APPENDIX-1

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore-641108

Achievement Test in Science

Class: XI Maximum Marks:75

Unit: Plant Morphology Duration: 2.30 hours

PART –A

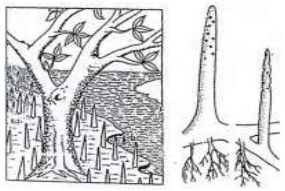
Objective type questions

I) Fill in the blanks. (1X20=20) marks

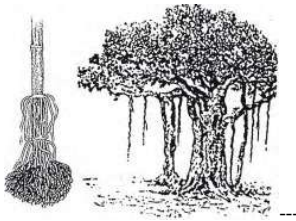
- All questions should be answered.
- Each question carries one mark.

1. The ovules are enclosed in a box- like organ called----------.
2. Sperm means----------.

The given picture is categorized under ----------roots.



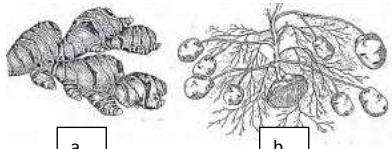
3. Observe the picture and complete the sentence.



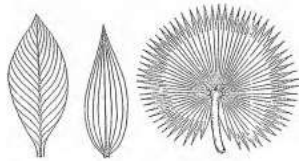
---------- roots give mechanical support to the aerial branches as in banyan tree.

5. Stem is positively----------and negatively----------.
6. Buds that develop in position other than the normal position are known as----------.
7. ----------grow in all directions from the mother plant.

8. Thepicture aand b belongs to ---------- category of underground stems.



9. In some plants the leaf has a swollen leaf base. It is known as----------.
10. These pictures are classified under ----------type of venation.



11. A flower having a uniform number of all the floral parts is called ----------flower.
12. Fruits without fertilization are called----------.
13. The edible part of the jack fruit is----------.
14. Mango and apple are classified under ----------fruits.
15. The biggest seed is found in ----------.
16. In gram seed, the seeds are attached to the wall of the pod by stalk called----------17.

When the mature seed is detached, the funiculus leaves a scar on the seed called ----------.

18. Theexplants tissue produces ----------during the period of incubation.
19. Bats perform---------- mode of pollination.
20. The pollinationthat maintains purity of the race and avoid mixingis ----------.

(II) Multiple Choice Questions. (1x15=15marks)

1. In the given picture the stem is modified into.

a. Tendrils b. Phylloclade c. Cladode d. Phylloclade and Cladode.

2. The Alternative Phyllotaxy is present in.

a. Polyalthia b. Guava c. Calotropis d. Nerium.

3. Musa is an example for----------.

a. Spadix b. Mixed spadixc. Compound d. Raceme.

4. Spike is a type of----------.

a. Racemose inflorescence c. Mixed inflorescence

b. Cymose inflorescence d. Special inflorescence

5. This is a homogamous head with rayflorets.

a. Vernonia b. Tridax c. Launaea d. Helianthus

6. When anthers have two chambers, they are described as.

a. Dioecious b. Dithecious c. Diadelphous d. Dimorphic

7. Timerous flowers are common among.

a. Dicots b. Xerophytes c. Monocots d. Gymnosperms

8. In the deciduous type of calyx, the sepals will fall.

a. as soon as the flower opens c. in the bud condition

b. after fertilization d. before fertilization

9. Seedless Grapes are.

a. Simple Dry fruits b. Multiple fruits c. Aggregate fruits d. Parthenocarpic fruits

10. The embryo sac in typical dicot at the time of fertilization is----------Celled.

a. 8 b. 6 c. 7 d. 5

11. Micropyle occurs in.

a. Ovary b. Seeds c. Ovule d Both a and c

12. The part of the embryonic axis between the plumule and the point of attachment of cotyledens is called.

a. Tegmen b. Plumule c. Micropyle d. Epicotyle

13. Vivipary is a characteristic feature of.

a. Mesophytes b. Halophytes c. Xerophytes d.Hydrophtes

14. Which one of the following generally increases during senescence?

a. Protein b. Chlorophyll c. Photosynthesis d. Respiration

15. Yellowing and shedding of leaves in autumn in many trees is an example for----------.

A.Overall senescence b. Deciduoussenescence c. Top senescence d. Progressive senescence

PART B

(2x20=40).

Short Answer Questions.Each question carries two marks.

1. Describe the parts of a typical root.
2. What are the two types of root systems?
3. Write about the functions of roots.
4. With a neat diagram describe the modification of Taproot system.
5. What are the advantages of rhizome?
6. Draw and label Phyllode /Phylloclade.
7. Sketch the diagram of a pitcher plant and give your judgment on the Pitcher plant.
8. Distinguish a simple leaf from a compound leaf.
9. How does a simple leaf differ from a compound leaf? Give an example?
10. Explain the parts of a leaf.
11. Define: Lingulate floret
12. How do you classify Cymose inflorescence.
13. Define aestivation.
14. Draw and label the essential organs of a flower.
15. Classify the Special inflorescence with an example.
16. How does a fleshy fruit differ from a dry fruit?
17. Differentiate Stolon and Sucker.
18. What is Bulbil? Draw a suitable Diagram.
19. Organize into categories the different modes of Pollination.
20. Draw and label the types of Pollen entry.

Answer key for Achievement in Science

Q. No.	Value Point	Allotment of marks	Total mark (range)
1	**I) Fill in the Blanks :** Ovary	Correct answer carries 1mark	0-1
2	Seed	Correct answer carries 1mark	0-1
3	Tap roots	Correct answer carries 1mark	0-1
4	Prop roots	Correct answer carries 1mark	0-1
5	Photo tropic, Geotropic	Correct answer carries 1mark	0-1
6	Adventitious buds	Correct answer carries 1mark	0-1
7	Runners	Correct answer carries 1mark	0-1
8	Rhizome and tubers	Correct answer carries 1mark	0-1
9	Pulvinus	Correct answer carries 1mark	0-1
10	Parallel venation	Correct answer carries 1mark	0-1
11	Aetinomorphic	Correct answer carries 1mark	0-1
12	Parthenocarpy	Correct answer carries 1mark	0-1
13	Perianth	Correct answer carries 1mark	0-1
14	Simple fleshy fruits	Correct answer carries 1mark	0-1
15	Coconut	Correct answer carries 1mark	0-1
16	Funiculus	Correct answer carries 1mark	0-1
17	Hilum	Correct answer carries 1mark	0-1
18	Callus	Correct answer carries 1mark	0-1
19	Chiropterophily	Correct answer carries 1mark	0-1
20	Self Pollination	Correct answer carries 1mark	0-1
	Choose the correct answer :		
1	Phylloclade	Correct answer carries 1mark	0-1
2	Polyalthia	Correct answer carries 1mark	0-1
3	Mixed Spadix	Correct answer carries 1mark	0-1
4	Racemose inflorescence	Correct answer carries 1mark	0-1

