JEE MAIN 27 JANUARY 2024 SHIFT 2 QUESTION PAPER

PHYSICS

1. If the work function of a metal is 6.63 eV, then find the threshold frequency for the photoelectric effect.

2. If $(p - a/V^2)(V - b) = nRT$ where P, V, R, & T are pressure, volume, universal gas constant, and temperature, then a/b^2 has the same dimensional formula as that of:
   i. R
   ii. PV
   iii. RT
   iv. P

3. Statement 1: Positive zero error is added to the measured value.
   Statement 2: Defects may occur during the manufacturing of measuring instruments
   i. Statement 1 is true while statement 2 is false
   ii. Statement 1 is false while Statement 2 is true
   iii. Both statements are true
   iv. Both statements are false

4. Find the total kinetic energy of 1 mole of oxygen gas at 27°C. Take R = 25/3 J/(mol-K).

5. A particle loses 1/3rd of its velocity when it strikes a block and covers a distance of 4 cm inside the fixed block. Then find D, if D is the distance covered by the particle inside the block and comes at rest.

6. A ring and solid sphere of the same mass and radius slide down an inclined plane of the same angle θ. Find the ratio of their kinetic energies.

7. If two bodies with masses 4 kg and 5 kg have the same kinetic energy, then find the ratio of their linear momentum.

8. A train moving at a speed of 12 m/s takes a circular turn of radius 500 m. The rails are 1.5m apart, then by what height the outer rail should be raised with respect to the inner rail?

9. In an adiabatic process, the pressure of a gas is proportional to the cube of absolute temperature, then the ratio of C_p/C_v is?

10. A ball suspended by a thread swings in a vertical plane so that its acceleration in the extreme position and lowest position are equal. The angle 0 of thread deflection in the extreme position will be?

11. A particle moves 80 m in the last 2 seconds of free fall of height h, then find the height h.

12. If a current of 200 μA deflects the coil of a moving galvanometer through 60°, then what is the current required to cause deflection through π/10 radians?

13. A uniform ring and uniform solid sphere roll down the same inclined plane at the same distance. If the ratio of their translational kinetic energies is 7/x then find x. It is given that the mass and radius of the ring and sphere are equal and the situation is pure rolling.

14. There exists a uniform electric field of 20 î N/C. A dipole of dipole moment |P| = 15c - m is placed at an angle of 30° with the electric field, then find the torque on the dipole.

15. If a man is carrying the weight of a rod with mass m leaning against his head such that the rod forms an angle of 60° with the horizontal, then find the weight of the rod experienced by him.

16. A bullet is fired into a fixed target. It loses 1/3rd of its velocity after 3 travelling for 4 cm. It penetrates further $p \times 10^{-3}$ m before coming to rest. Find p.

17. If the primary side of a transformer is connected with 230 V, 50 Hz AC supply and the ratio of the number of turns of primary to the secondary winding is 10:1. The load resistance at the secondary coil is 46 Ω then find the power of the secondary winding output.

18. Three voltmeters (V_1, V_2, V_3) are connected in a circuit such that V_1 and V_2 are in series with each other and both are in parallel with V_3. Find the correct relation among their readings.