



ST. FRANCIS DE SALES COLLEGE

A FRANSALIAN INSTITUTE OF HIGHER EDUCATION **AUTONOMOUS**

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END SEMESTER EXAMINATION – APRIL/MAY 2026

PHYSICS – II SEMESTER BSC (Repeaters)

**24BSC24B: KINETIC THEORY OF GASES, HEAT AND
THERMODYNAMICS**

Time: 3 Hours.

Max. Marks: 80

Instruction: *Answer should be written completely in English.*

SECTION – A

Answer any **TEN** questions. Each question carries **TWO** marks.

(10X2=20)

1. Define the specific heat of an ideal gas.
2. What is meant by mean free path?
3. State the zeroth law of thermodynamics.
4. Define open, closed and isolated systems.
5. List the thermodynamic potentials.
6. What is meant by melting?
7. Define the triple point of water.
8. State Wien's Displacement Law.
9. What is emissive power of a body?
10. What is meant by a black body?
11. Distinguish between conduction and convection.
12. Distinguish between natural convection and forced convection.

SECTION – B

Answer any **FOUR** questions. Each question carries **FIVE** marks.

(4X5=20)

13. Calculate the pressure exerted by hydrogen if the density of hydrogen is 0.1 kg/m^3 and the rms speed of hydrogen molecules at that pressure is 2 km/s .
14. In a Carnot engine, the temperature of the source and sink are 500 K and 375 K , respectively. If the engine consumes $25 \times 10^5 \text{ J/cycle}$, find (i) the efficiency of the engine, (ii) work done per cycle, and (iii) heat rejected to the sink per cycle.
15. A gas ($\gamma = 1.4$) of 2 m^3 volume and pressure of $4 \times 10^5 \text{ N/m}^2$ is compressed adiabatically to a volume of 0.5 m^3 . Find its new pressure. Given $4^{1.4} = 6.96$ and $\log_{10}(2.5) = -0.6021$.
16. A Carnot engine develops 100 H.P. and operates between 27°C and 227°C . Find thermal efficiency, heat supplied, and heat rejected. [Data: $1 \text{ H.P.} = 746 \text{ W}$].



17. Calculate the change in the melting point of ice when it is subjected to a pressure of 50 atmospheres. The density of ice = 917 kg/m^3 , and the latent heat of ice = $336 \times 1000 \text{ J/kg}$.
18. If the temperature of a blackbody is increased from 100°C to 400°C , by what factor does the rate of emission increase?

SECTION – C

Answer any **FOUR** questions. Each question carries **TEN** marks.

(4X10=40)

19. State the assumptions of the kinetic theory of gases. Distinguish between average speed, most probable speed, and root mean square speed. State the relation between C_p and C_v for an ideal gas and define γ .
20. Derive the expression for pressure of a perfect gas, $PV = \frac{1}{3} nmc^2$.
21. Describe the Carnot cycle in detail, and represent each stage using a PV diagram.
22. Derive the first and second TdS equations.
23. Explain thermodynamic potentials and derive Maxwell's thermodynamic relations.
24. Explain the concept of thermal conductivity in solids. Justify the suitability of Lee's disc method for measuring the thermal conductivity of poor conductors.

