightning strike happens even if there is no rain or overhead clouds
Rubber tyre of vehicle prevent people from getting a lightning strike	It's not the rubber tyre but the hollow metal body of the vehicle that prevent people from lightning inside a vehicle.
A lightning victim should not be touched since the people who touch can also get electrocuted	It's not right, as the human body cannot store electricity and that its perfectly ok to give the victim a first aid
Tall coconut trees and other tall trees are safe to seek shade under lightning or when lightning strikes and you are caught outside, it is safe to lie flat on ground.	No place is actually safe from lightning but it's always safe to avoid tall trees like coconut trees and palm trees. It is always safe to move towards a safe shelter rather than getting fried up by the ground current.
You are 100% safe inside your house during lightning	A house is safe as long as the people inside don't get contacted with electricity like TV, computers etc.

EVALUATION

Lightning strikes happen due to the heavy electric discharge between clouds and ground. This happens due to the static electricity formed in the clouds. During lightning 20-30 coulombs of charge flows through the air. It is very unsafe to be outside during a lightning strike. Appropriate methods must be taken to prevent a lightning attack.

What is thunder and lightning?

How can one prevent oneself from the dangers of thunder and lightning?

EXPERIENTIAL LESSON PLAN 1

Class VIII TOPIC: SOURCES OF SOUND

Learning Outcomes	Students will be able to ▪ understand the sound production process ▪ experience the different types of sounds ▪ classify the sound sources
Time required	2 hours

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Differences between various types of musical instruments used in daily lives. 2. Differences in the nature of sound between a natural sound and a man made sound.
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. Visit different places like, a waterfall, a mountain, a river to experience the beauty of natural sounds 3. Inform the Head Master prior to the field visit 4. Ensure to take the reflection of students after the visit
Resources required	Paper, Pens, Tuning forks

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be asked to observe their own experiences with different types of sounds. They can be asked to make some small paper toys or coconut leaf whistle which they are familiar as a common sound toy 2. Students can be asked to sing songs they like and share their wonderful experiences on hearing that song for the first time 3. The above ideas can be followed by a 'what if' discussion phase where the students are asked what if there was no sound, what if they and hear and enjoy the beautiful experience of hearing.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be taken to a nearby place or locality where a waterfall, a river is present and they can enjoy the sounds of birds, sounds of flowing river, sound of wind and thus can appreciate the beauty of this nature. The students are divided into groups of 5-7 for reflecting upon their field trip A detailed finding of the different kinds of sounds that they observed during their field trip can be listed down in a tabular column and give suitable heading after classifying the sounds to a common name. Man made sounds (Artificial Sounds) / Natural Sounds Vehicle sounds / Sounds of birds, animals Sounds of musical instruments / Sound of natural resources like, wind, water, fire etc.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners are then further motivated to arrive at the factors that are essentially needed for sound production. 3. All the groups will present their findings for the earning of the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator helps them to understand how the sound is produced and what are the essential factors that are need for the sound production ,viz; sound source, medium and a receiver The students are also shown various musical songs showing the natural and man-made sound sources.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on sound. How do musical instruments can be made to generate the natural sounds that are so peaceful and calming? How to set up a natural peaceful atmosphere with calming natural sounds to appreciate the beauty of nature and to preserve natural resources
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Developing a role play of natural sound sources and man-made sound sources 2. A visit to the nearby radio station to understand the sound production.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to produce sound from a tuning fork by striking the prongs of the tuning fork on to a rubber head. Bring the tuning fork near to a glass filled with water and the students can make a note of their observations in their notebook and discuss in the class. Pluck cards can be prepared on the factors that are essentially needed for the sound production.

EXPERIENTIAL LESSON PLAN 2

Class VIII TOPIC: NATURAL FREQUENCY

Learning Outcomes	Students will be able to ▪ experiment and find out the natural frequency of oscillating or vibrating bodies ▪ experience the difference between types of swings used for fun and entertainment ▪ list out the characteristics of sound that depends upon the natural frequency of each sound source
Time required	3 hrs

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Various types of rocking cradles and swings. 2. The differences in a high pitched song and low pitched song. 3. Loudness of a cracker burst and difference between that with a secret which is told in the ear of another person.
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. Ensure that no accidents happen during the making of swing on trees 3. Inform the Head Master prior to the field visit 4. Ensure to take the reflection of students after the visit
Resources required	Audio tapes, audio player, ropes, wooden planks

B. Implementation of the lesson plan- Stage 1: Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be asked to tell their own experiences in swinging in different types of swings, longer swings, shorter cradles, big pendulum swings in parks, beach swings etc. 2. Students can be shown different type of pendulum clocks, those displayed in museums and those which are still used in homes. 3. The above ideas can be followed by a discussion phase where the students are asked about their experiences in swinging. Did they experience dizziness, fatigue, or did they enjoy the swinging.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be taken to observe a pendulum clock. They can be asked to write about the features of the pendulum clock they see. They can be asked to note down the length of the pendulum clock and the number of oscillations that the pendulum clock make in a minute. They can also be taken to a pendulum swing in parks. The giant pendulum swing. They can observe the speed, length, movement and all other characteristics of that swing and note their observations in their notes. The students are also shown the video of a humming bird flapping her wings and flying near flowers. They are also made to observe a carpenter cutting wood with large saw blades and the vibration of the saw blades once the cutting is over. The students are divided into groups of 5-7 for reflecting upon their observations A detailed finding of the pendulum clock and the pendulum swing can be made Pendulum clock / Pendulum swing 40 cms / Varying size, but giant size Made up of a metal and makes 60 oscillations in a minute. / Made of heavy metal and can support the weight of a maximum of 100 people Makes a tik-tik sound / Makes a loud sound when moved very fast
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners are then further motivated to arrive at the factors contributing towards sound in oscillations. 3. The students are also encouraged to list out the differences in high pitched and low pitched music and to record the sound characteristics in both. 4. All the groups will present their findings for the earning of the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator helps them to understand how the oscillations are happening and the difference between an oscillation ad a vibration
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on sound. How sounds are produced from vibrations and no sound in the case of slower oscillations. The students are made to experiment with different length simple pendulums.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Dancing light experiment to study the vibrations and the sound production 2. Listing out the characteristics of sound by experimenting the sound production in wind bells and percussion instruments.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to construct a drum set using different radii steel tumblers or different radii PVC pipes and suitable diaphragms made out stretched balloons.

They can be asked to make a xylophone using different length glass tubes from science labs. They must be cautioned t experiment safely with the glass tubes as it can easily cut the hands and legs and can cause accidents.

They can study the characteristics of the sound through this.

EXPERIENTIAL LESSON PLAN 3

Class VIII TOPIC: CALCULATION OF FREQUENCY

Learning Outcomes	Students will be able to ▪ calculate the frequency 'f' of different oscillating objects ▪ understand the unit of frequency
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. What is natural frequency 2. How does it differ for an oscillating body and a vibrating body
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure there happens no accidents while experimenting with sharp objects 3. ensure to take the reflection of students after the experiments
Resources required	Meter scale, Stop clock, paper, pencils, simple pendulum model

B. Implementation of the lesson plan- Stage 1: Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can model different length simple pendulums 2. They can play a game using the simple pendulum that they have made by making the maximum number of oscillations in the simple pendulum in 10 seconds. The group who swings the pendulum maximum in a second wins he game. 3. The above ideas can be followed by an explanation phase where a member from each group tells the number of oscillations in ten seconds that they had made using their simple pendulum.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be made to observe a demonstration in which the instructor shows the simple pendulum experiment ad calculates the frequency of that. They can be asked to note down the frequency of their own simple pendulum made by their groups by observing the demonstration. They can also be shown the vibrating tuning forks of varying frequencies. Students can be given different tuning forks one in each group and can be asked to note down their frequencies they got and see which group could hear the highest sound from the tuning forks. The students are also asked to make a hacksaw blade vibrate by fixing it on a table. They can be asked to calculate the frequency f the vibrating hacksaw blade. The students are divided into groups of 5-7 for reflecting upon their observations A detailed finding of the frequencies of the simple pendulum and the hacksaw blade can be made Simple pendulum / Hacksaw blade Length = 40 cms / Length = 40 cms Number of oscillations made in 10 seconds n = 15 / Number of oscillations made in 10 seconds n = 30 Frequency f= n/t= 15/10=1.5 Hz / Frequency f= n/t= 30/10=3 Hz
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners are then further asked to arrive at the calculation of frequency f simple pendulum having different lengths. 3. The students can note down the dependence of frequency with the length of the simple pendulum. 4. All the groups are asked to present their inferences to the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator helps them to understand how the calculation of frequencies can be determined.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/ situations/ processes/systems to make the learning meaningful?)	The students will reflect upon their observations on frequency. How shorter swings move faster than a longer swing is reflected upon.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Finding out the frequency of a sitar or veena or any other string instrument by striking its string.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to construct any string instrument that can produce sounds. They can be asked to experiment with different lengths of the instrument.

They can be asked to make a pan flute that can produce different sounds from its different lengths while blowing through each pipe or straw

They can study the characteristics of the sound through this.

EXPERIENTIAL LESSON PLAN 4

Class VIII TOPIC: FACTORS AFFECTING NATURAL FREQUENCY

Learning Outcomes	Students will be able to ▪ Understand why there is difference in sounds from different sources ▪ Differentiate different sources according to the characteristics of sound
Time required	3 hrs

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Different types of musical instruments that they know 2. Shape and the vibrating part of the musical instruments while they produce sound
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure there happens no accidents while experimenting with sharp objects 3. ensure to take the reflection of students after the experiments
Resources required	Meter scale, Stop clock, paper, pencils, simple pendulum model

B. Implementation of the lesson plan- Stage 1: Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be given a wind bell and can be asked to observe the sound produced by the wind bell. 2. They can be asked to write down the differences in sounds observed from the different lengths of the wind bell. They can discuss with their group members. 3. The above ideas can be followed by an explanation phase where a member from each group tells the inferences that they have noted in their group.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be asked to make an '*Ektara*' a common string instrument that can be easily made using locally available materials such as coconut shells, bamboo sticks and strings. They can also be motivated to model plastic PVC pipe drums. The pipes selected must be of different diameters. The PVC pipe drums can be made using a stretched balloons and rubber bands. It can be played using a stick or a poliniter. The students can be asked to make a pan flute using sketch pens and cellophane tapes. The sketch pens used in the pan flue must be of different lengths. They can be made to observe the differences in sound produced from a wooden block and a steel tumbler when both of them are struck using a steel spoon. The students are divided into groups of 5-7 for reflecting upon their observations A detailed findings of their observations can be listed in a table Factors that depend on natural frequencies of sound sources Length Tension Surface area Nature of the material with which the sound source is made up of
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners can model different sound sources and check if there is any other factor that depends up the natural frequency of the sound source. 3. The students can note down the dependence of the different factors and the difference in sounds they make because of that. 4. All the groups are asked to present their inferences to the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The observations are discussed in the entire class where the facilitator helps them to conclude the different factors which contribute towards their natural frequencies with which they vibrate.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/ situations/ processes/systems to make the learning meaningful?)	The students will reflect upon their observations on frequency of different sound sources. How the different sound sources help in the making of beautiful musical concerts like *'Jugalbandis'*
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Formation of a musical band in class and trying to conduct a musical concert in the school stage.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to construct a *'Jal tarang* using water and glass bowls and stage a musical programme in the class.

