Time: 3 hours

PHYSICS (NEET|IIT-JEE)

Marks: 50

(MESUREMENT : UNITS, DIMENSIONS AND ERRORS)

NAME OF STUDENT:-_____ DATE:- 13/03/2022

INSTRUCTION:- Attempt All Question

Q1. The equation of state of some gases can be expressed as $\left(P+\frac{a}{V^2}\right)(V-b)=RT$, where the symbols have their usual meanings. The dimensions of 'a' are

(a) $ML^{-1}T^{-2}$ (b) ML^5T^{-2} (c) L^6 (d) ML^6T^{-2}

Q2. The measured mass and volume of a body are 22.42 g and 4.7 cm^3 , respectively, with possible errors 0.01 g and 0.1 cm^3 . The maximum error in density is about

(a) 0.2 % (b) 2 % (c) 5 % (d) 10 %

Q3. The heat produced in a circuit depends upon resistance, current and time. If the errors in measuring these quantities are 1%, 2% and 1%, respectively, the maximum error in measur -ing heat is

(a) 1 % (b) 2 % (c) 3 % (d) 6 %

Q4. The number of particles (n) crossing a unit area perpendicular to the x-axis per unit time is given by $n=-D\frac{n_2-n_1}{x_2-x_1}$, where n_1 and n_2 are number of particles per unit volume for x equal to x_1 and x_2, respectively. Find the dimensions of *D* (called diffusion constant).

(a) M^0LT^2 (b) $M^0L^2T^{-4}$ (c) $M^0L^2T^{-1}$ (d) $M^0L^2T^{-1}$

Q5. The velocity v of a particle is given in terms of time t by the equation $=at+\frac{b}{t+c}$. The dimensions of a, b, c are, respectively, [AIPMT 2006]

(a) L^2 T LT^2 (b) LT^2 LT L

(C) LT^{-2} L T (d) L LT T^2

Q6. In the van der Waals equation $\left(P + \frac{a}{V^2}\right)(V - b) =$ constant, the unit of a is.

(a) dyne cm (b) dyne cm^4 (c) dyne/cm^3 (d) dyne/cm^2

Q7. The van der Waals equation for a gas is $\left(P + \frac{a}{V^2}\right)(V - b) = nRT$ where P, V, R, T and n represent the pressure, volume, universal gas constant, absolute temperature and number of moles of a gas, respectively, a and b are constants. The ration b/a will have the dimensional formula

(a) $M^{-1}L^{-2}T^2$ (b) $M^{-1}L^{-1}T^{-1}$ (c) ML^2T^2 (d) MLT^{-2}

Q8. In the measurement of a physical quantity $X = \frac{A^2B}{C^{\frac{1}{3}}D^3}$ the percentage errors introduced in the measurements of the quantities A, B, C and D are 2%, 2%, 4% and 5% respectively. Then the minimum amount of percentage error in the measurement of X is contributed by

(a) A (b) B (c) C (d) D

Q9. A screw gauge gives the following reading when used to measure the diameter of a wire:
Main scale reading : 0 mm
Circular scale reading : 52 divisions
Given that 1 mm on main scale corresponds to 100 divisions of the circular scale.
The diameter of wire from the above data is

(a) 0.52 cm (b) 0.052 cm (c) 0.026 cm (d) 0.005 cm

Q10. In an experiment four quantities a, b, c and d are measured with percentage errors 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows:

$$P = \frac{a^3b^2}{cd}$$

Maximum percentage error in *P* is [NEET 2013]

(a) 14 % (b) 10 % (c) 7 % (d) 4 %