

II Semester B.Sc. Examination, May 2017
(CBCS) (Freshers) (2016-17 and Onwards)

PHYSICS – II

Mechanics – 2, Heat and Thermodynamics – 2

Time : 3 Hours

Max. Marks : 70

Instruction : Answer five questions from each Part.

PART – A

Answer any five questions. Each question carries eight marks.

(5×8=40)

1. a) What is periodic motion ? Give an example.
b) What is compound pendulum ? Deduce an expression for its time period. (2+6)
2. a) Arrive at the relation between elastic constants $K = \frac{q}{3[1-2\sigma]}$ where symbols have their usual notations.
b) Write the theoretical and practical limiting values of Poisson's ratio. (6+2)
3. a) Give the significance of thermodynamic potentials.
b) Using Maxwell's thermodynamic relations obtain an expression for the difference in specific heats for a perfect gas. (2+6)
4. a) Explain melting and sublimation of a solid.
b) Deduce an expression for Joule-Thomson coefficient. (2+6)
5. a) Distinguish between inertial and non-inertial frames of reference.
b) Show that acceleration is invariant under Galilean transformations. (2+6)
6. a) State the postulates of special theory of relativity.
b) Obtain Lorentz transformation equations. (2+6)

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7. a) Define moment of inertia. (2+6)
- b) Deduce an expression for moment of inertia of a solid sphere about an axis passing through its diameter. (2+6)
8. a) What is wave motion? Mention the characteristics of a wave. (4+4)
- b) Derive the equation of a progressive wave. (4+4)

PART - B

Answer any five problems. Each problem carries 4 marks. (5×4=20)

9. A particle of mass 0.01 kg, executing SHM makes 30 oscillations in 2s with an amplitude of 0.08 m. Find the maximum velocity of the particle.
10. A sphere is suspended from a wire of length 1 m and radius 0.5×10^{-3} m. If the period of torsional oscillations is 1.23 s and moment of inertia of the sphere about an axis through its diameter is 0.03×10^{-2} kg m², calculate rigidity modulus of the material of the wire.
11. Calculate the decrease in the melting point of ice when the pressure changes by 1 atmosphere, specific volume of ice at 273 K is 1.091×10^{-3} m³ kg⁻¹ and that of water at 273 K is 10^{-3} m³ kg⁻¹ and latent heat of ice, $L = 3.36 \times 10^5$ J kg⁻¹, one atmosphere = 10^5 Nm⁻².
12. The Van der Waals constant for hydrogen are $a = 0.0247$ Nm⁴ mol⁻², $b = 2.65 \times 10^{-5}$ m³ mol⁻¹. $R = 8.31$ J mol⁻¹ K⁻¹. Find the inversion temperature of hydrogen.
13. Calculate the expected fringe shift in Michelson-Morley experiment. If the effective length of each path is 6 m, velocity of the earth round the sun is 3×10^4 ms⁻¹ and wave length of monochromatic light used is 5000Å (Velocity of light is 3×10^8 ms⁻¹).
14. Calculate the velocity at which the mass of the electron is $\sqrt{3}$ times its rest mass. (Velocity of light is 3×10^8 ms⁻¹).

15. Calculate the moment of inertia of a uniform disc of mass 0.2 kg and radius 0.05 m about an axis passing through its edge and perpendicular to the plane of the disc.
16. The equation of a progressive wave is $y = 4 \sin 2\pi \left[\frac{t}{0.02} - \frac{x}{400} \right]$ metre. Find its amplitude and velocity.

PART - C

Answer **any five** questions. **Each** question carries **two** marks.

(5×2=10)

17. a) What should be the time period of a simple pendulum in a freely falling lift? Explain.
- b) Justify the statement that Poissons ratio cannot be negative.
- c) The melting point of ice decreases and that of wax increases with an increase in pressure. Explain.
- d) Ideal gas does not show Joule-Thomson effect. Why?
- e) Ether was assigned self contradictory properties. Explain.
- f) Moving clock runs slow. Explain.
- g) There are two spheres of same mass and same radius. One is solid and the other is hollow. Which of them has a larger moment of inertia about an axis through the diameter.
- h) Which properties of the medium are necessary for the propagation of a mechanical wave through it?
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