Q. No.	Value Point	Allotment of marks	Total mark (range)
5	Launaea	Correct answer carries 1mark	0-1
6	Dithecious	Correct answer carries 1mark	0-1
7	Monocots	Correct answer carries 1mark	0-1
8	As soon as flower opens	Correct answer carries 1mark	0-1
9	Parthenocarpic fruits	Correct answer carries 1mark	0-1
10	7 celled	Correct answer carries 1mark	0-1
11	Seeds	Correct answer carries 1mark	0-1
12	Epicotyle	Correct answer carries 1mark	0-1
13	Mesophytes	Correct answer carries 1mark	0-1
14	Protein	Correct answer carries 1mark	0-1
15	Deciduous senescence	Correct answer carries 1mark	0-1
	Short answer		
1	Root Cap, Meristematic Zone or Zone of cell division, Zone of elongation, Zone of cell differentiation	Each point carries $\frac{1}{2}$ mark	0-2
2	Tap root system, Adventitious root system	Each point carries 1 mark	0-2
3	Absorption: The main function of any root system is absorption of water and minerals from the soil with the help of root hairs. Anchorage: The roots help to fix the plant firmly in the soil.	Each point carries 1 mark	0-2
4	Neat diagram of two modification of Tap root system.	Neat diagram of ech modification of Tap root system carries 1 mark	0-2
5	Rhizomes are very good means of perennation. They help to tide over the unfavourable conditions like drought etc. They serve as store houses of food which is safely protected from the grazing of animals. Since aerial shoots arise from the buds of the rhizome they are useful in vegetative propagation also.	Each point carries 1 mark	0-2
6	Diagram of Phyllode / Phylloclade. Lableof Phyllode / Phylloclade.	Diagram of Phyllode / Phylloclade carries 1 mark Lable of Phyllode / Phylloclade carries 1 mark	0-2
7	Diagram of Pitcher plant. In the pitcher plant ***(Nepenthes)*** the leaf becomes modified into a pitcher. The function of the pitcher is to capture and digest insets.	Diagram of Pitcher plant carries 1 mark Each point about Pitcher plant carries 1 mark	0-2

Q. No.	Value Point		Allotment of marks	Total mark (range)
8	**Simple Leaf**	**Compound Leaf**	Each point about simple leaf carries $\frac{1}{2}$ mark Each point about compound leaf carries $\frac{1}{2}$ mark	0-2
	Axillary bud is present in the axil of a simple leaf	Axillary bud is present in the axil of a compound leaf.		
	Stipules are present at the base of simple leaves.	Stipules are not present at the base of the leaflets.		
9	**Simple Leaf**	**Compound Leaf**	Each point simple leaf and compound leaf carries 1 mark	0-2
	The simple leaf may have incisions but these incisions are not deep enough to divide the blade in to leaflets.	The compound leaves are divided into distinct parts called leaflets.		
10	**Parts of leaf** **Leaf base** : The part of the leaf which is attached to the stem or a branch is called leaf base. **Stipules**: In most of the dicotyledonous plants, the leaf-base bears two lateral appendages called the **stipules.** **Petiole** : Petiole connects the lamina with the stem or the branch. **Leaf blade**: It is also known as **lamina**. This is the most important, green part of the leaf which is mainly concerned with the manufacture of food.		Each parts of leaf carries$\frac{1}{2}$ mark	0-2
11	Lingulate floret Strap shaped. When the corolla tube is short and tubular at the base but flat above like a strap. Eg. Ray florets of Asteraceae		Definition of Lingulate floret carries 1 mark and example Lingulate floret carries 1 mark	0-2
12	Classification of cymose inflorescence		Classification of cymose inflorescence carries 2 marks	0-2
13	Aestivation The mode of arrangement of either sepals or petals of a flower in bud condition is said to be an Aestivation		Definition of Aestivation carries 2 marks	0-2
14	Diagram of essential organs (androecium, gynoecium) of a flower.		Diagram of each essential organs of a flower carries 1 mark	0-2

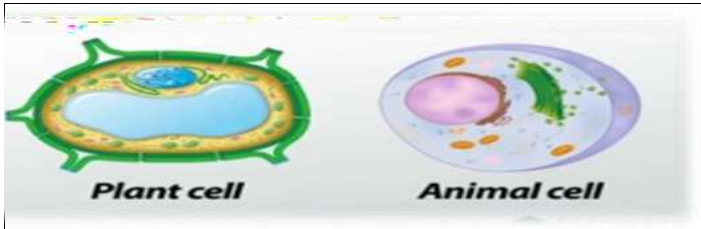
Q. No.	Value Point		Allotment of marks	Total mark (range)
15	Classification of Special inflorescence		Classification of Special inflorescence carries 2 marks	0-2
16	Diagram of Bulbils These are spherical multicellular, fleshy buds produced in the axil of foliage leaves in the lace of axillary buds.		Diagram of Bulbils carries 1 mark. Definition of bulbils carries 1 mark	0-2
17	Fleshy fruit	Dry fruit	Definition of fleshy fruit carries 1 mark and definition of dry fruit carries 1 mark	0-2
	Fleshy fruits either the entire pericarp or part of the pericarp is succulent and juicy when fully ripe. Normally the fruit wall may be differentiated into three layers	These fruits have dry pericarp, which is not distinguished into three layers.		
18	Stolon	Rhizome	Definition of Stolon carries 1 mark and definition of Rhizome carries 1 mark	0-2
	Stolon is a stem which grow at the soil surface or just below ground. It form adventitious roots at the nodes.	Rhizome is a continuously growing horizontal underground stem . It forms lateral shoots and adventitious roots at intervals		
19	Any Four mode of pollination Anemophily (Wind) ,Hydrophily (Water), Entomophily (Insects), Ornithophily (Birds) . Chiropterophily (Bats) Myrmecophily (Ants)		Each mode of pollination carries $\frac{1}{2}$ mark	0-2
20	Diagram of two types Pollen entry. Label the types of Pollen entry.		Each diagram of Pollen entry carries $\frac{1}{2}$ mark Label the each types of Pollen entry carries $\frac{1}{2}$ mark	0-2

APPENDIX-2

Science Process Skill Questionnaire(Sangeetha , T & Indu H, 2017)

2.a Observation Skill

1. Carefully observe picture (i) consisting of a plant cell and animal cell. Write any three similarities between them.



Picture (i)Plant and Animal Cell

No	
1	
2	
3	

2. Observe the picture (ii) and make any four observations.

Picture (ii) Germination of seeds

No	
1	
2	
3	
4	

3. There are some flowers kept for observation, they are marked as A, B, C, D, E, F, G, and H feel the taste (only testable), appearance, smell, texture, and special feature if any and write down in thetable.

Flower	Taste	Appearance	Texture	Smell	Special feature if any
A					
B					
C					
D					
E					
F					
G					
H					

4. Observe the preserved plant in the herbarium sheet. Write any four observation about the same.

No	Observation
1	
2	
3	
4	

5. Observe the picture of simple leaf and compound leaf. Write four differences between the two different types of leaves.

NO	Differences
1	
2	
3	
4	

6. Observe the real specimens of dry plant and fresh plant. Spot out four differencesbetween them.

[Real specimens of dry plant and fresh plant are kept for observation]

No	Fresh plant	Dried plant
1		
2		
3		
4		

7. Observe the given picture and record any four observations.

No	Observations
1	
2	
3	
4	

8. The inflorescence picture is shown below. Observe and write any four observation for Figure(A) and Figure (B)

Figure (A)

Figure (B)

No	A	B
1		
2		
3		
4		

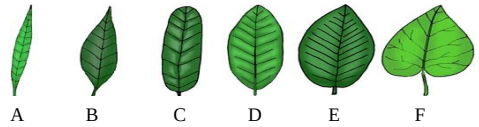
9. Observe the head inflorescence and give any four of your observation. [real head inflorescence is kept for observation]

No	Observation
1	
2	
3	
4	

10. There are four real leaves kept for observation, they are marked as A, B, C,D. Carefully observe and name out the margins of these leaves.

No	Observation
A	
B	
C	
D	

11. There are six leaves kept for observation. They are marked as A, B, C, D, E, F. Carefully observe and name out the shapes of these leaves.

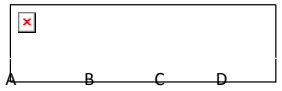


No	Observation
A	
B	
C	
D	
E	
F	

12. There are four plants kept for observation. They are marked as A, B, C, D. Carefully observe and name the arrangement of leaves in the given plant.

No	Observation
A	
B	
C	
D	

13. There are four flowers kept for observation. They are marked as A, B, C, D. Carefully Observe and name the shape of the petals in the corolla.



