I PUC ANNUAL EXAMINATION MARCH/APRIL-2022 ❶

SUBJECT : PHYSICS (33)

Time : 3 Hours 15 mins   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 x 1 = 10
1. Who discovered radioactivity ?
2. Name one of the fundamental forces of nature.
3. What is a position-time graph ?
4. Give an example of a scalar quantity.
5. For what angle of projection, range of a projectile is maximum ?
6. Define impulse of a force.
7. What is a vector product ?
8. How does pressure at a point in a fluid depends on depth ?
9. Define coefficient of viscosity of a fluid.
10. Write SI unit of thermal conductivity of a solid.
11. Mention the value of temperature at triple point of water.
12. State Zeroth law of thermodynamics.
13. How does rms speed of gas molecules vary with absolute temperature ?
14. Give an example of simple harmonic motion.
15. What is meant by resonance in terms of vibrations ?

PART - B

II   Answer any **FIVE** of the following questions :   5x2=10
16. Mention any two types of errors.
17. What is meant by centripetal force ? Give an example.
18. Write an expression for time of flight of a projectile and explain the terms.
19. Define (i) coefficient of static friction (ii) coefficient of kinetic friction.
20. State and explain Hooke's law of elasticity.
21. Mention two applications of Pascal's law of fluids.
22. Write relation between Fahrenheit scale of temperature and celsius scale of temperature and convert 95°F into celsius scale of temperature.
23. State and explain law of equipartition of energy of gas molecules.
24. At what positions the velocity of a particle in simple harmonic motion is
    i) maximum and ii) minimum.
25. Write expression for apparent frequency when sound emitting source move towards a stationary listener and explain the terms.

PART - C

III   Answer any **FIVE** of the following questions :   5x3=15

26. Check the homogeneity (correctness) of the equation KE = $\frac{1}{2}$ mV² using dimensions of physical quantities.

(PTO)

27. Deduce the expression $v = u + at$ using velocity-time graph.
28. Obtain an expression for maximum height of a projectile.
29. Derive the expression power $= \vec{F} \cdot \vec{V}$ where the symbols have usual meaning.
30. State law of conservation of angular momentum and give two illustrations.
31. Define Young's modulus of elasticity. Write expression for Young's Modulus of a wire by method of stretching.
32. State and Explain Bernoulli's theorem of steam line flow of fluid.
33. Define i) Coefficient of linear expansion ii) coefficient of area expansion and iii) coefficient of volume expansion.
34. Derive an expression for the work done in an isothermal process for an ideal gas.
35. On the basis of assumptions of kinetic theory of gases derive an expression for pressure by an ideal gas.

PART - D

IV Answer any TWO of the following questions :   2x5=10
36. Derive the expression for magnitude of the resultant of two concurrent coplanar vectors.
37. State Newton's second law of motion and hence obtain the relation $F = ma$.
38. Prove law of conservation of energy of a freely falling body.
39. State and explain i) perpendicular axes theorem ii) Parallel axes theorem.

V Answer any TWO of the following questions :   2x5=10
40. Derive expression for escape speed of a body from the surface of Earth and mention its value.
41. Explain Carnot's cycle with a pressure - volume diagram.
42. Arrive the expression for the time period of horizontally oscillating spring on a friction less surface.
43. Write Newton's formula for speed of sound in gases. Discuss Laplace's correction.

VI Answer any THREE of the following questions :   3x5=15
44. A police van moving on a high way with a speed of 36 Kmph fires a bullet at a thief's car speeding away in the same direction with a speed of 180 kmph. If the muzzle speed of bullet is 150 ms⁻¹, with what speed does the bullet hit the thief's car.
45. A train of mass 16800 Kg is pulled by its locomotive with a force of 10000 N and its speed increases from 10 ms⁻¹ to 12 ms⁻¹ in a distance of 50 m. Calculate the resistive force assumed constant in that distance.
46. A pump on the ground floor of a building can pump up water to fill a tank of volume 50 m³ in 20 minutes. If the tank is 30 m above the ground and the efficiency of the pump is 40%. How much electric power is consumed by the pump ? (Density of water 1000 Kgm⁻³).
47. A metre stick is balanced on a knife edge at its center. When a coin of mass 20 g is placed at 15.0 cm mark of the stick, the stick is found to be balanced at 40.0 cm mark. Calculate the mass of the metre stick. What is the shift in balancing point ?
48. A body weighs 720 N on the surface of Earth. What is the gravitational force on it due to earth at the height equal to half the radius of the Earth ?
49. How much heat is required to melt 2 Kg of ice at $-10°C$ and raise its temperature to 100°C ?
    Latent heat of fusion of ice $= 336 \times 10^3$ J kg⁻¹
    Specific heat capacity of ice $= 2.1 \times 10^3$ J kg⁻¹ k⁻¹
    Specific heat capacity of water $= 4.2 \times 10^3$ J kg⁻¹ k⁻¹
50. For travelling harmonic wave $Y(x, t) = 5.0 \sin (62.8t - 0.314 x)$; where x is in centimeter and t is in second. Calculate the frequency, wavelength and speed of the wave.

*****