Chapter 02

Unit & Measurement

TOPIC WISE QUESTIONS

UNIT AND QUANTITIES

Q.1 Which of the following system of units is not based on units of mass, length and time alone

(1) SI (2) MKS (3) FPS (4) CGS

Q.2 Which of the following quantity is unitless?

(1) Velocity / length

(2) Pressure / length

(3) Displacement / length

(4) Force / length

Q.3 The ratio of one micron to one nanometre is

(1) 10^{3} (2) 10^{-3} (3) 10^{-6} (4) 10^{-1}

Q.4 Temperature can be expressed as a derived quantity in terms of which of the following.

(1) Length and mass

(2) Mass and time

(3) Length. mass and time

(4) In terms of none of these

Q.5 Density of wood is 0.5 gm/ cc in the CGS system of units. The corresponding value in MKS units is

(1) 500 (2) 5 (3) 0.5 (4) 5000

Q.6 Which of the following is not the unit of time.

(1) Micro second (2) leap year

(3) Lunar months (4) Parallactic second

Q.7 Which of the following is smallest unit

(1) Milimetre (2) Angstrom

(3) Fermi (4) Metre

Q.8 Which relation is wrong

(1) 1 Calorie = 4.18 Joules

(2) 1 Å = 10^{-10} m

(3) 1 MeV = 1.6×10^{-13} Joules

(4) 1 Newton = 10^{-5} Dynes

DIMENSIONS, DIMENSIONAL ANALYSIS

Q.9 When a wave travels in a medium, the displacement of a particle located at distance x at time t is given by y = a sin (bt – cx) where a, b and c are constants of the wave. The dimension of b/c are same as that of :

(1) wave velocity (2) wave length

(3) wave amplitude (4) wave frequency

Q.10 The dimensional formula of k in y = sin(kx) is (if x is the distance)

(1) $M^{\circ}L^{\circ}T^{-1}$ (2) $M^{-1}L^{-1}T^{\circ}$

(3) $M^{\circ}L^{-1}T^{\circ}$ (4) $M^{\circ}L^{\circ}T^{\circ}$

Q.11 The method of dimensional analysis can be used to derive which of the following relations ?

(1) $N_0e^{-\lambda_t t}$

(2) $A \sin(\omega t + kx)$

(3) $\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$

(4) None of the above

Q.12 Which of the following does not have the dimensions of force ?

(1) Potential / length

(2) Energy / length

(3) Weight

(4) Rate of change of momentum

Q.13 Which of the following is incorrect statement

(1) A dimensionally correct equation may be correct

(2) A dimensionally correct equation may be incorrect

(3) A dimensionally incorrect equation may be correct

(4) A dimensionally incorrect equation is incorrect

Q.14 A dimensionless quantity

(1) Never has a unit

(2) Always has a unit

(3) May have a unit

(4) Does not exist

Q.15 A unitless quantity

(1) Does not exist

(2) Always has a nonzero dimension

(3) Never has a nonzero dimension

(4) May have a nonzero dimension

Q.16 Which of the following is incorrect

(1) All derived quantities may be represented dimensionally in terms of the base quantities

(2) A base quantity cannot be represented dimensionally in terms of other base quantities

(3) The dimension of a derived quantity is never zero in any base quantity

(4) The dimension of a base quantity in other base quantities is always zero.

Q.17 Two physical quantities of which one is a vector and the other is a scalar having the same dimensional formula are :

(1) Work and energy

(2) Torque and work

(3) Impulse and momentum

(4) Power and pressure

Q.18 The equation of a wave is given by

$Y = A \sin \omega\left(\frac{x}{v} - k\right)$ where ω is the angular velocity and υ is the linear velocity. The dimension of k is

(1) LT (2) T (3) T^{-1} (4) T^2

Q.19 The time dependence of a physical quantity P is given by $P = P_0 \exp(-\alpha t^2)$, where α is a constant and t is time. The constant α

(1) dimensionless (2) has dimensions T^{-2}

(3) has dimensions of P (4) has dimensions T^2

Q.20 In a particular system the units of length mass and time are chosen to be 10 cm, 10 g and 0.1 s respectively. The unit of force in this system will be equal to