No	Observation
A	
B	
C	
D	

14. Two flowers are kept for observation. They are named as A and B. Carefully observe and name the type of aestivation of Flower A and Flower B.

Flower A

Flower (B)

No	Aestivation
A	
B	

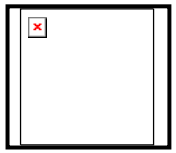
15. One flower is kept for observation. Carefully observe and name which type of cohesion of stamens are present in the given flower.

No	Observation

16. One fruit is cut and placed for observation. Carefully observe that fruit and name which type of placentation occur in the given fruit.

No	Observation

17. Carefully observe the two fruits named as A and B and name the type of fruit.



(A)

(B)

No	Type of fruit
A	
B	

18. A picture is kept for observation. Observe and name out which type of propagation occur in the particular plant.

No	Type of propagation

2.b Classification Skill

1. Classify the following fruits (Pomegranate, Orange Lemon, Blackberries, Cucumber, Pineapple, Apple, Strawberries, Pear, and Tomato) into simple fruits and multiple fruits.

S.No	Simple Fruits	Multiple Fruits
1.		
2.		
3.		
4.		
5.		

2. Various seeds such as Wheat, Soya, Tomato, Rice, Jowar, Brinjal, Bajra, Onion, Sesame, and Barley are kept for observation. Carefully classify them into Monocotyledon and Dicotyledone seeds.

S.No	Monocotyledon Seeds	Dicotyledon Seeds
1.		
2.		
3.		
4.		
5.		

3. Pictures of various flowers such as Cauliflower, Maize, Coriander, Amaranthus, Potato, and Pepper are kept. Classify them into Racemose inflorescence and Cymose inflorescence.

S.No	Racemose inflorescence	Cymose inflorescence
1.		
2.		
3.		

4. The picture of Carrot, Nepenthes, Sugarcane, Potato, Ginger, Opuntia, Asparagus, Beetroot, Banyan, Lathyrus, Bladder Plant, Acacia are shown below. Based on similarities and differences these pictures can be classified into different groups**.** Identify and classify them into different groups in the table given below.

S.No	Picture	Groups
1.		
2.		
3.		

5. Eichhornia, Euphorbia, Sunflower plant, Heterophylla, Wolffia, Hibiscus, Nelumbium, Opuntia, Mango and Cerotophyllum are having similar characteristics in their habitat. Identify and classify them into Hydrophytes, Mesophytes and Xerophytes.

Hydrophytes	Mesophytes	Xerophytes

6. Classify the following substances such as Dal, Wheat, Moongdal, Maize, Green gram, Rye, Bengal gram, Rice, Ragi and Horse gram into pulses and cereals.

S.No	Pulses	Cereals

7. Apple, Almond, Orange, Apricot, Betel nut, Pineapple, Cucumber, Cashew nut are kept. Classify them into dry fruits and fleshy fruits.

Dry Fruits	Fleshy Fruits

8. Classify the leaves of different plants and trees such as Mango, Guava, Grass, Coconut, Neem, Fig, Maize, and Bajra into reticulate venation and parallel venation

Reticulate venation	Parallel venation

9. Classify Tendrils, Spines, Climbing, Protection, Fleshy, Storage, Pitcher, and Nepenthus based on modification of leaves and uses of modification.

S.No	Modification of Leaves	Uses of Modification
1		
2		
3		
4		
5		

10. Name the plant part modified for food storage from the following list.
Carrot, Colocasia, Sweet Potato, Asparagus, Raddish, Potato, Dahlia, Turmeric, Gladiolus, Portulaca, and classify them into Root, Stem, Leaves.

Root	Stem	Leaves

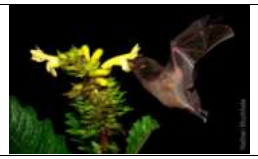
11. Pictures of different flowers with different cohesion of stamens are shown below. Flowers like Citrus, Asteraceae, Clitoria, Hibiscus, Renunculus, Cucurbitaceae are given. Cohesion like Polyadelphous, Monodelphous, Syngenesious, Synandrous, Polyandrous, and Diadelphous are there. Based on arrangement of stamens, identify and classify them into the type of cohesion they occur.

S.No	Flower	Cohesion
1		
2		
3		
4		
5		
6		

12. Classify the following flowers such as Water lily, Murraya, Rose, Daffodils into Epigynus flower and Hypogynus flower.

Epigynus Flower	Hypogynus Flower

13. The pictures of different pollination are shown below. Identify and classify them into Anemophily, Hydrophily, Entomophily, Ornithophily, Chiropterophily, Myrmecophily

S.No	Picture	Pollination
1		
2		
3		
4		
5		
6		

14. Various flower parts include Ovary, Fruits, Ovary wall, Ovule, Pericarp, Seed, Fertilized egg, Endosperm. Classify them into parts before fertilization and parts after fertilization.

S.No	Before fertilization	After fertilization
1		
2		
3		
4		

2.c Communicating Skills

1. Describe Phyllode / Phylloclade?
2. Describe various types of venation?
3. Describe the parts of a typical root?
4. Describe the different types of mixed inflorescence with example?
5. Classify Cymose inflorescence and explain any two of them?
6. Give an outline on Racemose types of inflorescence?
7. Explain the hypogynous and epigynous flowers with an example?
8. Explain the different types of calyx?
9. How the symmetry of a flower is determined? Briefly describe the different types of symmetry seen in flower?
10. Describe aggregate fruit with a suitable example.
11. Describe multiple fruit with a suitable example.
12. Bring out the essential difference in the structure of a dicot and monocot seed by means of labeled diagram.

2.d Experimenting Skill

1. Take one whole monocotyledon and dicotyledone plant and separate their parts and label

S.No.	Type of Plant	Plant Parts
1.		
2.		

2. Measure and table the given five leaves and identify and name the plant to which the leaf belong to

S.No.	Details	Leaf - 1	Leaf – 2	Leaf - 3	Leaf – 4	Leaf – 5
1.	Leaf square					
2.	Leaf height					
3.	Leaf parts					
4,	Name of the plant					

3. Pick the two different plants (monocot, dicot) and measure the time for picking out the whole plant from the soil. Give the reason for the difference in the time needed for pulling out the plant from the soil.

S.No.	Plant Type	Time taken for pulled out of the plant from the soil	Reason
1.			
2.			

4. Separate out the flower parts and label the given two flowers.

S.No.	Name of the Flower	Parts of the Flower
1.		
2.		

5. Some grains were given for plantation. Observe their cotyledons, and growth. Measure their sprout height every day and tabulate.

S.No.	Name of the grains / pulses	No of cotyledon	Day taken the cotyledon came from seed	Height of the plumule
1.				
2.				
3.				
4.				
5.				

6. Some flowers are kept on the table. Observe and identify which one is epigynous flower and hypogynous flower separate out and give the reason for it

S.No.	Name of the flower	Male reproductive parts	Female reproductive parts
1.			
2.			

7. Separate out the male reproductive parts and female reproductive parts from the given flowers and label the parts.

Flowers	Flowers Name	Type of Flower
1.		
2.		
3.		
4.		
5.		

8. Some flowers are kept on your table. Count their corolla, calyx and tabulate it.

S.No.	Name of the Flower	No. of Corolla	No. of Calyx
1.			
2.			
3.			
4.			
5.			

9. A fruit basket is kept on your table with lot of fruits. And on the other side 5 baskets are kept with the name simple, aggregate, multiple, fleshy and dry. You have to pick the fruits and put it in the concerned baskets.

S.No.	Fruits Name	Type of Fruits
1.		
2.		
3.		
4.		
5.		

10. Arrange the given flowers based on the fixation of anther namely basifixed, adnate, dorsifixed, versatile.

S.No.	Name of the Flower	Attachment of Pollen type
1.		
2.		
3.		
4.		
5.		