They can be asked to make a xylophone using glass pipes of different lengths arranged in a wooden frame.

They can study the dependence of natural frequency through these activities.

EXPERIENTIAL LESSON PLAN 5

Class VIII TOPIC: SOUND PROPAGATION

Learning Outcomes	Students will be able to ▪ How does sound travel ▪ Understand about sound reflection
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Why do they hear the sound of the school bell ringing after each class hour? 2. Why do they hear their own sounds back while standing in certain places like in bathrooms, empty rooms, hill tops, wells?
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure there happens no accidents while travelling to hill tops and near to wells 3. ensure the permission to take the children outside is taken from the school head master 4. ensure to take the reflection of students after the experiments
Resources required	Paper cups, threads, mason pipe, balloon, bottle cap

B. Implementation of the lesson plan- Stage 1: Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be asked to cup their ears using their hands and sense whether they can hear any sound resonating in their ears. They can find out what is the reason for the sound that keeps resonating inside their ear column and note down in their note books. 2. They can also be asked to cup their mouths with one hand and then try to sing a song and observe the sound difference in the cupped ear. Do they feel any vibrations? What is the reason for the vibrations in their ear column? What is that which vibrate inside the ear?
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be taken to a special school nearby which is especially for deaf and dumb children. They can form groups and communicate with the children of the school using their hand actions and mouth movements. Students can be shown a chart on the process of hearing and they can be asked to draw the human ear model in A4 papers and label the different parts inside the ear that help in the process of hearing. Students can be shown the different types of hearing aids that deaf people and partially deaf people uses to experience the sense of hearing. They can then note down the parts a hearing aid has and they can make a flow diagram including the parts of a hearing aid. The students are divided into groups of 5-7 for reflecting upon their observations A detailed findings of their observations can be listed in a table

PARTS OF HUMAN EAR	
Ear pinna, Auricle	External ear
Auditory canal	
Ear drum	Middle ear
The three anvil shaped parts inside ear; stapes, incus and malleus	
Cochlea	
Eustachian tube	Inner ear
Auditory nerve	

PARTS OF A HEARING AID
Microphone
Amplifier
Loudspeaker

Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can draw their own models of human ear and can colour using colour pencils and then label the different parts of it. 2. The learners can appreciate the sense of hearing and can understand what all are the practical difficulties that deaf people face. They can develop compassion towards those differently abled people and can help them make aware of the different possibilities with which they can experience the wonder world of sound. 3. The students can label the different parts in a hearing aid and can draw a flow diagram of the same. 4. All the groups are asked to present their inferences to the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The observations are discussed in the entire class where the facilitator concludes the process of hearing that takes place inside a human ear. Different types of hearing aids are also discussed in the class
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/ situations/ processes/systems to make the learning meaningful?)	The students will reflect upon their experiences of visiting the special school and spending their time with those students, understanding their practical difficulties of being deaf and dumb. They can understand that the first step towards learning anything is just listening and thus the sense of hearing has a very important role to play in our lives.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. A visit to a speech therapist and asking the therapist about the process f therapy in hearing disabled people. How they can learn a language?

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to enact a mime where they can stage the importance of hearing and the joy of hearing.

EXPERIENTIAL LESSON PLAN 7

Class VIII

TOPIC: LIMITS OF AUDIBILITY

Learning Outcomes	Students will be able to ▪ List the range of sounds ▪ Differentiate between audible and not audible sounds
Time required	4 hrs

	Frequency range	Name of the limit	Organisms that can hear the sound in this range
	Below 20 Hz	Infrasonic waves	Earthquake tremors- Doves
	20 Hz to 20000Hz	Human audible	Human beings and all other organisms
	Above 20000 Hz	Ultrasonic waves	SONAR, scanning machines- Pests, Rodents, Bats
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1 The learners can tabulate the different frequency ranges of sound 2 The learners can classify different types of sounds as human audible and not audible to humans 3 The students can record the works of a disaster management group and what all are the measures taken by the tea to predict the occurrence of an natural calamity or a disaster nearby 4 They can write down their own effective measures to design certain devices that can be used to catch the infrasonic waves produced during earthquakes. 5 All the groups are asked to present their inferences to the whole class		

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The observations are discussed in the entire class where the facilitator concludes the limits of audibility and explains the frequency ranges of human audible and not audible sounds using the limits of audibility chart
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/ situations/ processes/systems to make the learning meaningful?)	The students will reflect upon their experiences of natural calamities like earthquakes, landslides and tsunami if they have experienced it practically.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. An interview with a person who has witnessed any natural calamity like an earthquake, tsunami or a landslide and his/her observations on the same. How the nature of the surroundings changed? How the animals and bird behaviour changed? Did he observe all those?

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to direct a role play group wise stating the characteristics of each sound frequency range and the uses of each of them

EXPERIENTIAL LESSON PLAN 8

Class VIII

TOPIC: SOUND POLLUTION

Learning Outcomes	Students will be able to ▪ List out the factors causing sound pollution ▪ Suggest the remedial measures for reducing sound pollution
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. A note on festivals and celebrations where a lot of musical instruments are played together at a time especially for religious festivals like temples/churches/mosques/synagogues festivals 2. The health condition of them after such a visit to a heavily crowded and a noisy place like festival gatherings in religious places like temples/mosques/churches/synagogues etc.
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to take prior permission from the school head master before taking the students for any visit outside the school. 3. ensure to take the reflection of students after the experiments
Resources required	Video tapes on religious festivals and crowd in such festival gatherings.

B. Implementation of the lesson plan- Stage 1: Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be shown some different video tapes of festivals gatherings in religious places like temples/churches/mosques/synagogues etc. They can be asked to make a note on the different sounds that is coming from such festival gatherings.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be asked to make a poster on sound pollution. They can make this as a group activity an each group can create the best poster on sound pollution. Students can be asked to prepare notices on reducing sound pollution. They can circulate the notices in school so that the students will be aware of sound pollution. The students are divided into groups of 5-7 for reflecting upon their observations The detailed findings of their observations can be displayed on a chart and discussed in the whole class.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can classify the different factors contributing towards sound pollution. 2. The learners can suggest remedial measures in reducing sound pollution 3. The students can prepare notices and circulate i the whole school to create awareness on sound pollution 4. They can list down the various ill effects in the living beings because of sound pollution 5. All the groups are asked to present their inferences to the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The observations are discussed in the entire class where the facilitator concludes about sound pollution and suggest methods to reduce the same and the basis of healthy and peaceful environment.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/ situations/ processes/systems to make the learning meaningful?)	The students will reflect upon their experiences of attending in noisy festival gatherings and their health and physical condition after returning from there.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. The formation of a sound silent club that promotes healthy environments and avoids the use of loudspeakers and other sound enhancement devices to reduce sound pollution in their school

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to direct a drama group wise stating the sound pollution as its theme and the ill effects of sound pollution in living beings. The drama can be staged and played in front of the whole school.

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The observations are discussed in the entire class where the facilitator helps them to explain why they hear their own sounds back while standing in certain locations like hilltops. How does sound travel from one place to other.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/ situations/ processes/systems to make the learning meaningful?)	The students will reflect upon their experiences of sound propagation and sound reflection. When they had experienced echo and how do they hear the sound of an approaching and receding train in a railway station.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. A field trip to the nearby hill area or a well located inside or outside the school from where they can experience the echo of sound clearly.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to experiment with a conch shell. They can be asked why the conch shell produces an ocean sound whenever it is brought near to ears.

EXPERIENTIAL LESSON PLAN 6

Class VIII

TOPIC: HEARING AND SENSE OF HEARING

Learning Outcomes	Students will be able to ▪ Appreciate the sense of hearing ▪ Draw the model of human ear
Time required	4 hrs

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. How do they hear? 2. A note on external human ear and the process of hearing in human ear
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to visit a deaf and dumb school nearby and see how the children are communicating with each other 3. ensure to take the reflection of students after the experiments 4. to get permission from the school H.M prior to any visit outside the school
Resources required	Paper, colour pencils, chart on a hearing aid

A. Setting the stage for learning

Check for prior knowledge (How do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. A note on landslides, tsunami and earthquake tremors. 2. The behaviour of animal and birds during any natural calamity like earthquake or tsunami if they have observed.
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. ensure to take the reflection of students after the experiments
Resources required	Video tapes on tsunami disaster, earthquakes and landslides, galton whistle, lizard control ultrasonic pest repeller

B. Implementation of the lesson plan- Stage 1: Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be asked about earthquake and landslides. How do tsunami waves occur? Do all these have sounds that are audible to humans? The can be shown the video tapes of different earthquakes, landslides and tsunami that has been recorded by different medias and press people. They can be shown the behaviour of animals and birds prior to these natural calamities. 2. They can also be shown the functioning of SONAR waves inside seas for search of submarines and ships. They can be shown the functioning of ultrasound scanning machine that uses the ultrasound waves to take images of internal organs in human body.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be taken to a place where dogs are trained. They can be shown the galton whistle that is used by the dog trainers to train dogs. The sound of the galton whistle is not audible to humans while it is audible to the dogs and cats.
	Students can be shown an ultrasound pest repellent that can b used in houses to shoo away lizards and rodents. The high pitched voice disturbs those pests while it remains inaudible to humans. Students can then be shown the limits of audibility chart to differentiate between the different ranges of sounds. They can be asked to note the human audible sound. They can also note what type of sound waves are produced during the natural calamities and thus what is the actual reason of unusual behaviour of animals and birds during the natural calamities like earthquakes, landslides and tsunami. The students are divided into groups of 5-7 for reflecting upon their observations A detailed findings of their observations can be listed in a table

