XIARPLKGN20
2501
PHYSICS

Time : 3 Hours] **[Maximum Marks : 70**

(Very Very Short Answer Type Questions) **1 each**

1. If $y = \sqrt{x}$, find $\frac{dy}{dx}$.

2. Carts with rubber wheels are easier to ply than those with iron wheels. Why ?

3. Define forced vibration.

4. **Can we use pendulum watch in an artificial satellite ?**

5. If door of a refrigerator is kept open, will the room become cool or hot ?

(Very Short Answer Type Questions) **2 each**

6. Write the dimensions of a and b in the relation $E = \frac{b - x^2}{at}$, where E, x, t are energy distance and time respectively.

Or

A physical quantity (X) is given by $X = a^2b^3c^{-1}d^{-1/2}$. If the percentage errors of measurement in a, b, c and d are 4%, 2%, 3% and 1%, then calculate the percentage error in (X).

7. A man of mass 60 kg runs up a flight of 30 steps in 40 seconds. If each step is 20 cm high, calculate the power of man.

8. State first law of thermodynamics in mathematical form.

9. Define surface tension and surface energy. Give their S.I units.

10. The moment of inertia of a hollow sphere about its diameter is $\frac{2}{3}MR^2$. What is its radius of gyration about that axis.

(Short Answer Type Questions) 3 each

11. State Newton's three law of motion.

12. Differentiate 'sin x' by ab-initio method.

13. Derive expression for centripetal force acting upon a body of mass (m) moving with a speed (v) in a circle of radius (r) on the basis of dimensional analysis.

14. State and explain law of conservation of linear momentum.

15. Define Potential Energy. Derive expression for gravitational potential energy.

16. If electron and proton have same linear momentum, which has more kinetic energy ? Explain.

17. Define degree of freedom. Write the formula for finding number of degrees of gas molecules. What is the number of degrees of freedom in monoatomic, diatomic and triatomic gas molecule ?

18. Write six postulates of kinetic theory of gases.

19. At what distance from the mean position is kinetic energy equal to potential energy. Briefly explain.

20. State and explain Newton's law of gravitation. Hence define 'G'.

21. The escape speed of the earth is 11.2 km/s. Find the escape speed of another planet having mass 1000 times and radius 10 times that of earth.

22. A refrigerator is to remove heat from the eatables kept inside at 9°C. Since if room temperature is 36°C, calculate the coefficient of performance.

(Value Based Questions)

23. Energy of 484 Joule is spent in increasing the speed of a flywheel from 60 rpm to 360 rpm. Find moment of inertia of flywheel.

(Long Answer Type Questions) 5 each

24. **Derive an expression for the time of flight, maximum height and horizontal range of projectile fired at an angle with the horizontal.**

Or

State parallelogram law of addition of vectors. Write expression for magnitude and direction of two inclined vectors. When is resultant maximum and minimum ?

25. **Find an expression for displacement, velocity and acceleration of a particle executing SHM.**

Or

What is Organ pipe ? How different modes of vibration are formed in open organ pipe ?

26. Define terminal velocity. Derive expression for it.

Or

What are the various modes of transfer of heat ? Discuss them.