11. Carefully observe the cohesion of stamens of the given flowers and it should be arranged in the following order 1. Monodelphous 2.Diadelphous 3.Polyadelphous 4.Syngenesious 5.Synandrous.

S.No.	Name of the Flower	Pollens attached with Pollen Tube type
1.		
2.		
3.		
4.		
5.		

2.e Collection of Data

1. Bring minimum two underground stem modification used as a vegetable which is available in your home.
2. Collect some leaves (minimum 5) with reticulate venation from your surrounding and label the plant name.
3. Keenly observe all the plants and collect the plant which is containing different phyllotaxy like (i. Alternative, ii. Opposite, iii. Ternate, iv. Whorled) and write the name of the plant.
4. Bring two different small whorl plants from your surroundings, name the category to which it belongs and justify your answer.
5. Collect any two inflorescences with heterogamous head.
6. Collect the following Racemose inflorescence.
   (i.Simple raceme, ii. Compound raceme iii. Spike, iv. Compound spike, v. Spadix vi .Compound spadix)
7. Collect 5 flowers which are polypetalous.
8. Collect 5 flowers which are gamopetalous.
9. Collect the two flowers with valvate and twisted aestivation.
10. Collect the flowers with monadelphous and syngenesious stamens.
11. Collect one sample fruit from the following fleshy fruits.
    (i.Berry, ii.Drupe, iii. Hesperidium, iv. Pepo, v. Pome)

2.fFormulating Models

1. With the help of the given coloured charts make any types of leaves.
2. With help of sponge, water, toothpick, and seeds provided, make the sprout house experiment.
3. Make five types of flowers with coloured papers.
4. Different coloured clay is kept on your table. Use it and make five types of modification of roots.
5. With the use of ice sticks, and coloured papers kept on the table, make any two types of phyllotaxy.
6. With use of chart and colour paper make any two types of pinnately compound leaves (Unipinnate, Bipinnate, and Tripinnate).
7. By the use of thermocol make the pitcher plant model.
8. With the help of toothpick, clay and colour paper make the various types of cymose inflorescence.

9. Different coloured papers, scissors, gum, cello tape are kept on your table. Use these materials and make minimum three types of corolla.
10. Sticks of different sizes, chart, coloured papers and glue are provided to you for making minimum two different types of Aestivation.
11. With the help of coloured clay and chart provided, make five types of cohesion of stamens namely monodelphous, diadelphous, polydelphous, syngenesious and synandrous.
12. Different coloured clay are kept on your table. Use it and make any one fruit from following types of fruits i. Simple, ii. Aggregate, iii. Multiple.

Answer key for Science Process Skills

A) Observation Skill

<table>
<tr><th>Q No</th><th>Value Point</th><th>Materials provided for the task</th><th>Allotment of marks</th><th>Total mark (range)</th></tr>
<tr><td>1</td><td>Similarities between Plant and Animal cells
Cytoplasm, Ribosomes, Mitochondria</td><td>Picture of animal cell and plant cell</td><td>Each similarities carries 1 mark</td><td>0-3</td></tr>
<tr><td>2</td><td>Germination of Seed
Imbibition: Water fills the seed
The water activates enzymes that begin the plant’s growth.
The seed grows a root to access water underground.
The seed grows shoots that grow towards the sun.</td><td>Picture of Germination of seeds</td><td>Each point carries 1 mark</td><td>0-4</td></tr>
<tr><td>3</td><td>
<table>
<tr><th>Flower</th><th>Taste</th><th>Appearance</th><th>Texture</th><th>Smell</th><th>Special Feature if any</th></tr>
<tr><td>Jasmine</td><td>Sweet</td><td>White</td><td>soft</td><td>Aromatic Scent</td><td></td></tr>
<tr><td>Lily</td><td>Masky</td><td>Yellow</td><td>soft</td><td>Pleasant</td><td></td></tr>
<tr><td>Lotus</td><td>Crisper</td><td>Pink</td><td>harder</td><td>Fragrance</td><td>Broad floating leaves</td></tr>
<tr><td>Marigold</td><td>Spicy</td><td>Orange</td><td>harder</td><td>Pungent</td><td></td></tr>
<tr><td>Rose</td><td>Fruity</td><td>Red</td><td>soft</td><td>Rose</td><td></td></tr>
<tr><td>Sunflower</td><td>Bitter Sweet</td><td>Copper</td><td>soft</td><td>Quite Fragrant</td><td></td></tr>
<tr><td>Daisy</td><td>Bitter</td><td>Pink</td><td>soft</td><td>Earthy</td><td></td></tr>
<tr><td>Hibiscus</td><td>Tart</td><td>Red</td><td>soft</td><td>Modest Fragrance</td><td></td></tr>
</table>
</td><td>Real flowers</td><td>Each flower carries 1 mark</td><td>0-8</td></tr>
<tr><td>4</td><td>Herbarium
Name of the plant
Height of plant
Date collected
Location</td><td>Herbarium Sheet</td><td>Each point carries 1 mark</td><td>0-4</td></tr>
<tr><td>5</td><td>
<table>
<tr><td colspan="2">Differences of simple leaf and compound leaf</td></tr>
<tr><td>Axillary bud is present in the axil of a simple leaf.</td><td>Axillary bud is present in the axil of a com pound leaf.</td></tr>
<tr><td>Stipules are present at the base of simple leaves.</td><td>Stipules are not present at the base of the leaflets.</td></tr>
<tr><td>The incisions are not deep enough to divide the blade into leaflets.</td><td>It is divided into distinct parts called leaflets.</td></tr>
</table>
</td><td>Real simple and compound leaves</td><td>Each point carries $\frac{1}{2}$ mark</td><td>0-3</td></tr>
</table>

<table>
<tr><th>Q No</th><th>Value Point</th><th>Materials provided for the task</th><th>Allotment of marks</th><th>Total mark (range)</th></tr>
<tr><td>6</td><td>
<table>
<tr><td colspan="2">Difference between fresh plant and dried plant</td></tr>
<tr><td>Its looks very fresh</td><td>Its look very dried</td></tr>
<tr><td>Weight and shape of the leaves and stems are very high</td><td>Weight and shape of the leaves and stems are very low</td></tr>
<tr><td>It can survive</td><td>It cannot survive</td></tr>
<tr><td>Most of the plants are green in colour</td><td>Most of the plants are in light shade of yellow and brown in colour</td></tr>
</table>
</td><td>Real fresh plant and dried plant</td><td>Each point carries $\frac{1}{2}$ mark</td><td>0-4</td></tr>
<tr><td>7</td><td>Name of the picture is Cuscuta plant
It is a parasitic on much crop plant.
They have no green tissues.
They have herbaceous stems and small flowers in Ebracteate clusters.</td><td>Picture of Cuscuta plant</td><td>Each point carries 1 mark</td><td>0-4</td></tr>
<tr><td>8</td><td>
<table>
<tr><th>Picture A</th><th>Picture B</th></tr>
<tr><td>It is a Racemose inflorescence.</td><td>It is a Cymose inflorescence.</td></tr>
<tr><td>It is swollen and fleshy inflorescence.</td><td>Flowers follow the basipetal pattern of growth.</td></tr>
<tr><td>Axis is branched and bears sessile flowers.</td><td>The tip of the inflorescence stops growing after producing a flower.</td></tr>
<tr><td>There is a thick and large boat shaped bract called spathe.</td><td>The flower is the terminating point of each floral axis.</td></tr>
</table>
</td><td>Picture of Racemose and Cymose inflorescence</td><td>Each point carries $\frac{1}{2}$ mark</td><td>0-4</td></tr>
<tr><td>9</td><td>Head or capitulum inflorescence
The main axis of the inflorescence is flattened and functions as the thalamus.
This bears numerous floretsin acropetal order.
The inflorescence is surrounded by an involucre of bracts which are green in colour.
The involucre protects the young flowers and fruits.</td><td>Real head inflorescence</td><td>Each point carries 1 mark</td><td>0-4</td></tr>
<tr><td>10</td><td>Margine of the leaves
Entire, Lobed, Crenate, Undulate</td><td>Real leaves</td><td>Each point carries 1 mark</td><td>0-4</td></tr>
<tr><td>11</td><td>Shape of the leaves
Linear, Elliptical, Lanceolate, Ovate, Oblong, Cordate</td><td>Real leaves</td><td>Each point carries 1 mark</td><td>0-6</td></tr>
<tr><td>12</td><td>Arrangement of leaves
Compound leaves
Imparipinnate compound leaves
Palmately compound leaves
Multifoliate compound leaves</td><td>Real plants with different arrangement of leaves</td><td>Each point carries $\frac{1}{2}$ mark</td><td>0-2</td></tr>
<tr><td>13</td><td>Types of corolla
Crucifom
Caryophyllaceous
Rosaceous
Papilionaceous</td><td>Real flowers with different corolla</td><td>Each point carries $\frac{1}{2}$ mark</td><td>0-2</td></tr>
<tr><td>14</td><td>Aestivation
Valvate aestivation
Open aestivation</td><td>Real flowers</td><td>Each point carries 1 mark</td><td>0-1</td></tr>
<tr><td>15</td><td>Cohesion of stamen
Syngenesious</td><td>Real flower</td><td>Each point carries 1 mark</td><td>0-2</td></tr>
</table>