EXPERIENTIAL LESSON PLAN 9

Class VIII

TOPIC: ELECTRICAL CHARGES

Learning Outcomes	Students will be able to ▪ Differentiate between positive and negative charges ▪ Identify how many charges exist ▪ Differentiate between attraction and repulsion
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Different types of energies around us 2. Importance of electrical energy in human lives
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. ensure to take the reflection of students after the activities
Resources required	Magnets, paper, woollen threads, balloon, plastic scale

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be given two magnets and they can be asked about attraction and repulsion in these two magnets 2. Students can be asked to identify the north and south poles in the given magnets. 3. Students can be asked about their experiences in getting an attraction of their body hairs to a freshly ironed polyester shirt after wearing it just after the iron. Also sometimes they might have experienced static shocks by catching door handles or windows. 4. The above ideas can be followed by a 'what if' discussion phase where the students are asked to write what if there happens to be no attraction or repulsion. 5. Students can be given a discussion about gravitational attraction where they can be told the story of Isaac Newton who put forward the theory of gravitation and about his discovery.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be given a message passing game where the students pass message by holding their hands in chains. They press the neighbour's hands and pass he message from the sender to the receiver by pressing each other's hands. The catcher outside who is trying to spot the pressing of hands of his group members is electron and all those students in the circle are protons and neutrons. When the catcher sees anyone pressing the hands then that member is out and becomes the next catcher. All the catchers outside are electrons while the group members inside are protons and neutrons. Students can be asked to run a 100 meter race where the students who are participating in the race run in specific tracks which are drawn on the ground. This can be equated to the concept of electron who orbit in their special tracks called as orbits. The electron number is unique to each atom. They can also equate the concept with the 4*100 m relay athletic race where 4 students stand in a special track and exchange their batons. Similarly there are a fixed number of electrons that can be placed in an orbit. The number of protons and number of electrons determine the unique atomic number of each atom. The number of protons equals the number of electrons in an atom. The number with which electrons can be filled is according to a specific rule. Electron transfer is the process by which atoms become charged and acquire static charges. Students can be given different sized bangles and beads where the beads can be modelled as electrons and the bangles as orbits. Different particles inside the atom are modelled using different coloured beads in order to differentiate between positive, negative and charge less.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners are then further motivated to arrive at the points or situations where attraction and repulsion happens between two bodies. 3. All the groups will present their findings for the earning of the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator explains to them how an atom model can be drawn neatly and what all are the steps that should be taken to draw an atom model.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on different kinds of atoms and then try to draw the atom model of those atoms that are familiar to them.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Trying to draw the model of the Chlorine atom that are very much familiar to all.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a chart group wise displaying the atom model of all the atoms whose atomic number is lesser than 20.

EXPERIENTIAL LESSON PLAN 12

Class VIII

TOPIC: ELECTROSCOPE

Learning Outcomes	Students will be able to ▪ Represent the model of electroscope ▪ Construct a model of an electroscope ▪ Experiment with electroscope
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. The properties of electric charges 2. How static charges are formed
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure that there happens no accidents while performing experiments with static electricity 3. ensure to take the reflection of students after the visit
Resources required	Paper, plastic transparent bottle, resistance wires

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be asked to come up with situations where they have experienced electric shocks. They can be asked about the situations where they had got electric shock without the connection with actual

Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be given a plastic scale, a woollen thread roll and they can be asked to rub the scale in the woollen roll and see whether it can attract small paper pieces. Students can be asked to rub an inflated balloon by woollen stockings and then bring it near to their hair. They are asked to note down their observations I their notebooks. What happens to their hair? How does the balloon pull their hair? Students can be given a flannel cloth and two balloons. They are asked to rub the flannel between the balloons after tying them to a rod. Te balloons should touch with each other and the flannel should be brought in between the balloons. They are asked to note down their observations. After this they can rub the flannel to one of the balloons and observe the difference what happens to the balloons They can be asked to write down their experiences from both of the activities and find out the reason behind the phenomenon they had observed. They can also be asked to make a definition for the phenomenon based on their experiences The can tabulate their findings as given below: PAIR OF BODIES THAT ATTRACTS EACH OTHER 1. Paper bits and plastic scale 2. Balloon and hair 3. Oppositely charged balloons PAIR OF BODIES THAT REPELS EACH OTHER 1. Like charged balloons They can record when does the balloons attract each other and when do they repel each other. They can note the difference in both of the situations.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners are then further motivated to arrive at the points or situations where attraction and repulsion happens between two bodies. 3. All the groups will present their findings for the earning of the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator helps them to understand how they experience static shocks on touching door knobs or when wearing freshly ironed polyester shirts. The definition of static electricity and the daily applicability of the am is discussed in the

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be given the solid wooden cubes, liquid water and the agarbathis and make them tell which one can be easily felt, easily sensed and easily moved. 2. Students can be made to write about the characteristics of each of the form of matter solid, liquid and gas. 3. Students can be made to tell their experiences about postman game that they play using towels and dropping the towels at the back of the students who sits in a circle. The catcher drops the towel at the back and then they run behind the catcher. 4. The atom model is similar to the postman game where all the particles are concentrated in the circular shaped atom. Those that run outside are labelled as electrons and those that are inside are protons and neutrons.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be given a message passing game where the students pass message by holding their hands in chains. They press the neighbour's hands and pass he message from the sender to the receiver by pressing each other's hands. The catcher outside who is trying to spot the pressing of hands of his group members is electron and all those students in the circle are protons and neutrons. When the catcher sees anyone pressing the hands then that member is out and becomes the next catcher. All the catchers outside are electrons while the group members inside are protons and neutrons. Students can be asked to run a 100 meter race where the students who are participating in the race run in specific tracks which are drawn on the ground. This can be equated to the concept of electron who orbit in their special tracks called as orbits. The electron number is unique to each atom. They can also equate the concept with the 4*100 m relay athletic race where 4 students stand in a special track and exchange their batons. Similarly there are a fixed number of electrons that can be placed in an orbit. The number of protons and number of electrons determine the unique atomic number of each atom. The number of protons equals the number of electrons in an atom. The number with which electrons can be filled is according to a specific rule. Electron transfer is the process by which atoms become charged and acquire static charges. Students can be given different sized bangles and beads where the beads can be modelled as electrons and the bangles as orbits. Different particles inside the atom are modelled using different coloured beads in order to differentiate between positive, negative and charge less.

	They can tabulate their findings as given below: PARTICLES INSIDE ATOM 4. Protons 5. Electrons 6. Neutrons CHARGES OF PARTICLES INSIDE ATOM 2. Proton- Positive 3. Electron-Negative 4. Neutron-Charge less
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. The learners are then further motivated to arrive at the theories that electrons, protons and neutrons are having different types of charges viz; negative, positive and charge less 3. All the groups will present their findings for the earning of the whole class

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator helps them to understand how many particles are present inside an atom and what all are their charges.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on message passing games and the similarity of the game in the structure of atom. They understand the different types of charges are the reason for the observance of static shocks.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Trying to draw the model of the structure of atom in charts and displaying in the class.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a chart group wise displaying the properties of electrons, protons and neutrons.

The students can be asked to prepare the modern periodic table and draw a model of the same on a chart and display it in the class. The atomic number is displayed in the top left of each atom and the atomic mass at the bottom right like $^{A.N}X_{A.M.}$

X being the atom;

A.N being the Atomic Number

A.M being the Atomic Mass of each atom

These are unique to each atom.

	alternating current which is supplied in houses, offices, schools, industries etc.... how is electrical shock experienced without an alternating current. 2. This can be followed by a discussion ad each group discusses about the same and present their ideas to the whole class.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be asked to prepare a model of electroscope with the help of locally available materials like plastic bottle, paper and resistance wires. Students can be asked to replace the paper leaves of the electroscope with aluminium foil leaves and repeat the experiment. Students can be asked to experiment with the electroscope they have made and can be asked what all are the methods by which the charges acquired by the leaves of the electroscope can be neutralised or discharged. Students can be taken to the science laboratory inside their school to see the gold leaf electroscope in the laboratory and record their observations after experimenting with it. They can rub a plastic scale on their dry hair and see whether the leaves get or they acquire charges or not. The students from each group can be asked to come and draw the model on the black board. They can note down their findings in their notebooks.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. All the groups are asked o construct a model of a paper electroscope which they are asked to display to the whole class and demonstrate a experiment with it. 3. All the groups will present their findings for the learning of the whole class.

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator explains that the presence of static charges can be felt with the help of an electroscope and that there are different kinds of electroscopes available.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on different kinds of electric shocks. Static electric shocks and the alternating current shocks. They can tell the experiences to the whole class.

	class. They are also familiarised with the different types of charges and the process of attraction and repulsion between two bodies.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on static electricity. More practical examples and situations of static electricity applications are discussed in the class. The presence of static charges is experienced by the students through simple activities.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Developing a static electricity powered games like static electricity fan, balloon sticking on walls without glue or any adhesives 2. Arranging a still model of some common pair of bodies through which static electricity can be easily comprehended

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a list of objects or bodies that acquire positive charges and those that acquire negative charges on rubbing them with each other. The list can be displayed in the class after discussion.

EXPERIENTIAL LESSON PLAN 10

Class VIII TOPIC: ATOM MODEL

Learning Outcomes	Students will be able to ▪ Represent an atom ▪ Classify the particles inside an atom ▪ Number the particles inside an atom
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. states of matter 2. examples for different states of matter
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure that no accidents happen during the activities 3. ensure to take the reflection of students after the visit
Resources required	Solid wooden cubes, liquid water, agarbathis

EXPERIENTIAL LESSON PLAN 11

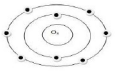
Class VIII TOPIC: DRAWING THE ATOM MODEL OFOXYGEN ATOM

Learning Outcomes	Students will be able to ▪ Represent the oxygen atom ▪ Draw the electrons of Oxygen atom in orbits
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. The electron filling rule 2. Atomic number of oxygen atom
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. ensure to take the reflection of students after the visit
Resources required	Paper, pencil

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be given an example of hydrogen atom having 1 electron 2. Students can be shown how to represent a hydrogen atom having 1 atomic number and 1 atomic mass 3. Students can be given the example of helium atom having two electrons. 4. Students can also be given a model of any other atom having an atomic number below 10, how to represent its atomic number, atomic mass and draw its atom model.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be asked to draw the atom model of Oxygen atom. They can attempt to draw the atom model in their groups. They can discuss and draw the model. The students from each group can be asked to come and draw the model on the black board. They can tabulate their findings as given below: OXYGEN ATOM 7. Atomic Number=8 8. Atomic Mass=16 9. Number of protons=number of electrons=8 
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. All the groups will present their findings for the learning of the whole class

Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Trying to construct a still model of an electroscope using plastic bottle and experimenting with static charges

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a comparison between static electric shock and current electricity shock due to alternating currents. They can supplement using practical examples for each of them.

