Y–23–X

Roll No. .....

Total No. of Questions : 26]

[Total No. of Printed Pages : 7

XIARJKUT23

9223–X

PHYSICS

Time : 3 Hours]

[Maximum Marks : 70

Section–A

(Very Very Short Answer Type Questions) 1 each

1. If $y = u^3 + 2u$ and $u = x^2 + 5$, find $\frac{dy}{dx}$.

2. Gun recoils back when it is being fired is based on law of conservation of linear momentum. (True/False)

3. Define transverse wave motion.

4. At what point, the energy of a Harmonic Oscillator is entirely :

   (i) Kinetic

   (ii) Potential

5. Can temperature of a gas be increased by keeping its pressure and volume constant.

Section–B

(Very Short Answer Type Questions) 2 each

6. The volume of a liquid flowing out per second of a pipe of length (l) and radius (r) is written as $v = \frac{\pi}{8}\frac{Pr^4}{\eta l}$ where (P) is pressure difference between the two ends of pipe and (η) is coefficient of viscosity of the liquid. Check the correctness of the above equation on the basis of dimensions.

Or

If the lengths of two rods are (15.2 ± 0.2) cm and (10.7 ± 0.2) cm respectively, find the sum and difference in lengths of the two rods with the limits of errors.

7. Derive the relation for torque acting on a particle in a plane.

8. State Bernoulli's theorem in mathematical form (any one form).

9. State first law of thermodynamics in Mathematical form.

10. Define radius of gyration. Write expression for it.

Section–C

(Short Answer Type Questions) 3 each

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

Or

Define friction, static friction and limiting friction. Which of them is called self-adjusting force of friction.

12. Differentiate x^n 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.

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

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

17. Write *six* postulates of kinetic theory of gases.

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

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

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

21. 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.

22. 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.

Section–E

(Long Answer Type Questions) 5 each

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.