

(6 pages)

Reg. No. :

Code No. : 41375 E Sub. Code : SMPH 21

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2019.

Second Semester

Physics — Main

THERMAL PHYSICS AND STATISTICAL
MECHANICS

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A super fluid can flow through a capillary tube with _____ resistance.
(a) zero (b) infinite
(c) 1000 kilo ohms (d) none
2. In the adiabatic demagnetization process, the fall in temperature ΔT is _____ if the magnetic field H is greater and initial temperature is lower
(a) smaller (b) greater
(c) zero (d) none

3. The mean free path λ of a gas molecule is inversely proportional to _____ (d-is the diameter of the gas molecule)

(a) $d^{1/2}$ (b) d^2
(c) d^3 (d) $d^{1/3}$

4. The coefficient of viscosity is proportional to _____

(a) $T^{-1/2}$ (b) $T^{3/2}$
(c) $T^{1/2}$ (d) $T^{-3/2}$

5. Efficiency of Carnot engine working between temperatures T_1 and T_2 where ($T_1 > T_2$) is

(a) $\frac{T_2}{T_1}$ (b) $\frac{T_1}{T_2}$
(c) $1 - \frac{T_2}{T_1}$ (d) None

6. An adiabatic process occurs at constant _____

(a) temperature (b) pressure
(c) heat (d) none

7. Entropy is a measure of

(a) perfect order (b) disorder
(c) energy (d) none

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8. The melting point of ice decreases if pressure is
(a) Increased (b) decreased
(c) Constant (d) none
9. According to ——— statistics the energy at absolute zero cannot be zero.
(a) M-B (b) F-D
(c) B-E (d) None
10. Photons have spin value
(a) 0 (b) $\frac{1}{2}$
(c) $\frac{3}{2}$ (d) None

- PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Answer should not exceed 250 words.

11. (a) Define Joule-Kelvin effect What are the results of it?
Or
(b) Explain the liquefaction of hydrogen.

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12. (a) Derive the expression for the coefficient of Viscosity of a gas molecule.

Or

- (b) Derive the expression for the coefficient of diffusion of a gas molecule.

13. (a) State and explain the First law of Thermodynamics.

Or

- (b) Derive the expression for the work done during the adiabatic process.

14. (a) State and explain III law of Thermodynamics.

Or

- (b) Discuss the effect of pressure on the boiling point of a liquid.

15. (a) What are distinguishable and indistinguishable particles?

Or

- (b) How does Fermi Dirac statistics differ from Bose Einstein Statistics?

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[P.T.O.]



PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Answer should not exceed 600 words.

16. (a) What are liquid Helium land II? Discuss the important properties of liquid Helium II.

Or

- (b) Define adiabatic demagnetization. Explain in detail the production of low temperature using it.

17. (a) Derive the expression for thermal conductivity of a gas on the basis of kinetic theory of gases.

Or

- (b) Derive the relations between Van der Waals constants and Critical constants.

18. (a) Discuss with necessary theory, the Construction and working of Otto engine.

Or

- (b) Describe Carnot's cycle and derive the expression for the efficiency of an ideal heat engine.

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19. (a) What is Temperature — Entropy diagram? Find the expression for the efficiency of a Carnot's engine using it.

Or

- (b) State and derive the Clasius – Claperon first latent heat equation.

20. (a) Derive Bose Einstein Distribution law.

Or

- (b) Derive Fermi Dirac Distribution law.

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