EXPERIENTIAL LESSON PLAN 13

Class VIII

TOPIC: ELECTRIC SHOCK AND EARTHING

Learning Outcomes	Students will be able to ▪ Represent the symbol of earth ▪ Understand the methods by which electric shock can be avoided ▪ How earthing is done
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. The types of electric shocks 2. The electric connections in houses, schools and public places
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure that there happens no accidents while recording observations from electric boards and supply wires 3. to take the permission of school head master to take the children for school surrounding observations and outdoor visits 4. ensure to take the reflection of students after the visit
Resources required	Field visit, meter board observations, video tapes

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be told about electric short circuits and damage of electrical equipments and fire accidents. They can be own a video recording of an electric short circuit happened in their city or town or in neighbouring states. 2. This can be followed by a discussion and each group discusses about the electric shock incidents that they have experienced and present their ideas to the whole class. 3. They can also be asked to write down some ideas that come into their mind regarding the avoidance of electric shocks.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be taken for a field trip to examine the earth pits dug in their school and record their observations on the earth pits like how many earth pits are there, how much deep are the earth pits in their school. Students can be asked to model the electroscope and can be asked to see whether the charges acquired by the leaves in the electroscope can be earthed. What methods can be adopted to earth the leaves of the electroscope? Students can be asked to symbolise the earth connection suitably. Students can model the earth symbol using twigs or rods and can display it on a chart. Students can be asked to open the metre box where the electric supply is given and identify the wires present in the box, the colour of the wires, the number of the wires etc. The students from each group can be asked to come and draw the model on the black board. They can note down their findings in their notebooks. They can note down the uses of earth connection and record their observation in heir notebooks.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. All the groups will present their findings for the learning of the whole class.

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator explains and concludes on the importance of earth connection and the avoidance of electric shocks. What all are the methods that can be adopted for the avoidance of electric shocks.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on earth pits. They can tell their experiences of the damages that they have seen because of electric short circuits and improper earthing connections in buildings
Extended learning	1. Trying to calculate the number of earth pits that

(How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	are needed for a building which is functioning with 10 tube lights 10 fans and 10 power plugs.

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a survey on comparison between buildings that have proper eathing and those buildings that are not having proper earthing connections. They can tabulate the differences and present their research findings to the whole class.

EXPERIENTIAL LESSON PLAN 14

Class VIII

TOPIC: CHARGE TRANSFER

Learning Outcomes	Students will be able to • Demonstrate the different types of charge transfer • Predict the factors that can affect the charge transfer • Differentiate objects based on their method of charge transfer
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Their knowledge on charge carriers 2. Difference between a conductor and an insulator
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure that there happens no accidents while handling electrical appliances 3. ensure to take the reflection of students after the activities
Resources required	Plastic scale, paper pieces, woollen thread roll, clothes, iron box, paper electroscope

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be told about a common situation in villages. One of the main and very common electric accidents happening n villages is through conduction or direct contact with the electric supply line overhead. People try to pluck fruits wit long iron rod and accidentally touch the electric supply cable and gets a massive electric shock. 2. They can also be shown the pictures of birds getting electric shock from the supply lines above leading to their death. But some birds can sit easily in one single line. Whenever the two cables are shorted by these birds they get an electric shock and they die. 3. They can also be taken to a field where electric fencing is done in order to prevent the stray animals getting into the field and damaging the crops.

Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be given a plastic scale and they can be asked to rub the plastic scale to a woollen thread and see whether it attracts small paper pieces or not. Why this happens? The students can be asked to do the activity and record their observations. Students can then be given some clothes and a hot iron box. They can be asked about how the clothes get properly ironed even though cotton clothes are insulators. What is the method that they have adopted to iron the clothes properly? How ironing the clothes make the clothes neat and stiff. Students can be asked to experiment with a paper electroscope and see what happens if a charged plastic scale is brought near to the conducting end of the electroscope. What happens if the conducting end is touched by keeping the plastic scale at the same place itself? What if the conducting end is removed? Note the paper leaves of the electroscope each time. The students in each group can record their observations and tell their observations to the whole class.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. All the groups will present their findings for the learning of the whole class.

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The records and the observations are discussed in the entire class where the facilitator explains and concludes the different types of charge transfer in materials and they can be differentiated by the process of charge transfer.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on charge transfer. They can consider different methods and knowing the method of charge transfer in the bodies, classify the nature of the material.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Trying to find out what kind of transfer is taking place in current electricity. How the electricity is transferred to different places like houses and institutions? What is the method of transfer?

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a comparison chart on the different kinds of charge transfer methods and display the chart in the class.

EXPERIENTIAL LESSON PLAN 15

Class VIII

TOPIC: CAPACITORS AND CHARGE DISTRIBUTION IN CONDUCTORS

Learning Outcomes	Students will be able to • Understand the concept of conservation of electrical energy • Model a capacitor • Identify a capacitor • Differentiate between different types capacitors
Time required	2 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. Their knowledge on charge carriers 2. Difference between a conductor and an insulator
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure that there happens no accidents while handling electrical appliances 3. to ensure that the play dough for modelling the capacitors is used only for modelling purposes and not for any other purposes. 4. ensure to take the reflection of students after the activities
Resources required	An old radio, play dough, different types of capacitors

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be given small electrical toys and they can be instructed to see the operation of the toys and ten carefully dismantle the parts of the toys to identify the electrical connections inside the toys. How they are moved, how sound is coming from the toys etc are carefully studied by the students. They are asked to examine the parts and then mend it back to the original form. 2. They can make a note of the parts that are known to them and later that can be discussed in the class.

Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be given an old radio and the can be asked to carefully observe the radio and how the radio is working. How channels can be changed in a radio? They are asked and instructed by the facilitator to carefully open the radio and identify the electrical parts inside the radio. Students can then be given some different kinds of capacitors that are practically used in all electrical circuits. They are asked to note down the names, the external appearance of each capacitor given to them. Students can also be given play dough to model different kinds of capacitors. They can name the capacitors accordingly as in the prior activity. Students can be given a candle and they can be asked to light the candle and identify the hottest part in the candle flame. The same concept can be used in finding out the maximum intensity of electric charge concentration in conductors. The students in each group can record their observations and tell their observations to the whole class.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. All the groups will present their findings for the learning of the whole class.

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The facilitator can conclude that electric charges can be stored in a device which is called as capacitor. Capacitors can charge as well as discharge the electric charges in them through the process of charging and earthing. The facilitator also concludes that a conductor has maximum charge intensity at its sharp pointed ends rather than other flat surfaces. Then a charge distribution of different shape conductors can be displayed in the class.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on changing channels in a radio. The selector in the radio helps to switch channels in different frequencies. Variable capacitors in the selector help in doing this
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	Trying to find out what kind of a capacitor is used in television. Or does the television use capacitors or any other device inside them to select channels.

Assessment (How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to make a comparison chart on the different kinds of charge transfer methods and display the chart in the class.

The students can also be asked to draw different shaped conductors and the charge distribution pattern on them

EXPERIENTIAL LESSON PLAN 16

Class VIII TOPIC: THUNDER AND LIGHTNING

Learning Outcomes	Students will be able to • Identify the reason behind thunder and lightning • Practice the necessary safety measures for preventing the dangers caused by thunder and lightning • Suggest methods that can be adopted to reduce the ill effects of thunder and lightning. • Reason the lightning associated myths spread in the society and explain the facts behind them
Time required	3 hrs

A. Setting the stage for learning

Check for prior knowledge (how do you check what learners already know?)	Class will be divided into groups of 5-6 students. Learners will be asked to discuss and write: 1. About rain damages 2. About accidents caused during rain
Pre Activity Phase	The activity shall be age appropriate. Teacher will have 1. to check the applicability of the activity 2. to ensure that there happens no accidents during the outdoor visits 3. to ensure that the school head master has given permission to take the children outside for studying about preventive measures to reduce the ill effects of thunder and lightning 4. ensure to take the reflection of students after the activities
Resources required	Field visit

B. Implementation of the lesson plan- Stage 1 Preliminary phase

Sparking curiosity (How the lesson will be introduced to create interest and stimulate curiosity of the learners?)	1. Students can be taken to any tall building, tower or a matchstick factory outside where they can see the lightning rescue conductor. The students can observe it and can ask about it to the authorities of the building. 2. They can note the points that are told to them by the authorities and can later discuss the same in the class.
Providing the experience (What experiential learning strategies will be used to achieve the lesson objectives?)	Students can be taken to the top of the school building and they can inspect the lightning rescue conductor that is installed on the top building in the school. They are asked to make a note on where the lightning rescue conductor is installed, what is the shape and how the connections are given. Students can then be show the famous picture of Moro Rock brothers who were struck by lightning and had undergone serious injuries after that. They can be told the story of the brothers and how they got lightning. The students can then discuss upon the process of lightning and how the charges

	are getting transferred from the clouds to the earth. What is the role of lightning rescue conductor during heavy lightning and thunder? Students can also be given an activity to display posters in their school on the topic of how to stay safe during heavy thunder and lightning. Students can also take a survey of the common lightning myths that are spread in our society and arrange a stage programme on behalf of the science club of their school in bursting these common lightning myths and explaining the scientific facts behind these myths The students in each group can record their observations and tell their observations to the whole class.
Drawing inferences (How and in what format learners will record their observations from the experiential tasks assigned to them?)	1. The learners can record their observations and compare the observations with the other partners in their group. 2. All the groups will present their findings for the learning of the whole class.

C. Lesson Steps: Stage 2: Conclusive Phase

Conceptualization (How will the facilitator assimilate the key aspects of learning from the inferences drawn by the learners?)	The facilitator can conclude that thunder and lightning are a natural source of static electricity. Lightning carries heavy amount of electric charge which is hotter than the temperature at the Sun's surface and can cause a massive electric shock once it is struck on any person. The facilitator also concludes about the rescue methods and the safety with a lightning rescue conductor.
Connecting to real life (How the lesson will be extended further, how it will be linked to real life incidents/situations/processes/systems to make the learning meaningful?)	The students will reflect upon their observations on massive thunder and lightning and the accidents they have experienced in their village or town during thunder and lightning.
Extended learning (How will the facilitator provide opportunities to reflect upon the experience in terms of their real life application?)	1. Making a still model on thunder and lightning striking a building installed with a lightning rescue conductor and hence explaining the working of a lightning rescue conductor

Assessment

(How will the facilitator check and ensure that learners have constructed knowledge and learning objectives have been achieved?)

