(6 pages) **Reg. No. :** .....

Code No. : 10736 E **Sub. Code : EMPH 21**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2024.

Second Semester

Physics — Core

HEAT THERMODYNAMICS AND STATISTICAL PHYSICS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which instrument is used for the measurement of heat?
   (a) Wattmeter
   (b) Energy meter
   (c) Voltmeter
   (d) Calorimeter

2. The Refrigerator works on the principle of _____
   (a) Osmosis
   (b) Centrifugation
   (c) Dispersion
   (d) Evaporation

3. Which law of thermodynamics defines the concept of Temperature?
   (a) First law (b) Second law
   (c) Third law (d) Zeroth law

4. The efficiency of a heat engine can never be _____
   (a) 10% (b) 80%
   (c) 100% (d) More than 60%

5. The S.I. unit of entropy is _____
   (a) J/K (b) J
   (c) J/S (d) J/C

6. The slope of the curve in Clausius – Clapeyron is _____
   (a) P–T plot (b) S–T plot
   (c) V–T plot (d) ρ–T plot

7. Which of the following is the SI unit of Thermal conductivity?

(a) $Wm^{-2}K^{-1}$ (b) WmK^{-1}

(c) $Wm^{-1}K^{-1}$ (d) WmK

8. Heat transfer takes place in liquids and gases is essentially due to ————————

(a) Radiation

(b) Conduction

(c) Convection

(d) Both conduction and convection

9. The crystal planes are described with the help of ————————

(a) Miller Indices (b) Density

(c) Direction (d) Symmetry

10. What is the relation between the K.E. of a gas and its pressure (P)?

(a) $P = \frac{2}{3}E$ (b) $P = 3E$

(c) $P = \frac{1}{3}E$ (d) $E = \frac{2}{3}P$

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the experimental determination of C_p by Regnault's method.

Or

(b) Discuss the practical applications of low temperatures.

12. (a) Explain about the zeroth law of thermodynamics.

Or

(b) Write short notes on Petrol and diesel engines.

13. (a) Discuss entropy change during a irreversible process.

Or

(b) Write a note on third law of thermodynamics.

14. (a) Obtain the expression for Thermal conductivity of a good conductors.

Or

(b) Deduce Newton's law from Stefan's law.

15. (a) Distinguish between micro and macro states.

Or

(b) Discuss about B-E statistics.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Derive the Meyer's relation of Gases.

Or

(b) Describe the porous plug experiment with a neat diagram.

17. (a) State and explain the first law of thermodynamics.

Or

(b) Explain the construction, working and efficiency of a Carnot's engine.

18. (a) Deduce Maxwell's thermodynamical relations.

Or

(b) Derive the Clausius Clapeyron Latent heat equation.

19. (a) Explain the method of finding thermal conductivity of a bad conductor using Lee's Disc method.

Or

(b) Discuss about the energy spectrum of black body.

20. (a) Find the molecular energies in an Ideal gas by applying M-B statistics.

Or

(b) Derive an expression for distribution function for F-D statistics.

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