

DEPARTMENT OF PRE-UNIVERSITY EDUCATION, KARNATAKA
MODEL QUESTION PAPER - 2022
I PUC PHYSICS (33)

Time Duration: 3 Hrs 15 Minutes

Max. Marks: 70

Instructions:

1. All parts are compulsory.
2. Answers without relevant diagram/figure/circuit wherever necessary will not carry any marks.
3. Direct answers to the numerical problems without writing the relevant formula and detailed solutions will not carry any marks.

PART- A

I. Answer any TEN of the following questions: **10 × 1 = 10**

1. Name the domain of Physics which includes phenomena at the laboratory and astronomical scales.
2. Which is the strongest fundamental force in nature?
3. Define displacement of a particle.
4. Write the magnitude of $\hat{k}$.
5. For what angle of projection, range of a projectile is maximum?
6. State Aristotelian law of motion.
7. Mention the expression for centre of mass of a system of two particles lying in a straight line.
8. In given materials steel, brass and copper, which is more elastic?
9. What is Magnus effect?
10. Give the meaning of sublimation.
11. Mention the SI unit of thermal conductivity.
12. Write the statement of Zeroth law of thermodynamics.
13. On what factor does the mean free path of a gas molecule depend?
14. Give an example for periodic motion.
15. What are free oscillations?

PART- B

II. Answer any FIVE of the following questions: **5 × 2 = 10**

16. Write the number of significant figures in 2.386 and 0.0340
17. Distinguish between scalars and vectors.
18. What is centripetal acceleration? Give the expression for it.
19. Mention any two advantages of friction.
20. State and explain Hooke's law.
21. Write the expression for capillary rise of liquid and explain the terms.
22. Convert 100°C into Fahrenheit and Kelvin scale of temperature.
23. Mention the degrees of freedom for (i) monatomic molecule and (ii) diatomic molecule.
24. Draw the graphs to represent the (i) variation of displacement and (ii) variation of velocity with time for a particle undergoing SHM.
25. What are nodes and antinodes in standing waves?

PART- C

III. Answer any FIVE of the following questions:

5 × 3 = 15

26. Write two applications and one limitation of dimensional analysis.
27. a) Define relative velocity of an object with respect to another and
b) Draw position-time graphs of two objects moving along a straight line when their relative velocity is (i) zero and (ii) non-zero.
28. Obtain the expression for the time of flight of a projectile.
29. Derive the expression $\vec{F} \cdot \vec{v}$, where the symbols have usual meaning.
30. Show that torque is equal to rate of change of angular momentum of a particle.
31. Define i) Young's modulus ii) Shear modulus and iii) Bulk modulus of elasticity.
32. State Pascal's law. Mention any two applications of Pascal's law.
33. Obtain $\gamma = \frac{P}{\rho}$ for ideal gas, where symbols have usual meaning.
34. Derive an expression for the work done in an isothermal process.
35. State any three assumptions of kinetic theory of gases.

PART- D

IV. Answer any TWO of the following questions:

2 × 5 = 10

36. Derive the expression for magnitude and direction of the resultant of two concurrent vectors making an angle of θ between them.
37. State and prove the law of conservation of linear momentum using Newton's laws of motion.
38. What is meant by inelastic collision? Obtain the expression for loss in kinetic energy in case of completely inelastic collision in one dimension.
39. Define moment of inertia. State and explain (i) theorem of perpendicular axes and (ii) theorem of parallel axes.

V. Answer any TWO of the following questions:

2 × 5 = 10

40. Derive the expression for acceleration due to gravity at a point below the surface (depth) of the earth.
41. Explain Carnot's cycle with a P-V diagram.
42. Arrive at the expression for the time period of oscillation of a simple pendulum.
43. Write Newton's formula for speed of sound in a gas medium. Discuss Laplace's correction to it.

VI. Answer any THREE of the following questions:

3 × 5 = 15

44. A car moving along a straight highway with a speed of 126 km/h is brought to a stop within a distance of 200 m. Calculate the,
(i) retardation of the car by assuming it to be uniform and
(ii) time taken by the car to stop.
45. A circular racetrack of radius 300 m is banked at an angle of 30° . If the coefficient of friction between the wheels of a race car and the road is 0.2, find the,
(i) optimum speed of the race car to avoid wear and tear on its tyres, and
(ii) maximum permissible speed to avoid slipping.
46. A body of mass 0.1 kg falling freely under gravity takes 10 s to reach the ground. Calculate the kinetic energy and potential energy of the body when it has travelled for first 6 s. Given, $g = 10 \text{ m/s}^2$.

47. A metre stick is balanced on the knife edge at its centre. When two coins, each of mass 5 gram are put one on top of the other at the 12.0 cm mark, the stick is found to be balanced at 45.0 cm mark. Calculate the mass of the metre stick.
48. An artificial satellite is going round the earth, close to its surface. Find the,
(i) orbital velocity of the satellite and
(ii) time taken by it to complete one round.
Given, the radius of the earth is 6400 km and
49. A pan filled with hot food cools from _____ in 2 minutes, when the room temperature is at _____. How long will it take to cool from _____
50. For travelling harmonic wave $y(x, t) = \sin(36\pi x - 3600\pi t)$; where x and y are in cm and t is in second. Calculate the frequency and the speed of the wave. Also calculate the distance between two successive crests in the wave.