The students can be asked to prepare a poster on how lightning is struck and how a properly earthed house or an institution is safe from the dangers of lightning and thunder.

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Appendix L2

(Item No 5 of Check List)
Details of Research Publications

S.No	Article	Journal	Other Details Vol/No/Page No/ Year	Published in UGC-CARE / Scopus Indexed/ Web of Science (*List of Journals in that category including the particular Journal to be attached)
1	Experiential learning practices and the scientific attitude of particularly vulnerable tribal group children of Kerala	Journal of Education: Rabindrabharati University	ISSN: 0972-7175 Vol: XXIII No: 7 2021	UGC-CARE
2	Effectiveness of experiential pedagogical module in the development of select science process skills in science among secondary school students in Kerala	Shodha-Prabha	ISSN: 0974-8946 Vol: 46 Issue: 04 2021	UGC-CARE

*Proof of list of Journals from Internet to be attached along with copies of reprints.

Scholar : Santhya

Supervisor : 6/12/21

Checked By: S.S.Mangi 6/12/2021
HoD/Dean

UGC-CARE List

Journal Details

Journal Title (in English Language)	Journal of Education: Rabindra Bharati University (print only) | (Current Table of Content)
Publication Language	English
Publisher	Department of Education, Rabindra Bharati University
ISSN	0972-7175
E-ISSN	NA
Discipline	Social Science
Subject	Social Sciences (all)
Focus Subject	Education

UGC-CARE List

UGC-CARE List

You searched for "J". Total Journals : **205**

Search:

Sr.No.	Journal Title	Publisher	ISSN	E-ISSN	Action
51	Journal of Early Modern Studies	Firenze University Press	NA	2279-7149	Indexed in Scopus
52	Journal of East- West Thought	International Association for East-West Studies	2161-7236	2168-2259	View
53	Journal of Economic Research	Hanyang University Seoul	1226-4261	2713-6418	View
54	Journal of Education Culture and Society	Institute of Pedagogy, University of Wrocław	NA	2081-1640	Discontinued from Oct. 2021
55	Journal of Education for Sustainable Development	Centre for Environment Education	0973-4082	0973-4074	View
56	Journal of Education: Rabindra Bharati University (print only)	Department of Education, Rabindra Bharati University	0972-7175	NA	View
57	Journal of Educational Planning and Administration	National University of Educational Planning and Administration	0971-3859	NA	View
58	Journal of Educational Technology Systems	Sage Publications	0047-2395	1541-3810	View
59	Journal of English Language Teaching	The Society for the Promotion of Education in India	0973-5208	NA	View
60	Journal of Enterprising Culture	World Scientific Publishing	0218-4958	1793-6330	View

UGC-CARE List

UGC-CARE List

You searched for "**Arts and Humanities**". Total Journals : **409**

Search: Shodh

Sr.No.	Journal Title	Publisher	ISSN	E-ISSN	Action
336	Shodhak: A Journal of Historical Research	National Organisation of Historians and Social Scientists	0302-9832	NA	View
337	Shodha-Prabha (print only)	Shri Lal Bahadur Shastri Rashtriya Sanskrit Vidyapeetha	0974-8946	NA	View
338	ShodhKosh: Journal of Visual and Performing Arts	Granthaalayah Publications and Printers	NA	2582-7472	View

Showing 11 to 13 of 13 entries (filtered from 409 total entries)

UGC-CARE List

Journal Details

Journal Title (in English Language)	Shodha-Prabha (print only) | (Current Table of Content)
Journal Title (in Regional Language)	शोध-प्रभा (print only)
Publication Language	English , Sanskrit
Publisher	Shri Lal Bahadur Shastri Rashtriya Sanskrit Vidyapeetha
ISSN	0974-8946
E-ISSN	NA
Discipline	Arts and Humanities
Subject	Arts and Humanities (all)
Focus Subject	General Arts and Humanities

JOURNAL OF EDUCATION: RABINDRABHARATI UNIVERSITY
ISSN : 0972-7175

EXPERIENTIAL LEARNING PRACTICES AND THE SCIENTIFIC ATTITUDE OF PARTICULARLY VULNERABLE TRIBAL GROUP CHILDREN OF KERALA

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Abstract
The experiential learning advocates hands on learning where students engage themselves actively and reflect upon their experiences and environment to comprehend the concept provided in the experience. Teachers or facilitators should provide apt and appropriate learning experience taking into consideration the age and the intellectual level of the learner. The experiential learning practices help the students in developing critical thinking and hence make the learning permanent. The present study includes the secondary school students belonging to particularly vulnerable tribal group (PVTG) students studying in Asram Schools of Kerala. The children selected in the PVTG belongs to 'Kadars' of Cochin, 'Kurumbars' of Palakkad, 'Kattunayakkars' of Wayanad and 'Cholanayakkars' of Nilambur Valley. The experiential learning practices were administered as a package including two selected lessons in Science. From the results it was inferred that there existed different levels of Scientific Attitude among the students and that the experiential learning practices has significant effect in enhancing the scientific attitude levels of the students. The pre and post test showed a significant increase in the mean score of the Scientific Attitude among the students. The scientific attitude scale was developed by the researcher as a five point Likert type scale that consisted of 60 statements out of which 31 were positive questions and 29 were negative questions.
Keywords Scientific attitude, Experiential learning practices, Scheduled Tribes, Particularly Vulnerable Tribal Group (PVTG) students, Secondary school, Asram school

Introduction

India is a diverse country blessed with different cultures, traditions, beliefs and practices. According to National Census Survey Reports of honourable ministry of India, tribal population consists of 8.6 percent of the total population numbering to 104.28 million. (Census of India, 2011) The total Scheduled Tribe (ST) population in Kerala is coming to 4,84,839 constituting to 1.45 percent of the total population of the State. (Census of India, 2011) All the communities are entirely different in terms of their culture, beliefs, livelihood strategies, social organisation, economy and total developmental perspectives. The major communities in Kerala include Paniya, Kurichchya, Kurumba, Kattunayakans, Uralies etc of Wayanad, Irulas of Attapadi, Muthuvans, Malayarayan and Uralies of Idukki and Kottayam and Kanikkar of Thiruvanathapuram. (KIRTADS) There are 5 major tribal communities that are identified as primitive considering the stage of transition into modern society. These tribes are referred to as Particularly Vulnerable Tribal Groups (PVTG). They are named as Kattunaikans of Wayanad, Koragas of Kasargod, Cholanaikans of Nilambur Valley and Malappuram district, Kurumbar of Attapadi and Palakkad districts and Kadars of Cochin. The present study includes the students studying in Palakkad district of Kerala where in a majority of 'Kurumbars' is seen when compared with the other 'Kadars', 'Kattunayakkars' and 'Cholanayakkars'. Scientific attitude is selected as the criterion variable in the study to see the effectiveness of experiential learning practices in the selected chapters among the PVTG students studying in Asram School, Malampuzha in Palakkad district situated in the state of Kerala.

Scientific attitude is a very important aspect to be evaluated since it warrants the positive attitude of the individual towards science and scientific developments happening in and around the world. Thus it is the teacher responsibility towards the students in growing a positive attitude towards Science as a subject and knowledge. Scientific attitude helps in the development of open mindedness, curiosity, intellectual honesty, ethics, values and many other elements that make the individual a responsible person towards the society. (Noll, 1935). Scientific attitude is a curiosity or ability to know

about one's environment; the belief that nothing can happen without a cause and those occurrences that seem strange and mysterious can always be explained by natural causes (Caldwell & Curtis, 1943). Through science teaching certain social ethics and values such as honesty, rationality, objectivity and making judgment on the basis of reliable information can be developed in our youths. (Abdullahi, 1982).

Science as a subject of knowledge demands the development of positive attitude, values and morals among individuals. It possesses a clear definition of unbiased opinions, truthfulness, honesty, empathy and true temperament. (Jancirani, Dhevakrishnan, and Devi, 2012)

Need and Significance

Science is a subject that explains the cause effect relation between each and every entities present in the universe. The problem solving nature of Science makes it universally acceptable in terms of experimentation and applicability. This can be time tested irrespective of the location and individual related errors in administration. Hence it is the duty and responsibility of every teacher to make the students whom they teach scientifically inclined and build a positive attitude towards advancements and developments in Science.

Scientific attitude can be fostered with proper and relevant experiences given by the teachers at apt and appropriate timings in order to develop intellectual honesty, open mindedness, curiosity, critical thinking all of which comes as associated behaviours that come along with scientific attitude. Therefore students need to be trained in experiences that help in the development of scientific attitude which in turn make the students responsible citizens of tomorrow.

The development of scientific attitude and experiential learning go hand in hand as the experiences lead the students to a broader goal of scientific thinking and responsibility. This helps the students to explore the link between the daily life situations and connect them with the concepts in science. Hence science as a subject of study will prove to be more interesting and enthusiastic to students.

The tribal group have their own culture, beliefs, customs and traditions. Thus they have their own job, traditional practices that will directly reflect upon their children. The daily life practices will have a deep impact in the mindset of children and that they will be skilled workers in their future by getting such lively hands on training right from their childhood. Hence the learning that the children acquire through this process of experience and practice is from their regular experiences which make it permanent and interesting in their minds.

Experiential learning pedagogy is a practice where in which the teacher provides apt and appropriate experiences that are familiar and known to the learner so that he/she can easily relate and link it with the new experiences the teacher is providing. Hence the learning so made will be interesting and it will have positive impact on the learning process of the learner.

Definition of Key Terms

Scientific Attitude

Scientific attitude can be regarded as a complex of "values and norms which is held to be binding on the man of science. The norms are expressed in the forms of prescriptions, proscriptions, preferences and permissions. They are legitimatized in terms of institutional values." (Barnes & Dolby, 1970).

In this study Scientific Attitude way of viewing things, a curiosity to know how and why things happen with an open mind an governed by facts.