Q No	Value Point	Materials provided for the task	Allotment of marks	Total mark (range)
16	Parietsal Placentation	Real fruit	Each point carries 1 mark	0-1
17	Simple fleshy fruit Multiple fruit	Real fruits	Each point carries 1 mark	0-2
18	Asexual Propagation	Picture of Eichhornia	Each point carries 1 mark	0-2

B) Classification Skill

Q No	Value Point	Materials provided for the task	Allotment of marks	Total mark (range)
1	**Simple Fruits -** Pome, Lemon, Cucumber, Apple, Tomato **Multiple Fruits** Orange, Blackberries, Pineapple, Strawberries, Pear	Real simple fruits and multiple fruits	Each simple fruit carries $\frac{1}{2}$ mark Each multiple fruit carries $\frac{1}{2}$ mark	0-5
2	**Monocotyledon Seeds** Wheat, Rice, Bajra, Onion, Barley **Dicotyledon Seeds** Soya, Tomato, Jowar, Brinjal, Sesame,	Real monocotyledon and dicotyledon seeds	Each Monocotyledon Seeds carries $\frac{1}{2}$ mark Each Dicotyledon Seeds carries $\frac{1}{2}$ mark	0-5
3	**Racemoseinfloresence** Cauliflower, Amaranthus, Coriander **Cymose inflorescence** Maize, Potato, Pepper	Picture of Racemoseinfloresence and Cymose inflorescence	Each infloresense carries $\frac{1}{2}$ mark	0-3
4	**Stem** Carrot, Sugarcane, Betroot, Banyan **Roots** Potato, Ginger, Oputia, Asparagus **Leaf** Nepenthus, Lathyrus, Bladder Plant, Acacia	Picture of modifications of roots stems, roots and leaves	Group of stem carries 1 mark Group of leaf carries 1 mark Group of root carries 1 mark	0-3
5	**Hydrophytes** Eichhornia, Wolffia, Cerotophyllum, Nelumbium **Mesophytes** Sunflower plant, Hibiscus plant, Mango, Heterophylla **Xerophytes** Euphorbia, Opuntia	Picture of Hydrophytic, Mesophytic and Xerophytic plants	Each hydrophyte plant carries $\frac{1}{2}$ mark. Each mesophyte plant carries $\frac{1}{2}$ mark. Each xerophyte plant carries $\frac{1}{2}$ mark.	0-5
6	**Pulses** Dal, Mungdal, Green gram, Bengal gram, and Horse gram **Cereals** Wheat, Maize, Rye, Rice, Ragi	Real pulses and cereals	Each pulses carries $\frac{1}{2}$ mark. Each cereals carries $\frac{1}{2}$ mark.	0-5

Q No	Value Point	Materials provided for the task	Allotment of marks	Total mark (range)
7	**Dry Fruits** Almond, Apricot, Betel nut, Cashew nut **Fleshy Fruits** Apple,Orange, Pineapple, Cucumber	Real dry and fleshy fruits	Each dry fruit carries $\frac{1}{2}$ mark Each fleshy fruit carries$\frac{1}{2}$ mark	0-4
8	**Reticulate venation** Mango, Guava, Neem, Fig, **Parallel venation** Grass, Coconut, Maize, Bajra	Mango, Guava, Grass, Coconut, Neem, Fig, Maize, Bajra	Each Reticulate venation plant carries $\frac{1}{2}$ mark Each Parallel venation plant carries $\frac{1}{2}$ mark Four Parallel venation carried 2 marks	0-4
9	**Modification of Leaves** Tendrils, Spines, Pitcher, Bladder, Phyllode **Uses of Modification** Climbing, Protection, Capture and Digest the Insects, Trapping the insects, Synthesis of food.	–	Each modification of leaves carries $\frac{1}{2}$ mark 5 modification of leaves carries$2\frac{1}{2}$ mark Each use of modification of leaves carries $\frac{1}{2}$ mark 5 use of modification of leaves carries$2\frac{1}{2}$ marks	0-5
10	**Root Modification** Carrot, Asparagus, Sweet Potato, Raddish, Dahlia, Portulaca **Stem Modification** Turmeric, Potato, Colocasia, Gladiolus	–	Each root modification carries $\frac{1}{2}$ mark Each stem modification carries $\frac{1}{2}$ mark	0-5
11	**Types of Cohesion of stamens** Polyadelphous, Monodelphous, Syngenesious, Synandrous, Polyandrous, Diadelphous.	Picture flowers with different types of cohesion of stamens	Each Types of Cohesion carries 1 mark	0-6
12	**Epigynus Flower** Daffodils, Water lily **Hypogynus Flower** Rose, Murraya	Picture of Epigynous flower and Hypogynous flower	Each flower carries $\frac{1}{2}$ mark	0-2
13	**Types of Pollination** Anemophily, Hydrophily, Entomophily, Ornithophily, Chiropterophily, Myrmecophily	Pictures of different pollination	Each pollination carries 1 mark	0-6
14	Flower parts after fertilization Ovary-Fruit Ovary wall-Pericarp Ovule-Seed Fertilized egg-Endosperm	Real flower and fruit	Each part carries 1 mark	0-4

