Mr. A. Vennila, Principal, Kumbakonam - Thanjavur District.

HALF YEARLY EXAM – 2024

Class : XI   **PHYSICS**   Time : 3 hrs

PART – I   Max marks : 70

Note: 1) Answer all the questions. 2) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.   15*1 =15

1. If $\pi = 3.14$, then the value of π^2 is,
   a. 9.8596   b. 9.860   c. 9.9   d. 9.86

2. Identify the unit vector in the following,
   a. $\hat{i} + \hat{j}$ b. $\dfrac{\hat{i}}{\sqrt{2}}$ c. $\hat{k} - \dfrac{\hat{j}}{\sqrt{2}}$ d. $\dfrac{(\hat{i} + \hat{j})}{\sqrt{2}}$

3. Which one of the following is a scalar quantity?
   a. velocity   b. displacement   c. speed   d. linear momentum

4. Force acting on the particle moving with constant speed is,
   a. always non zero   b. always zero   c. need not be zero   d. cannot be concluded.

5. If two linear momentum of the object is increased by 0.1 %, then the kinetic energy is increased by,
   a. 0.1 %   b. 0.2 %   c. 0.4 %   d. 0.01 %

6. The speed of the centre of a wheel rolling on a horizontal surface is V_0. A point on the rim in level with the centre will be moving at a speed of
   a. Zero   b. V_0 c. $2 V_0$ d. $\sqrt{2}V_0$

7. If the mass of the Earth are doubled, then the acceleration due to gravity g is,
   a. remains same   b. g / 2   c. 2 g   d. 4 g

8. The Young modulus for a perfect rigid body is,
   a. zero   b. 1   c. 0.5   d. infinity

9. Which one of the following diagrams corresponds to isobaric compression?
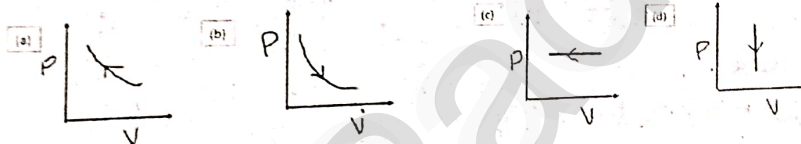
10. Which of the following gases will have least rms speed at a given temperature?
    a. Hydrogen   b. Nitrogen   c. Oxygen   d. Carbon dioxide.

11. In a simple harmonic oscillation, the acceleration against displacement for one complete oscillation will be,
    a. A circle   b. a parabola   c. an ellipse   d. a straight line.

12. Which of the following represents a wave,
    a. $(x - vt)^3$ b. $x(x + vt)$ c. $1/(x + vt)$ d. $\sin(x + vt)$

13. For a monoatomic molecule, the number of degrees of freedom is,
    a. 5   b. 7   c. 6   d. 3

14. An object of mass 1 kg is falling from the height h = 10 m, potential energy of the object when it is at h = 4 m is
    a. 100 J   b. 60 J   c. 40 J   d. 50 J

15. The dimensional formula of moment of inertia
    a. $[MT^{-2}]$ b. $[ML^2]$ c. $[ML^{-3}]$ d. $[ML^{-2}]$

PART II

Note : Answer any six questions. Q. No. 24 is compulsory.   6 * 2 = 12

16. Write the rules for determining significant figures.

17. Define a vector. Give example.
18. Under what condition will a car skid on a levelled circular road?
19. Write the differences between Conservative and Non conservative forces.
20. State conservation of angular momentum.
21. State Newton's Universal law of gravitation.
22. Define: Poisson ratio.
23. What is a black body?
24. Consider two springs whose force constants are 1 N/m and 2 N/m which are connected in series. Calculate the effective spring constant.

PART – III

Note : Answer any six questions. Q. No. 33 is compulsory.   6 * 3 = 18

25. What are the limitations of dimensional analysis?
26. An object is thrown with initial speed 5 m/s with an angle of projection 30°. Calculate the maximum height reached and the horizontal range.
27. When a cricket player catches the ball, he pulls his hands in the direction of the ball's motion. Why?
28. What are geo stationary and polar satellites?
29. Write the differences between transverse and longitudinal waves.
30. Which one of these is more elastic steel or rubber?
31. Explain Resonance. Give an example.
32. What is meant by reversible and irreversible process.
33. A force of ($4i – 3j + m5k$) N is applied at a point whose position vector is ($7i + 4j -2k$) m. Find the torque of force about the origin.

PART – IV

Note : Answer all the questions :   5 * 5 = 25

34. a) (i) Write a note on Radar method to measure larger distances.
    (ii) A Radar signal is beamed towards a planet its echo is received 7 minutes later. If the distance between the planet and the earth is 6.3×10^{10} m. Calculate the speed of the signal.   (OR)
    b) Derive an expression for escape speed.
35. a) Explain in detail the triangle law of addition.   (OR)
    b) Write down the postulates of kinetic theory of gases.
36. a) Prove the law of conservation of linear momentum, use it to find the recoil velocity of a gun when a bullet is fired from it.   (OR)
    b) Write down the difference between Simple harmonic motion and Angular simple harmonic motion.
37. a) Arrive at an expression for Power and Velocity. Give some examples for the same.   (OR)
    b) State Hooke's law and verify it with the help of an experiment.
38. a) Derive Mayer's relation for an ideal gas.   (OR)
    b) State and prove parallel axis theorem.   HSK – 11PHY EM -2