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Question Paper

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Y–23–Y

Roll No. .....

Total No. of Questions : **26]**

[Total No. of Printed Pages : **7**

XIARJKUT23

9223–Y

PHYSICS

Time : 3 Hours]

[Maximum Marks : 70

Section–A

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

1. Solve :

$$\int_0^{\pi} \sin x - dx$$

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

3. Define Longitudinal wave motion.

4. What happens to the time period of a simple pendulum, if it is taken from the surface of earth to the surface of moon ?

5. Does internal energy of a system change during isothermal expansion ? If not, why ?

Section–B

(Very Short Answer Type Questions) 2 each

6. In the gas equation

$$\left(P + \frac{a}{v^2}\right)(v - b) = RT$$

where P, V, R, T represent pressure, volume, universal gas constant and absolute temperature. Find dimension of $\frac{a}{b}$

Or

Find the percentage error in the area of block of length 25.2 cm and breadth 16.8 cm measured to an accuracy of 0.1 cm.

7 Calculate the torque of force $(5\hat{i} - 2\hat{j} + 5\hat{k})$ about the origin which acts on a particle whose position vector is $(\hat{i} + \hat{j} - 2\hat{k})$.

8 Define elastic fatigue and elastic limit

9 State second law of thermodynamics (*Two statements only*).

10 The moment of inertia of a sphere about its diameter is $\frac{2}{5}MR^2$. What is its radius of gyration about that axis ?

Section–C

(Short Answer Type Questions) **3 each**

11. Define inertia of rest, inertia of motion and inertia of direction with one example of each.

Or

Why friction is called necessary evil ?

12. Differentiate e^{ax} by ab-initio method.

13. An experiment measures quantities a, b, c and x as $x = ab^2c^{-3}$. The percentage error in a, b, c are ±1%, ±3% and ±2% respectively. Find the percentage error in (X).

14. State Newton's *three* laws of motion. Show that Newton's second law is the only real law of motion.

14. Define elastic, inelastic collision, coefficient of restitution. How does coefficient of restitution define elastic and inelastic collision.

15. Define work, power and energy. Give their S.I. units.

16. Write six postulates of kinetic theory of gases.

17. State law of equipartition of energy. Write the number of degrees of freedom of monoatomic, diatomic and triatomic gas.

18. Derive an expression for displacement of a plane progressive wave.

19. State and explain Kepler's three laws of planetary motion.

20. The escape speed of the earth is 11.2 km/s. Find the escape speed of another planet of mass 100 times and radius 10 times that of earth.

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

Section–D

(Value Based Questions) 4

23. A man arrived at Delhi Railway Station and wanted to go to his relative's house 10 km away from the station. He hired a taxi to reach the destination. The driver followed a long path 25 km to reach the destination in one hour and charged for 25 km from the man. Now, answer the following :

(i) Comment on the behaviour of driver.

(ii) Calculate the average speed of the taxi

(iii) Calculate the average velocity of the taxi.

Turn Over

Section–E

5 each

(Long Answer Type Questions)

24. Derive :

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

where letters have their usual meanings (Use calculas approach).

Or

Find an expression for the maximum height, time of flight and horizontal range of a projectile fired at an angle with the horizontal.

25. Define Capillarity. Find an expression for the height of liquid due to its rise in a capillary tube.

Or

What are various modes of transfer of heat ? Discuss them in detail.

26. Derive an expression for the displacement, velocity and acceleration of a particle executing simple Harmonic motion.

Or

What is Doppler effect ? Derive an expression for the general apparent frequency of sound in doppler effect. Hence find expression for apparent frequency when source is at rest and observer is in motion.

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