C) Communicating Skills

Q No	Value Point	Allotment of marks	Total mark
1	Green, flattened or cylindrical stems with nodes and internodes.	Each point carries 1 mark.	0-5
	The leaves are reduced to spines to reduce the loss of water by transpiration.		
	The stem becomes flat like a leaf and performs the function of photosynthesis.		
	Petiole or any part of the rachis becomes flattened or winged taking the shape of the leaf and turning green in colour.		
	The wing of the phyllode normally develops in the vertical direction so that sunlight cannot fall on its surface.		
2	The arrangement of veins in the leaf blade or lamina is called venation.	Each point carries 1 mark.	0-5
	Reticulate venation and Parallel venation.		
	Reticulate venation is common in all dicot leaves.		
	All the veins run parallel to each other.		
	The arrangement of leaves on the stem or the branches is known as phyllotaxy.		
3	The root system is typically a non-green underground descending portion of the plant axis.	Each point carries 1 mark.	0-5
	The roots do not have nodes and internodes.		
	Root is positively geotropic and negatively phototropic.		
	Do not have chlorophyll pigments and hence they cannot perform photosynthesis.		
	Regions of typical roots areRoot Cap, Meristematic Zone or Zone of cell division, Zone of elongation, Zone of cell differentiation.		
	The lateral branches of the roots are endogenousin origin.		
4	The axis starts as a racemose inflorescence.	Each point carries 1 mark.	0-5
	A number of simple dichasial cymes arranged in a racemose manner.		
	A pair of dichasial cymes arises from the axils of opposite flowers and grows as monochasialscorpioid cymes.		
	Several cymose clusters are arranged on the swollen inflorescence axis from base to apex.		
	Each cymose cluster is surrounded by a large bract called spathe.		
5	The type of the stem or the axil of the leaf may show a single flower which shows a joint on the pedicel.	Each point carries 1 mark.	0-5
	Simple Dichasium is a group of three flowers and the inflorescence axis ends in a flower.		
	In Compound Dichasiathe tip of the inflorescence ends in a flower. From the lateral bracts of this flower a pair of branch arise, each ending in a flower.		
	The inflorescence axis terminates in a flower. Of the two lateral bracts only one branches further.		
	The main axis terminates in a flower. The lateral branches arising from the bracts are on one side only giving rise to a helical appearance.		
6	Main axis elongated, main axis shorted, main axis ending in flowers, main axis flattered.	Each point carried 1 mark.	0-5
	Main axis elongated: simple raceme, compound raceme, spike, compound spike, spadix, compound spadix.		
	Main axis shorted : corymb		
	Main axis ending in flowers: umbel, compound umbel.		
	Main axis flattered: head of capirulum, compound head.		
7	When the thalamus is convex or elongated, the carpel occupies the top most position on it.	Each point carried 1 mark.	0-5
	The other floral members (sepals, petals, and stamens) are placed below them called Hypogyny.		
	The flower is described as hypogynous.		
	When the thalamus is cup shaped, the lower part of the ovary is situated at the bottom of the cup and also fused with the inner wall of thalamus called Epigyny.		
	The other floral members appear to be inserted upon the ovary. This mode on arrangement is called epigyny.		
8	The calyx is the outermost whorl of a flower.	Each point carried 1 mark.	0-5
	The sepals are usually green in colour, but sometimes, become brightly coloured then, said to be petaloid.		
	The primary function of the calyx is protective. It protects the inner parts of the flower from mechanical injury, rain and excessive sun shine, and from drying out in the bud condition.		
	The calyx may be regular or irregular. The sepals are free from one another and is said to be polysepalous, when united, gamosepalous.		
	Duration of Calyx: Caducous or Fugacious, Deciduous, Persistent, Accrescent.		
9	The mode of arrangement of either sepals or petals of a flower in bud condition is said to be an Aestivation.	Each point carries 1 mark.	0-5
	Sepals or petals in a whorl just meet by their edges without overlapping is called valvate aestivation.		
	Sepals or petals in a whorl just meet by their edges without overlapping is called twisted aestivation.		
	One sepal or petal is internal or being overlapped on both the margins and one sepal or petal is external with both of its margins overlapping called imbricate.		
	Descendingly Imbricate or Vexillary Aestivationis a type of aestivation where posterior petal overlaps one margin of the two lateral petals.		
	In Ascendingly imbricate aestivation,the posterior odd petal is innermost being over lapped by one margin of the two lateral petals.		
10	An aggregate fruit develops from a single flower.	Each point carries 1 mark.	0-5
	Multicarpellary, apocarpous, superior ovaries and each of them develops into simple fruitlets.		
	An aggregate fruit therefore consists of a collection of simple fruits as in Polyalthia.		
	The carpels of the flower unite.		
	Carpel gives rise to a single fruit as in Annonasquamosa.		
11	Multiple or composite fruit is formed by all the flowers of a whole in florescence grouped together to give a single big fruit.	Each point carries 1 mark.	0-5
	Multiple fruits are false fruits.		
	The rachis and all the floral parts of the female inflorescence fuse together forming composite fruit.		
	The edible part of the fruit represents the perianth, which is fleshy and juicy.		
	The sterile or unfertilized flowers, occur in the form of numerous, elongated, whitish, flat structures in between the edible flakes.		
12	Monocot seed: draw a diagram and label it.	Each diagram carries 1 $\frac{1}{2}$ marks and label carries 1 mark.	0-5
	Dicot seed: draw a diagram and label it.		

D) Experimenting Skill

Q No	Value Point	Allotment of marks	Total mark (range)
1	Students need to take one monocotyledon and one dicotyledonous plant and label the parts.	Name the plant type carries 2 marks (each-1 mark) Label the plant parts carries 3 marks each plant label $1\frac{1}{2}$ marks	0-5
2	Measure and table the given five leaves and identify and name the plant. Leaf square Leaf height Leaf parts Name of the plant	Each leaf (square, height, parts and name of the plant) carries 1 mark 5 leaves carries 5 marks	0-5
3	Plant Type Time taken for pulled out the plant from the soil Reason	Two Plants type carries 1 mark Time taken for pulled out the two plants carries 1 mark Reason for each carries $1\frac{1}{2}$marks	0-5
4	Name of the Flower Parts of the Flower	Name of each flower carries 1 mark Parts of each flower carries $1\frac{1}{2}$ marks	0-5
5	Name of the grains / pulses No of cotyledon Days taken the cotyledon came from seed. Height of the plumule	Name of the grains / pulses, No of cotyledon, Days taken the cotyledon came from seed, and Height of the plumule carries 1 mark	0-5
6	Name of the flower Male reproductive parts Female reproductive parts	Name of the flower each carries 1 mark, Male reproductive parts carries $1\frac{1}{2}$marks, Female reproductive parts carries $1\frac{1}{2}$ marks	0-5
7	Flowers Name Type of Flower	Name of each flower carries $\frac{1}{2}$ mark Type of flower carries $\frac{1}{2}$ marks	0-5
8	Name of the Flower No. of Corolla No. of Calyx	Answer with name of the flower, no. of Corolla, no of Calyx each flower carries 1 mark 5 flower carries 5 marks	0-5
9	Fruits Name Type of Fruits	Name of the fruit, type of fruit, each carries 1 mark 5 fruits carries 5 marks	0-5
10	Name of the Flower. Attachment of Pollen type.	Name of the flower and attachment of pollen type each carries 1 mark 5 flowers carries 5 marks	0-5
11	Name of the Flower. Pollens attached with Pollen Tube type.	Name of the flower and attachment of pollen tube type each carries 1 mark 5 flowers carries 5 marks	0-5

E) Collection and Interpretation of Data

Q No	Value Point	Allotment of marks	Total mark (range)
1	Students need to collect and bring five different types of stem modification.	Each type of modified stem carries 1 mark	0-5
2	Students need to collect and bring five different types of leaves with reticulate venation.	Each type of leaf carries 1 mark	0-5
3	Students need to Keenly observe and collect leaves which are containing five different phyllotaxy.	Each type of leaf carries 1 mark	0-5
4	Students need to Bring two different small whorl plants.	Each type of plant carries $2\frac{1}{2}$ marks.	0-5
5	Students need to Collect any two inflorescences with heterogamous head.	Each inflorescence with heterogamous head carries $2\frac{1}{2}$ marks.	0-5
6	Students need to Collect Racemose inflorescence i. Simple raceme, Compound raceme, Spike, Compound spike, Spadix.	Each Racemose inflorescence carries 1 mark	0-5
7	Students need to Collect 5polypetalous.	Each polypetalous carries 1 mark	0-5
8	Students need to Collect 5 gamopetalous.	Eachgamopetalouscarries 1 mark	0-5
9	Students need to collect two flowers with valvate and twisted aestivation.	Each flower carries $2\frac{1}{2}$ marks.	0-5
10	Students need to collect flowers with monadelphous and syngenesious stamens.	Each flower carries $2\frac{1}{2}$ marks.	0-5
11	Students need to collect one sample fruit: i. Berry, ii. Drupe, iii. Hesperidium, iv. Pepo, v. Pome.	Each fruit carries 1 mark	0-5