Some notable features of scientific attitude are:

- Open-mindedness
- Curiosity
- Freedom from superstitions
- Judgment based on scientific facts alone
- Faith in cause and effect relation
- Willingness to test and verify conclusions
- Critical thinking while engaging in all activities

- Honest reporting

Secondary School Particularly Vulnerable Tribal Group Students

Residential school tribal students who are learning in 8th standard and belonging to the PVTG community who are studying in Asram Schools in Kerala

Experiential learning practices

The experiential learning practice holds its roots back to the experiential pedagogy developed by the world renowned educationist David. S. Kolb. Kolb has proven in his theory that the experiential learning enhances the academic achievement and the understanding of the students. As per Kolb's learning theory, teaching through experience makes the learning permanent provided the learning experience provided should be apt and appropriate to the age and intellect level of the learners. (Kolb, D.A & Fry, R.E. (1975))

Asram Schools

These schools have been started through a centrally sponsored scheme under the recommendations of the Dhebar Commission Report. The schools are opened specially for the education and development of the particularly vulnerable tribal group children all over the country. (Dhebar, U. N. (1961))

Variables

The study is designed with Scientific Attitude as a dependent variable. Experiential learning pedagogy is the independent variable.

Objectives

1. To construct an experiential learning module in science for secondary school tribal students
2. To find out if there is any significant difference in the mean pre test and post test Scientific Attitude score for the sample considered for the study.

Hypothesis

1. There exists a significant difference in the mean pre test and post test score of scientific attitude for the whole sample.

Module Construction

The Experiential Learning Module in Science (ELMS) has been constructed by the researcher incorporating two lessons in Science from Kerala State Syllabus (SCERT Kerala). The lessons were Sound and Static Electricity. The module included the following:

- Module Title
- Module Duration
- Lesson Transcripts
- Theme
- Activities
- Evaluation
- Feedback

After the administration of the module the students were given feedback forms to find out their interest in the module. The feedback forms were collected and kept with the researcher for further analysis and research.

Methods

A brief and precise description of the sample selected, tools used, and statistical techniques employed for analyzing the data are as follows:

Method: Experimental method

Design: Single group pre test post test method

Sample: The present study was conducted on a sample of 40 students of Government Residential Tribal School in Palakkad district of Kerala State.
Tools: The tool used for the present study is Scientific Attitude scale
Statistical Techniques: Preliminary analysis of the sample, t-test

Preliminary Analysis of the Sample

Descriptive statistical measures are used to describe the characteristics of the sample or population in totality. The variable studied in the present investigation is Scientific Attitude. The major statistical constants such as mean, median, mode and standard deviation of the variables were calculated.
Important Statistical constants of the variables Scientific Attitude are given in the Table below given.
Table 1
Data and Result of Preliminary Analysis of Scientific Attitude among Secondary School Tribal Students

Descriptive Statistics	Scientific Attitude
Mean	204.15
Median	202.50
Mode	211.00
Std. Deviation	25.213
Skewness	-.056
Kurtosis	-1.081

From the Table 1 it is revealed that the three measures of central tendencies, mean, median and mode of the variable Scientific Attitude is 204.15, 202.500 and 211.00 respectively. The standard deviation of Scientific Attitude is 25.213.The skewness value of Scientific Attitude is -.056. The kurtosis value of Scientific Attitude is -1.081 indicating that the score are almost normally distributed.
Graphical representation of distribution of scores of Scientific Attitude among secondary school tribal students is given in Figure 1.

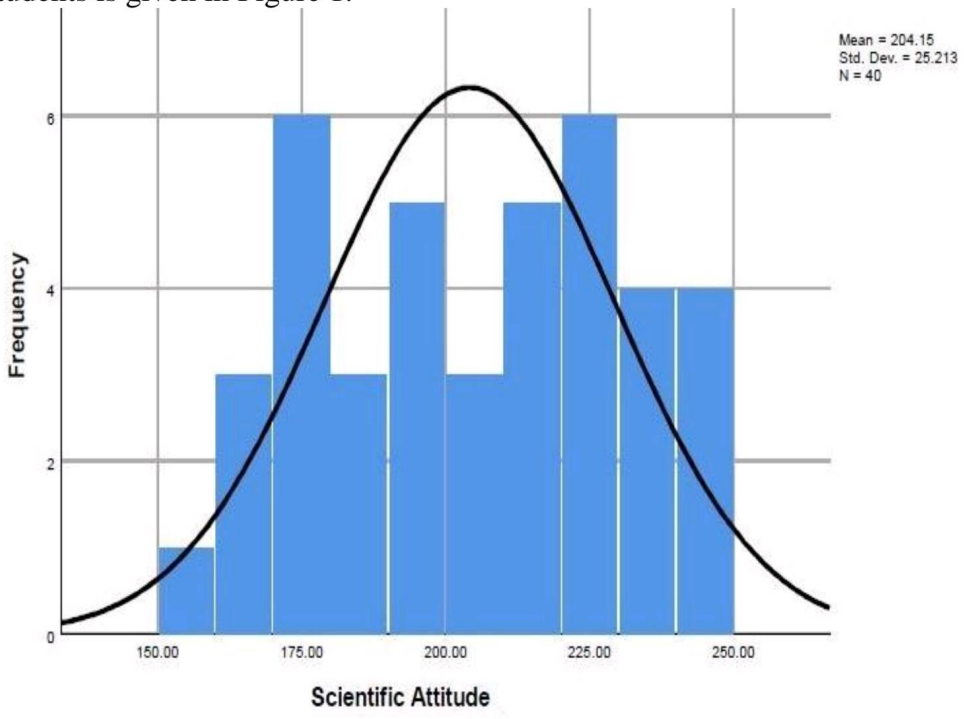

Figure 1 Graphical representation of distribution of scores of Scientific Attitude of secondary school tribal students

From Figure 1 it is revealed that the curve is platykurtic and is negatively skewed.

Major Analysis of Data

Analysis of difference between mean scores of pre test and post test of Scientific Attitude in the whole sample

Data and results of mean scores of Scientific Attitude among secondary school students in Palakkad district classified based on the mean pre test and post test scores are given in the Table 2

Table 2

Test of significant Difference between mean scores of pre test and post test of Scientific Attitude of PVTG students

Variable	Sample	*N*	*M*	*SD*	*t*	*P*
Scientific Attitude	Pre test	40	204.1500	25.21350	-11.802	Significant
	Post test	40	239.5500	22.31356		

From Table 2 it is revealed that score of Scientific Attitude of pre test (M=204.1500) is lower than the score of post test (M=239.5500). The obtained *t* value 11.802 is greater than the table value (1.96) at 0.05 levels. So the difference between mean scores of Scientific Attitude of pre test and post test is highly significant at 0.05 levels.

Graphical representation of distribution of mean scores of pre test and post test of Scientific Attitude of secondary school *PVTG students* is given in Figure 2.

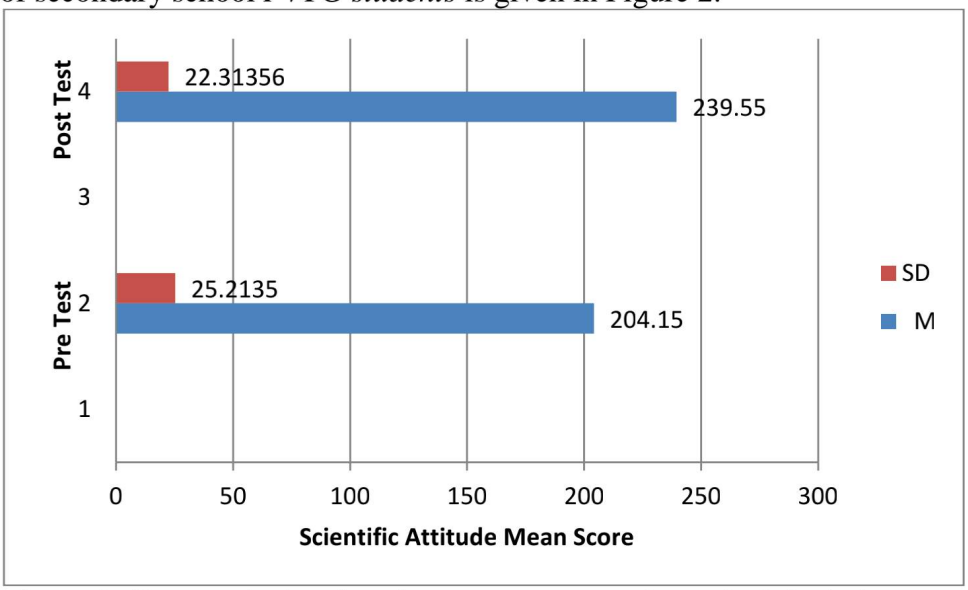

Figure 2: Bar graph showing the mean scores and standard deviation scores of pre test and the post test of Scientific Attitude

Discussion of results

From the result it is also evident that difference in the mean scores of Scientific Attitude between pre test and post test scores of secondary school PVTG students is highly significant, since the obtained *t* value is greater than the table value 1.96 for 0.05 level. It can also be observed that the mean score of the post test (M=239.55) is higher than the mean score of the pre test (M=204.15) which shows that the module in experiential learning practices which were transacted among the sample turned out to be highly effective. Therefore this part of the hypothesis which states there exists significant difference in the mean scores of Scientific Attitude between the pre test and the post test scores of the secondary school tribal students is accepted.

Major findings

Major findings of the present investigation are summarized and presented below:
The findings of t test obtained for Scientific Attitude among secondary school tribal students of Palakkad district.
When the difference between mean scores of pre test and post test of Scientific Attitude of secondary school tribal students were tested for significance it was found that the values obtained were significant at .01 levels of significance. When the Scientific Attitude of pre test and post test scores among the secondary school students were compared the *t* value obtained is 11.802. Since the *t* value is higher than the table value at .01 level of significance, mean difference between the pre test and the post test scores of secondary school PVTG students was found to be significant.

Tenability of hypothesis

The hypothesis states "There exists a significant difference in the mean score of pre test and post test score of scientific attitude for the whole sample."
This hypothesis was tested using the test of significance of difference between means. Results indicate that there exists significant difference in mean scores of Scientific Attitude for the whole sample between the pre test and post test scores of the variable. Therefore the hypothesis is fully substantiated.

Conclusion

It is evident from the findings that there exists significant difference in pre and post test scores of Scientific Attitude among secondary school tribal students with reference to experiential learning practices followed among them. Hence it can be told that experiential learning practices directly influences the scientific attitude of the sample provided apt and appropriate experiences are provided to them by the teachers or facilitators who are advocating experiential learning strategies to them.

