Manimegalai

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 12B
Coimbatore - 641 043, Tamil Nadu, India

Bachelor's Degree Examination – March 2021
I Semester

Class : I UG **Time : 3 Hours**
Major : Physics **Max. Marks: 100**

18BPHC02 Heat and Thermodynamics

Part A **10 x 1 = 10**
Choose the Correct Answer

1. Thermoelectric thermometers are working on the principle of
   a. Peltier effect b. Thomson effect
   c. Seebeck effect d. Material Expansion

2. According to Dulong and Pettit'slaw, the average energy of an atom of a solid at temperature T is
   a. 1/2 KT b. 3KT c. $(KT)^{1/2}$ d. 2k/T

3. In Nernst Vacuum Calorimeter, while used to find specific heat of solids at low temperature the heat loses are practically eliminated, it is because of experiment is performed in
   a. ice b. air c. vacuum d. water

4. The critical temperature of Helium is
   a. 4.2 ^{o}C b. -264.8 ^{o}C c. 0K d. -267.8 ^{othe}C

5. The value of critical volume Vc according to Vander Waals' gas equation is
   a. V_c=b b. V_c =3b c. V_c =2b d. V_c =3KT

6. The mean free path of a gas depends on
   a. pressure b. volume c. viscos force d. density

7. In Carnot cycle the first step is
   a. Isothermal expansion b. Adiabatic expansion
   c. Isothermal compression d. Adiabatic l compression

8. An engine works between 30K and 300K. The efficiency is
   a. 52% b. 90% c. 47% d. 20%

9. In an adiabatic process the entropy is
   a. decreased b. not changed
   c. reached the maximum d. becomes zero

10. The Clapeyron equation is (L-quantity of heat required, V-specific volume, p- pressure, T- temperature)
    a. $dP/dT = L/T(V_2-V_1)$ b. $dT/dP = L/T(V_2-V_1)$
    c. $dP/dT = L/T(V_2-V_1)^{1/2}$ d. $dP/dT = T(V_2-V_1)/L$

Part B **5 x 6 = 30**

Answer ALL questions

Each answer should not exceed 400 words or two pages

11.a. What are the different types of specific heats of a gas? Deduce the relation between them.

(or)

11.b. State Dulong and Petit's law and justify it through law of equipartition of energy.

12.a. State and verify the Newton's law of cooling.

(or)

12.b. Describe the method of liquefaction of hydrogen with diagram.

13.a. What are the postulates of kinetic theory of gases?

(or)

13.b. Show that for a gas possessing f degrees of freedom, the ratio of two specific heats is $1+2/f$ and the atomicity of a molecule is given by $f= 2/\gamma-1$.

14.a. Distinguish between reversible and irreversible process.

(or)

14.b. A Carnot engine whose low temperature reservoir is at 7 ^{o}C has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees should the temperature of the high temperature reservoir be increased.

15.a. What are the physical significance of entropy?

(or)

15.b. State and explain the Nernst's heat theorem.

Part C **5 x 12 = 60**

Answer ALL questions

Each answer should not exceed 800 words or four pages

16.a. Describe the method of determination of specific heat of gas at constant pressure using continuous flow electrical method and list the advantages.

(or)

16.b. Deduce Debye's equation for the atomic heat of a monoatomic solid from Debye's theory and discuss.

17.a. Describe Nernst Vaccum Calorimeter method of determination of the specific heat of solids at low temperature.

(or)

17.b. Give the theory and method of adiabatic demagnetisation with the explanation for T-S diagram.

18.a. State and prove the theorem of equipartition of energy.

(or)

18.b. Derive the Van der Waals' equations of critical constant. Discuss their limitations.

19.a. Deduce the expression for the work done in the processers of Carnot's cycle.

(or)

19.b. What is Otto cycle? Explain. Derive the expression for efficiency.

20.a. Derive Maxwell's thermodynamical general equations connecting the thermodynamic quantities.

(or)

20.b. Discuss the change of entropy in reversible and irreversible process.

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