F) Formulating models

Q No	Value Point	Materials provided for the task	Allotment of marks	Total mark (range)
1	Students need to make five different types of leaves.	Coloured chart paper.	Each type of leaf carries 1 mark.	0-5
2	Students need to make Sprout house.	Sponge, water, toothpick, and seeds.	Marks based on the perfection and appropriateness in the model making.	0-5
3	Students need to make five types of flowers.	Coloured chart paper.	Each type of flower carries 1 mark.	0-5
4	Students need to make five types of modification of roots.	Coloured clay	Each type of modification of roots carries 1 mark.	0-5
5	Students need to make any two types of phyllotaxy.	Ice sticks, and coloured papers.	Each type of phyllotaxycarries $2\frac{1}{2}$ marks.	0-5
6	Students need to make any two types of pinnately compound leaves.	Chart paper and colour paper.	Each type of pinnately compound leaves carries $2\frac{1}{2}$ marks.	0-5
7	Students need to make the pitcher plant model.	Thermocol	Proper model carries 5 marks (depending upon the shape of the model the marks has been given)	0-5

8	Students need to make two types of cymose inflorescence.	Toothpick, clay and colour paper.	Each type of cymose inflorescence compound leaves carries $2\frac{1}{2}$ marks.	0-5
9	Students need to make minimum five types of corolla.	Colour papers, scissors, gum, cello tape.	Each type of corolla carries 1 mark.	0-5
10	Students need to make minimum two different types of Aestivation.	Sticks of different sizes, chart paper, colour papers and glue.	Each type of Aestivation compound leaves carries $2\frac{1}{2}$ marks.	0-5
11	Students need to make five types of cohesion of stamens.	Coloured clay and chart paper.	Each type of cohesion of stamens carries 1 mark.	0-5
12	Students need to make any one fruit from following types of fruits i. Simple, ii. Aggregate.	Coloured clay	Each type of fruit stamens carries 1 mark.	0-5

APPENDIX-3

Rating Scale on Attitude Towards Science (Sangeetha , T & Indu H, 2017)

Name :

Sex : Male/Female

Instruction :

To know your attitude towards science you are given 50 statements below. After reading each statement, your response about it has to be recorded in terms of Strongly Agree, Agree, and Strongly Disagree. After reading each statement carefully, put (✓) mark against the option you would like to select. For example, if you strongly Agree with a statement put (✓) mark against "Strongly Agree". Your response to the statements will be kept confidential and will be used only for research purpose. Therefore you are requested to respond to these statements freely and frankly. There is no right or wrong answer. Do not leave any statement unanswered.

S. No	Statements	Strongly Agree	Agree	Strongly Disagree
1.	I understand that learning Science is very important for the development of one's country.			
2.	I am of the opinion that science and technology are the root cause of many problems in our world.			
3.	Science lessons are exciting to me.			
4.	I do not have much interest in Science.			
5.	To my belief, scientific discoveries do more harm than good.			
6.	I have my passion for becoming a scientist.			
7.	It gives me immense pleasure to read science fiction, novels, and listen to scientific news.			
8.	For me, science learning is quick and easy.			
9.	The subject that I love most is science.			
10.	I find that science is so exciting because we can find out the answer to many questions through practical experiments.			
11.	Science programs and shows inspire me.			
12.	I understand that the benefits of science are greater than its harmful effects.			
13.	I like to observe and participate in demonstrations, experiments, and all activities related to Science.			
14.	I believe that money spent on scientific research is a waste.			
15.	My thinking and inventive skills increase by having an interest in science.			
16.	I do not want a science background to build my future and career.			
17.	To my belief science is a very tough and complicated subject.			
18.	I think that my employment opportunities triple when I take science as my optional subject.			
19.	I don't think that human life is complete and happy only because one has mastered scientific skills in his life.			
20.	The developments in science have given rise to many			

S. No	Statements	Strongly Agree	Agree	Strongly Disagree
	devices which has made human life purely mechanical in nature.			
21.	I believe that many impossible things have become possible only because of the developments in science and technology.			
22.	I am curious to find out the reason behind natural events like earthquakes, lightning, etc.			
23.	My ambition is to become a science teacher in the future.			
24.	I would love to pursue my career as a science teacher.			
25.	Science is a thrilling subject for me.			
26.	Science is a practical subject useful to all human beings.			
27.	Science activities and experiments are always interesting and fun-filled.			
28.	Science learning is an enjoyable experience to me and never a herculean task.			
29.	Pursuing a career in science is my dream.			
30.	I feel I am unable to learn advanced science.			
31.	My opinion about science as a subject is that it is a tough one.			
32.	Practical work in science is exciting.			
33.	I like watching science programmes on Television.			
34.	I am interested in science only because I think that it is only going to help me in my future career.			
35.	My science grades are always top in my school.			
36.	I will be revealing the truth of any statement after finding out its authenticity, even in troublesome situations.			
37.	The reasoning power and logical thinking are higher among science learners.			
38.	I get discouraged often when I am unable to answer some science-related questions.			
39.	Everyday life might be impossible without knowledge of science.			
40.	Sometimes I feel bored while doing Science practical experiments.			
41.	In my opinion, Science is best learned when it is like 'learning by doing'.			
42.	I am interested in doing science experiments even in my home.			
43.	I always keep as a treasure the science book or experiment kit given to me as a gift.			
44.	A scientist inspires me a lot and I always dream to become a great scientist.			

APPENDIX- 4

Metacognitive Awareness Inventory (*Schraw and Dennison,* 1994)

Q.No.	STATEMENT	YES	NO
1	I ask myself periodically whether I am meeting my goals.		
2	I consider several alternatives to a problem before I answer.		
3	I try to use strategies that I have worked in the past.		
4	I pace myself while learning in order to have enough time.		
5	I understand my intellectual strengths and weakness.		
6	I think about what I really should learn before I begin a task.		
7	I know how well I did once I finish a task.		
8	I set specific goals before I begin a task.		
9	I slow down when I encounter important information.		
10	I know what kind of information is most important to learn.		
11	I ask myself whether I have considered all options when solving a problem.		
12	I am good at organising information.		
13	I consciously focus my attention on important information.		
14	I have specific purpose for each strategy I use.		
15	I learn best when I know something about the topic.		
16	I know what the teacher expects me to learn.		
17	I am good at remembering information.		
18	I use different learning strategies depending on the situation.		
19	I ask myself if there was an easier way to do things after I finish a task.		
20	I have control over how well I learn.		
21	I periodically review to help me understand important relationships.		
22	I ask myself questions about the material before I begin.		
23	I think of several ways to solve a problem and choose the best one.		
24	I summarize what I have learned after I finish.		
25	I ask others for help when I don't understand something.		
26	I can motivate myself to learn when I need to.		
27	I am aware of what strategies I use when I study.		
28	I find myself analyzing the usefulness of strategies while I study.		
29	I use my intellectual strength to compensate for my weakness.		
30	I focus on the meaning and significance of new information. .		

Q.No.	STATEMENT	YES	NO
31	I create my own examples to make information more meaningful.		
32	I am a good judge of how well I understand something.		
33	I find myself using helpful learning strategies automatically.		
34	I find myself pausing regularly to check my comprehension.		
35	When I use each strategy I know when it will be most effective.		
36	I ask myself how well I accomplished my goals once I have finished my learning.		
37	I draw pictures or diagrams to help me understand while learning.		
38	I ask myself if I have considered all options after I solve a problem.		
39	I try to translate new information into my own words.		
40	I change strategies when I fail to understand.		
41	I use the organizational structure of the text to help me learn.		
42	I read instructions carefully before I begin a task.		
43	I ask myself whether I am relating my reading to what I already know.		
44	I re-evaluate my assumptions when I get confused.		
45	I organize my time to best accomplish my goals.		
46	I learn more when I am interested in the topic.		
47	I learn the things by breaking it into smaller steps.		
48	I focus on overall meaning rather than specifics.		
49	I ask myself questions about how well I am doing while I am learning something new.		
50	Once I finish a task, I ask myself whether I have learned as much as I could.		
51	I stop and go back to new information that is not clear.		
`52	I stop and read again from the same point when I get confused.		