Educational Implications

- The study reveals the need of experiential learning practices in the schools
- The study will help teachers to effectively plan the activities given in the text books according to the age and intellect level of the learners

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शोध प्रभा

ISSN: 0974-8946

EFFECTIVENESS OF EXPERIENTIAL PEDAGOGICAL MODULE IN THE DEVELOPMENT OF SELECT SCIENCE PROCESS SKILLS IN SCIENCE AMONG SECONDARY SCHOOL STUDENTS IN KERALA

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Abstract
Experiential Learning advocates hands on teaching and learning. The students are free for inquiring and discovering new concepts and applications through practical training sessions guided by the facilitator. The study comprehends the effectiveness of experiential pedagogical module in the process skill development in Science among the secondary school students in Kerala. The study was conducted in residential tribal schools of Palakkad and Malappuram districts in Kerala in a total of 80 tribal students. The tribal population of Kerala amounts to 4,84,839 as of the report given by Census 2011, honourable government of India. The study was conducted among the children who belong to the PVTG community in Kerala which is coming in to 20,186 only. The PVTG community belong to the weaker and vulnerable sections of the community and is standing at the extreme backward list considering their societal status. The experiential pedagogical module was divided into two sub modules that included the two chapters in Physics of Class 8 Basic Science, a text book published by SCERT Kerala. A tool to assess the Science Process Skills of the tribal students was developed by the researcher with a reliability value 0.659 and the validity value 0.594. The analysis was carried out and a pre test and a post test were administered on the sample. The results showed that there exists a significant difference in the pre and post test of the process skill test conducted in the sample. The study concludes that the experiential pedagogy has a significant role in developing the process skill competencies among the students.
Keywords : Experiential pedagogy, Particularly Vulnerable Tribal Group, Asram Schools, Process Skills in Science, Process Skill Classification

Introduction

Experiential learning and Science Process Skills

Experiential learning is defined as learning in which the learner is in direct touch with the realities being studied. It is contrasted with learning in which the learner reads, hears, talks or writes about those referents or realities but never comes into contact with them as part of the learning process (Keeton and Tate, 1978). Mitzel (1982) described as Experiential education involves not merely observing what is being studied but also doing something with it, such as testing the dynamics of the phenomenon or applying the theory to achieve some desired results.

Exploring the historical evidences of the experiential learning, it can be seen in depth in the philosophy of the great philosopher Aristotle who practically learned the biological processes. Also Lord Budha set a fair example to the world, telling that worldly problems can be felt and experienced and in order to experience the same one has to come out to the world and explore it from the grass root level.

Experiential learning got an additional impetus from the UNESCO publication “Learning to be” (Faure, 1972) that specially focussed on life-long learning as a pre requisite for the building up of a knowledge society. The principle can be incorporated in students by making them learn through their own experiences and failures.

The present study is based on experiential module prepared by the researcher by following the principles of experiential pedagogy put forward by David S Kolb (1984) that depicts learning as a four stage cycle. The learner undergoes a concrete personal experience followed by reflective observation, abstract conceptualization and finally active experimentation. The Kolb’s model

suggests that there are different learning styles for different tasks. Hence the learning cycle can be entered at any of its four stages.

The experiential learning module for the study was prepared from the secondary school basic science textbook, SCERT, Kerala following the four stage learning cycle of David S Kolb. The module was named as Experiential Learning Module in Physics and comprised of two chapters from the textbook.

The science process skills are the foundation stone of learning science. The process skills in science help the children in developing curiosity and interest towards the subject. Whenever the children interact with the environment in a scientific manner, process skills are developed in them. They form as the building block of inquiry based science learning.

Renner and Marek (1990) suggest that the activities in Science that are achieved with the help of these process skills lead the children to facts, concepts, principles, laws and generalizations. However to apply the process skills the children have to learn, re learn and master them continuously by practising them. All the scientists and educationists advocate that the best way to learn Science by the children is to do Science and engage in scientific experiments and activities. For these many process skills are needed that form the basis of development of process skills in Science.

Science Process Skills can be arranged in a hierarchic order. Charlesworth and Lind (1995) arranged Science Process Skills in a hierarchic order which is given in table below:

BASIC PROCESS SKILLS	***INTERMEDIATE PROCESS SKILLS***	***ADVANCE PROCESS SKILLS***
Observing	*Inferring*	*Hypothesizing*
Comparing	*Predicting*	*Defining and Controlling Variables*
Classifying		
Measuring		
Communicating		

Table 1: *Hierarchy of Science Process Skills Categorized by Levels*

The process skill selected for this study is coming under 5 sections as given below:

a. Observing
b. Classifying
c. Comparing
d. Measuring and
e. Formulating Models

The first four come under the basic science process skills and the last one come under the integrated science process skill.

Observing domain refers to the ability that is needed by a person in perceiving things, properties and the characteristics of the objects or entities. This domain uses the five primary sense of humans (touch, hear, taste, smell and see) in order to analyse and understand the properties and peculiarities of a thing or an object.

Classifying domain discusses the way or the method by which things can be sorted with the help of their peculiarities and similarities. There exist different methods of classification. The classification can be based on the special properties of the object or the thing or it can be based on the similarities of two objects or things. For an example students in a class can be classified on the basis of their weight and height or different types fruits can be classified on the basis of the vitamins and minerals present in them.

Comparing domain, checks for similarities and differences between objects or events. The domain makes the student understand the ways with which things can be organised and what are the differences in them and why such different groups exist.

Measuring domain is a quantitative observation in simple words. The student on mastering the skill understands the need of expressing numbers and quantities. The measurement skill is very important as it tells the student about the number and makes the student comprehend how the thing can be quantified.

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Formulating Models comes under the integrated process skills. It helps the student to create a physical model of a process or an event. The models can be created to depict a cycle or a concept but serious approach is very much necessary for the completion of the same as it demands high end precision for accurate results.

Objective of the study

The objective of the study is as follows:

1. To find out the significant difference between the pre and post-test scores of process skill test is Science of Class 8 PVTG students studying in Asram Schools of Kerala

Hypothesis of the study

The hypothesis formulated for the study is as follows

1. There exists a significant difference between the pre and post-test scores of process skill test of Class 8 PVTG students studying in Asram Schools of Kerala

Variables of the study

Dependent Variable: Test Scores of the Process Skill

Independent Variable: Experiential learning module

Operational definitions of terms and definitions used in the study

Asram School

Asram schools are referred to those schools that are fully funded financially by the Central and the State governments for the betterment and the progress of the economically weakest section of the society. The economically weakest section of the society includes the Particularly Vulnerable Tribal Gorup (PVTG) whose developmental indices are very low. These people come from the interior part of the forests and are not interested in formal system of educational needs and aspirations. The present study includes the students who are studying in Asram schools and are belonging to the PVTG community in Kerala. In Kerala there are four different Asram Schools situated in three districts namely, Palakkad, Malappuram and Wayanad. The PVTG community included in Kerala are *'Kurumbas', 'Koragas', 'Cholanaikkans', 'Kattunaikkans'* and *'Kadars'.* The study is aimed to enhance the education status of the hildren and to help them in building up a positive attitude towards Science as a subject of study. The Asram Schools provide all financial assistance and support in all means with regard to their health, education and stay during the years of their schooling. The deprived community are thus being helped and encouraged by the government to come up in the society and make a sustainable living. The honourable Government of India has renamed the Primitive Tribes as Particularly Vulnerable Tribal Group as per recent regulations of Government. These groups as the name suggests, they are extremely vulnerable to poverty and lifestyle. They come from the most interior and rural parts of the forest that are unknown to the outsiders. There is no provision of a school or any educational institution in the deep forests and hence they are not interested in formal education. Because of the extreme efforts put forward by Governments and the non profit organisations, they are now slowly learning the importance of education and literacy in one's life. Such children belonging to the PVTG community are admitted in Asram Schools for acquiring formal education which is their fundamental right. Asram Schools are exclusively built to support the children solely belonging to this community and only those children belonging to these communities can secure an admission in these Asram schools. These schools are purely residential schools and thus the relation between a student and a teacher is very close. Thus the children are given free and quality education here. The community people even find difficulty to meet their basic needs and hence the main aim behind setting up of Asram Schools is to enhance the education and literacy of the coming generation so that they can make a good living in future.

With the help of the respective State Governemnts, Central Government also provide financial assistance for the tribal development projects and support the PVTG community. It is very difficult for these people to get formal education since no schools or any other public institutions are in the places where they reside. Hence the Asram Schools are the formal educational institutions where these children can get a quality education. Through the formal education they receive from the

ISSN: 0974-8946

school, they develop their personality and behaviour as well. Thus they receive a good educational atmosphere where the students are given motivation and opportunities to participate in academic and non academic activities that help in moulding their personality. These schools are fully residential schools and along with the academic activities, the students have ample opportunities to take part in games, cultural progrsms craft music dance etc that form an important part of their affective domain.

Operational Definition of Asram Schools: In the present study the Asram schools of Kerala has been operationally defined as those schools that make provision for the PVTG students to reside and study till they complete their formal education. They are provided with co-curricular activities and sports to enhance their affective and psychomotor domain as well.

PVTG students

Particularly vulnerable tribal group (PVTG) was earlier called as Primitive tribal groups. They were named because of their rural practices of hunting and food gathering for their living. They were renamed by our honourable Government so as to provide help and offer them services for their improvement and progress in their societal status

It was the '*Dhebar Commission (1960-1961)*' who stated that within Scheduled Tribes, there existed a clear inequality in the rate of social development. Hence a recommendation was put forward by the commission for the creation of a particular sub category within the Scheduled Tribes. This was carried out during the action plan of Fourth Five Year Plan and those tribes with lower developmental indices were isolated and a particular category was identified and named as PTG. This was formed by following the recommendations given by the '*Dhebar Commission'* report and also from the recommendations of similar studies. This sub-category was named "Primitive tribal group" (PTG) then (Dhebar Commission, 1962). The notable characteristics of this identified group involve within them a rural and a pre-agricultural system of existence that is the practice of hunting and gathering, zero or negative population growth, extremely low level of literacy in comparison with other tribal groups.

Those groups which could get into any one of the above said conditions were considered as PTG. Thus according to these recommendations and the conditions put forward by our government, at the end of the Fifth Five Year Plan, our government identified 52 communities of our nation as "primitive tribal group". They were included under this group on the basis of various suggestions and recommendations put forward by the respective Governments of the State. After the Sixth Five Year Plan, 20 more groups were added to this list of PTG, again 2 more got added in the Seventh Five Year Plan and 1 more after the Eighth Five Year Plan thus making a total number of 75 groups in the primitive tribal group (PTG) list. The last and the 75th group identified and included in the PTG list was "Maram" in Manipur State in the year 1993-94. Then after, there were no new additions in the PTG list as on the basis of the 2001 census of India. (Census of India Report, 2001)

The name "*Particularly Vulnerable Tribal Group*" was suggested and proposed by the Indian Government in the year 2006 instead of "*Primitive Tribal Group*". Thus the group was renamed as "*Particularly Vulnerable Tribal Group*" (PVTG) then after.

Kerala state government has identified 5 primitive tribes based on their development indices. This includes "*Kadars of Thrissur", "Kurumbars of Palakkad", "Kattunayakars and Cholanaikkans of Malappuram" and "Koragas of Kasargode*". The study here focuses on four particular primitive tribes of Kerala residing in Palakkad and Malappuram districts, namely, "*Kadar", "Kurumbar", "Kattunayakar"* and *"Cholanaikkar".* (KIRTADS, Kerala)

The present study tries to study the Class 8 PVTG students studying in Asram Schools, that are exclusively built as per the Government rules and regulations in order to enhance the else deprived social status of the primitive tribal group population.

Operational Definition of PVTG students: PVTG students are those students who are from socially deprived sections of the tribal community who live in the most interior and dense forests of Kerala. The deprived sections selected in the present study include children from 4 selected primitive groups namely*,"Kadars","Kurumbas","Cholanaikkars" and "Kattunayakars"*.

Experiential pedagogy

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Experiential pedagogy is defined as culturally relevant or responsive teaching where in each student is helped by the culturally competent teachers to relate the course content to his or her cultural context. Such instruction is a form of pedagogy effectively suited to all children from different racial and ethnic backgrounds. By making education culturally relevant, it is thought to enhance academic achievement and hence the self-sustenance and social awareness of the students (Kelly & Crawford, 1997).

Experiential Pedagogy uses the high school science syllabus of Kerala state, and the instruction given by the teachers is culturally relevant and local experiences. The instruction follows a modified form of experiential pedagogy by David Kolb and also finds its roots in the constructivist processes (Kolb D, Fry R, 1975). The term is operationally defined as the pedagogy of experience and creativity, wherein the subject, science is taught through culturally relevant practices and methods that generates interest and makes the learning permanent (Billings L, 1994). This will help in enhancing the cognitive skills and hence the cognitive domain of the students at an appropriate age so that they will be benefitted in their later lives. Science, as a subject of interest, must be taught through locally relevant examples and practices so that they can easily club their knowledge with their experience.

Operational Definition of Experiential Pedagogy: Experiential pedagogy is operationally defined as the methodology implemented by the teacher to the children so as to experience the learning by themselves through locally relevant activities and experiments. Learners thus experience the curriculum and engage themselves in the active learning process.

Method of study

The method that was used in the study was the experimental method since it was the most apt and appropriate method to study the objective in detail. In order to study the cause effect relationship and to express the same in a quantitative aspect, the best suitable method that can be adopted is the experimental method. The present study follows the single group experimental design in order to study the characteristics of the group in a detail and an elaborate manner. The method followed can be validated both statistically and scientifically.

Design of the study

Single group pre test post test design

Population and sample

The population for the present study is the tribal children belonging to the PVTG community and is studying in Class 8 in Asram Schools of Kerala. In Kerala there are four different Asram Schols sitatued in three different districts namely, Palakkad, MAlappuram and Wayanad. The sample chosen for the study is the children from Palakkad and Malappuram since those regions are personally known to the researcher in terms of language and culture. The Wayanad district PVTG tribes speak a dialect that has least resemblance with the state language and hence was avoided for the study. The total population of the tribal students is 160 and the sample chosen for the study was 80 students from the two districts. The details of the sample are given below:

Table 2 *Demographic data of the participants*

S.No.	PVTG Asram School	Location (District)	Students	Number of students	Total students
1.	Malampuzha	Palakkad	Boys	15	40
			Girls	25	
2.	Nilambur	Malappuram	Boys	20	40
			Girls	20	

Tool developed for the study

A tool to test the science process skills of the students was prepared by the researcher. It was standardised and validated for reliability. The tool consisted of 60 questions in total and it is divided into 5 sections where in a set of 12 questions are in each section. The test was developed to measure the science process skill of the PVTG students studying in secondary level in Asram Schools of

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Kerala. The reliability of the tool was found by Cronbach Alpha Method and it was found to be 0.659 and the validity was established to be 0.594. The Sections of the tool is described in Table 3.

Table 3 Description of the sections of the tool

Sl.No:	Dimensions	Process Skill in Science	Total number of questions
1	Observation	Basic Process Skill	12
2	Comparison	Basic Process Skill	12
3	Classification	Basic Process Skill	12
4	Measuring	Basic Process Skill	12
5	Formulating Models	Integrated Process Skill	12

Mode of Responding

There were 60 items in the process skill test in Science. For each there were four alternatives in which one was the correct answer. The respondent was asked to put a tick mark (√) in the correct alternative among the four options.

Scoring Scheme

The scoring scheme of the process skill test was as follows: For Correct response a score of 1 is given and for incorrect response the score is 0.

Statistical Technique

Paired sample t test

Data Analysis

Analysis of the significance of the difference between mean pre-test and post-test scores of Science Process skill of the Experimental group

A paired sample t-test was conducted to determine whether there exists a significant difference between pre-test and post-test scores of *Science Process Skills of the* Experimental groups. *SD*, *t* value, and *r*-value of the mean pre-test and post-test scores of the experimental group is given in Table 4.

Table 4

Data and results of the test of significant difference in mean pre-test and post-test scores of Science Process skill of the Experimental group.

Experimental Group	*N*	*M*	*SD*	*r*	*t*	*P*
Pre-test	80	20.375	4.500	0.697*	31.40*	<0.0001
Post-test	80	33.3375	4.931			

* denotes the value of *r* = 0.601 is significant and the value of t=31.40 is significant at 0.01 level of significance

Source: Field survey analysis findings by the author, 2019

The mean pre-test and post-test scores of the *Science Process skill of the* experimental group are 20.375 and 33.3375, respectively. The *SD* value of pre and post-test of the experimental group is 4.500 and 4.931, respectively. The obtained r value is 0.697, and the *t* value is 31.40, and both the values are significant at 0.01 level. It shows that there exists a significant difference between mean pre-test scores of *Science Process Skill* and post-test scores of *Science Process Skill* among the experimental groups. That is, post-test scores are significantly higher than that of pre-test scores of *Science Process Skill* of the experimental group.

*Discussion of the Result*s

The result shows that there is a significant difference in the mean pre-test and post-test scores of the *Science Process Skill* of the experimental group. The *t* value obtained is 31.40 and is significant at 0.01 level. The post-test in *Science Process Skill* is significantly higher than that of pre-test scores in *Science Process Skill*. It shows the lesson transcript and the experiential learning module developed

ISSN: 0974-8946

as per the Kolb's Experiential pedagogy was effectively transacted in the Experimental group and is apt enough to enhance the *Science Process Skill* of the sample selected as the experimental group. The results of the pre-test and post-test scores of experimental group are shown in Figure 1.

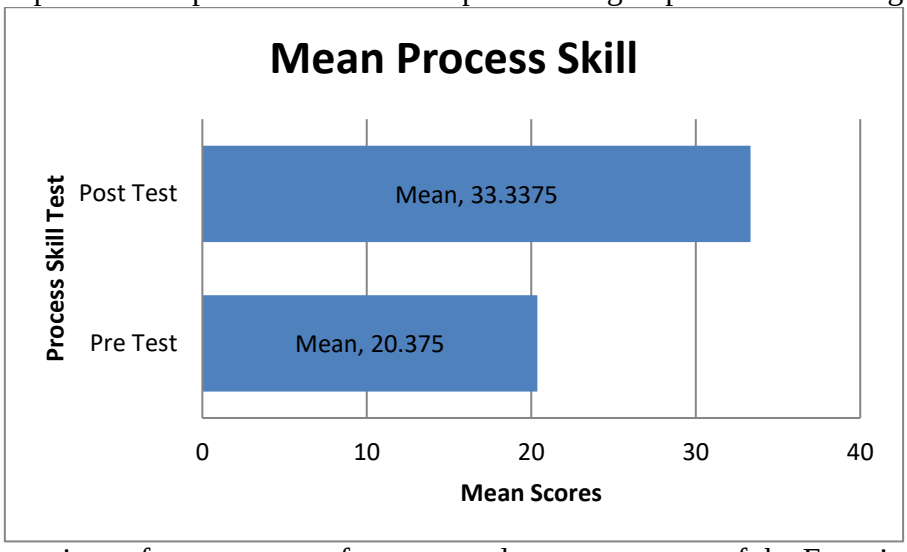

*Figure 1.*Comparison of mean scores of pre-test and post-test scores of the Experimental group.

Graphical Interpretation

The interpretation that can be made from the Figure 1 is that, the mean score of the post test is significantly higher than the mean score of the pre test of the experimental group selected for the study. Hence the module that is selected for the study has proved to be effective in enhancing the select Science Process Skills of the students belonging to the PVTG community and is studying in Class 8 in Asram Schools of Kerala.

Conclusion and Finding of the study

Finding

There exists a significant difference between the pre and post-test scores of Science Process Skills of Class 8 PVTG students studying in Asram Schools of Kerala

Conclusion

The study is aimed in addressing the Science Process Skills of the tribal students. The sample was given a module strictly based on the experiential learning practices as put forward by David S Kolb. The effectiveness of the module was evaluated in the study throught he experimental method. The researcher followed the single group pre test post test design in order to check the same. The findings were such that it satisfied the proposed hypothesis. The study thus found out that there exists a significant difference between the mean scores of the Science Process Skill test conducted among the Class 8 tribal students studying in Asram Schools of Kerala State. The Science Process Skills were evaluated in the students and were found to be effective and the students developed an interest towards Science learning through life oriented experiences and practical experiments.

Since Science Process Skills are very much important in the Science learning, it is very much essential and important that apt and adequate training must be given to the children so as to develop scientific creativity and interest in them at a younger age itself. This study clearly elaborates that the Science Process Skills can be mastered through regular practice, experiences and practical experiments that arouse the spirit if inquiry among the students. The Science learning thus becomes an enjoyable experience for the learners. Hence the experiential learning module is effective enough in giving training and experience to enhance the Science Process Skill in the students.

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