APPENDIX- 5

Interview Schedule for students

1. Did you like Inquiry-Based Instruction method of teaching? Why?
2. Whether all the experiments and activities included in the Inquiry-Based Instruction was appropriate to you?
3. How did you feel about learning from Inquiry-Based Instruction garden and learning from lab activities?
4. What differences did you feel while learning through inquiry based teaching?
5. Can you observe and classify the objects, things and real plants based on similarities and difference?
6. How did you feel about learning from Inquiry-Based Instruction garden?
7. What do you consider to be the important outcome of inquiry-based teaching and learning?

Interview Schedule for teachers

1. What is your opinion about Inquiry-Based Instruction ?
2. Do you feel that Inquiry-Based Instruction is possible within given time period?
3. Whether the school will be benefitted from Inquiry-Based Instruction ?
4. Did you observe any changes in the students who were involved in the Inquiry-Based Instruction ?
5. Do you feel there are any obstacles to implement this method of teaching?
6. What do you consider to be the important outcomes of inquiry-based teaching?
7. Do you like to continue this Inquiry-Based Instruction in future?

APPENDIX-6

6.a Item Analysis for Achievement in Science test (Sangeetha, T & Indu H, 2017)

Item No	di	dp	Item No	di	dp	Item No	di	dp
1	0.58	0.83*	20	0.62	0.75*	38	0.33	0.33*
2	0.74	0.58*	21	0.54	0.58*	39	**0.79**	**0.08**
3	0.62	0.75*	22	0.45	0.58*	40	0.29	0.58*
4	0.54	0.91*	23	0.54	0.25*	41	0.37	0.58*
5	0.45	0.91*	24	0.41	0.33*	42	0.66	0.33*
6	0.66	0.66*	25	0.25	0.33*	43	0.62	0.83*
7	0.25	0.33*	26	0.29	0.58*	44	0.41	0.33*
8	0.79	0.25*	27	0.45	0.91*	45	0.54	0.41*
9	**0.04**	**0.08**	28	0.37	0.75*	46	0.37	0.75*
10	0.54	0.91*	29	0.33	0.66*	47	0.54	0.58*
11	0.83	0.33*	30	0.58	0.33*	48	0.29	0.25*
12	0.62	0.75*	31	0.70	0.41*	49	0.62	0.58*
13	0.37	0.75*	32	0.66	0.66*	50	0.70	0.25*
14	0.74	0.58*	33	0.54	0.75*	51	**0.66**	**1.33**
15	0.45	0.91*	34	0.45	0.58*	52	0.45	0.41*
16	0.58	0.83*	35	0.54	0.41*	53	0.70	0.58*
17	0.83	0.33*	36	0.29	0.25*	54	0.37	0.25*
18	0.62	0.58*	37	0.62	0.33*	55	0.58	0.83*
19	0.87	0.25*	38	0.33	0.33*	56	0.74	0.58*
						57	0.62	0.75*
						58	0.87	0.25*

6.bItem Analysis for Scale of Attitude towards Science (Sangeetha, T & Indu H, 2017)

Item No	t-value	Item No	t-value
1	12.42*	26	19.53*
2	9.05*	27	11.60*
3	14.71*	28	16.37*
4	8.79*	29	8.95*
5	17.31*	30	14.62*
6	13.35*	31	15.49*
7	13.09*	32	25.22*
8	10.11*	33	10.53*
9	**1.45**	34	7.71*
10	22.62*	35	14.09*
11	13.41*	36	25.05*
12	20.51*	37	**1.79**
13	28.54*	38	9.71*
14	34.47*	39	16.10*
15	19.12*	40	**0.92**
16	5.87*	41	6.21*
17	12.23*	42	25.57*
18	8.51*	43	13.10*
19	13.41*	44	8.12*
20	3.42*	45	3.96*
21	22.10*	46	5.74*
22	**1.67**	47	14.41*
23	17.52*	48	10.18*
24	13.41*	49	21.85*
25	16.81*	50	19.01*

Item Analysis for Process Skills Questionnaire (Sangeetha, T & Indu H, 2017)

6.c Observation Skill

Item No	di	dp	Item No	di	dp
1	0.70	0.58*	13	0.37	0.41*
2	0.58	0.33*	14	**0.16**	**0.33**
3	0.62	0.58*	15	0.62	0.75*
4	**0.66**	**0.16**	16	0.70	0.25*
5	0.45	0.41*	17	**0.18**	**0.22**
6	0.54	0.25*	18	0.58	0.33*
7	0.87	0.25*	19	0.45	0.41*
8	0.66	0.66*	20	**0.75**	**0.16**
9	**0.16**	**0.03**	21	0.83	0.33*
10	0.70	0.41*	22	**0.12**	**0.03**
11	0.87	0.25*	23	0.70	0.58*
12	0.54	0.58*	24	0.83	0.33*

6.d Classification Skill

Item No	di	dp
1	0.62	0.58*
2	0.66	0.66*
3	0.45	0.41*
4	0.62	0.75*
5	**0.45**	**0.08**
6	0.87	0.25*
7	0.83	0.33*
8	0.70	0.41*
9	0.37	0.41*
10	0.54	0.58*
11	0.54	0.75*
12	0.29	0.25*
13	**0.24**	**0.18**
14	0.62	0.58*
15	0.45	0.41*
16	0.79	0.25*

6.e Communicating Skill

Item No	di	dp
1	0.70	0.41*
2	**0.12**	**0.25**
3	0.37	0.41*
4	0.45	0.41*
5	**0.66**	**1.33**
6	0.66	0.66*
7	0.54	0.58*
8	**0.75**	**0.16**
9	0.83	0.33*
10	0.62	0.58*
11	0.79	0.25*
12	0.62	0.75*
13	0.58	0.33*
14	0.62	0.58*
15	0.37	0.25*

6.f Experimenting Skill

Item No	di	dp
1	0.58	0.33*
2	0.29	0.25*
3	0.45	0.41*
4	0.62	0.58*
5	**0.79**	**0.08**
6	0.37	0.41*
7	0.62	0.75*
8	**0.12**	**0.25**
9	0.83	0.33*
10	0.41	0.33*
11	0.54	0.75*
12	0.70	0.58*
13	0.70	0.25*

6.g Skill of Collection and Interpretation of data

Item No	di	dp
1	0.83	0.33*
2	0.45	0.41*
3	**0.16**	**0.33**
4	0.62	0.58*
5	**0.41**	**0.16**
6	0.87	0.25*
7	0.66	0.66*
8	0.70	0.58*
9	0.37	0.41*
10	0.58	0.33*
11	0.70	0.41*
12	0.54	0.58*
13	0.29	0.25*
14	0.62	0.58*
15	**0.37**	**0.25**
16	0.79	0.25*

*Selected Item, di=differential index, dp= discriminative power

6.h Skill of Formulating Models

Item No	di	dp
1	0.29	0.25*
2	0.37	0.41*
3	0.54	0.75*
4	0.45	0.41*
5	0.58	0.33*
6	0.41	0.33*
7	0.54	0.25*
8	0.37	0.41*
9	0.70	0.58*
10	0.54	0.58*
11	**0.58**	**0.16**
12	0.87	0.25*
13	**0.16**	**0.33**
14	0.62	0.58*