(1) 0.1 N (2) 1 N

(3) 10 N (4) 100 N

Q.21 The dimensional formula of angular velocity is

(1) $M^0L^0T^{-1}$ (2) MLT^{-1}

(3) $M^0L^0T^1$ (4) ML^0T^{-2}

ERROR AND MEASUREMENT

Q.22 For a cubical block, error in measurement of sides is $\pm$ 1% and error in measurement of mass is $\pm$ 2%, then maximum possible error in density is-

(1) 1% (2) 5% (3) 3% (4) 7%

Q.23 To estimate 'g' (from $g = 4\pi^2 \frac{L}{T^2}$), error in measurement of L is $\pm$ 2% and error in measurement of T is $\pm$ 3%. The error in estimated 'g' will be -

(1) $\pm$ 8% (2) $\pm$ 6% (3) $\pm$ 3% (4) $\pm$ 5%

Q.24 The least count of a stop watch is 0.2 second. The time of 20 oscillations of a pendulum is measured to be 25 seconds. The percentage error in the time period is

(1) 16% (2) 0.8 % (3) 1.8 % (4) 8 %

Q.25 The dimensions of a rectangular block measured with a vernier callipers having least count of 0.1 mm is 5 mm × 10 mm × 5 mm. The

maximum percentage error in measurement of volume of the block is

(1) 5 % (2) 10 % (3) 15 % (4) 20 %

Q.26 An experiment measures quantities x, y, z and then t is calculated from the data as $t = \frac{xy^2}{z^3}$. If percentage errors in x, y and z are respectively 1%, 3%, 2%, then percentage error in t is :

(1) 10 % (2) 4 % (3) 7 % (4) 13 %

Q.27 The external and internal diameters of a hollow cylinder are measured to be (4.23 ± 0.01) cm and (3.89 ± 0.01) cm. The thickness of the wall of the cylinder is

(1) (0.34 ± 0.02) cm (2) (0.17 ± 0.02) cm

(3) (0.17 ± 0.01) cm (4) (0.34 ± 0.01) cm

Q.28 The mass of a ball is 1.76 kg. The mass of 25 such balls is

(1) 0.44×10^3 kg (2) 44.0 kg

(3) 44 kg (4) 44.00 kg

Q.29 Zero error of an instrument introduces

(1) Systematic errors (2) Random errors

(3) Both (4) None

Q.30 What is the fractional error in g calculated from $T = 2\pi\sqrt{\ell / g}$? Given that fractional errors in T and ℓ are ± 2 and ± 2 respectively.

(1) 4 (2) 0 (3) 6 (4) 2

Q.31 A thin copper wire of length ℓ metre increases in length by 2% when heated through 10°C. What is the percentage increase in area when a square copper sheet of length ℓ metre is heated through 10°C ?

(1) 4% (2) 8%

(3) 16% (4) None of the above

Q.32 The period of oscillation of a simple pendulum in the experiment is recorded as 2.63s, 2.56s, 2.42s, 2.71s and 2.80s respectively. The average absolute error is

(1) 0.1s (2) 0.11s (3) 0.01s (4) 1.0s

Q.33 The resistance is $R = \frac{V}{I}$ where V = 100, 5 Volts and I = 10 ± 0.2 amperes. What is the total error in R ?

(1) 5 % (2) 7 % (3) 5.2 % (4) $\left(\frac{5}{2}\right)$%

Q.34 The length, breadth and thickness of a strip are (10.0 0.1) cm, (1.00 0.01) cm and (0.100 0.001) cm respectively. The most probable error in its volume will be

(1) ± 0.03 cm^3 (2) ± 0.111 cm^3

(3) ± 0.012 cm^3 (4) None of these

Q.35 If error in measuring diameter of a circle is 4 %, the error in circumference of the circle would be :-

(1) 2 % (2) 8 % (3) 4 % (4) 1 %

Q.36 Percentage error in measuring the radius and mass of a solid sphere are 2% & 1% respectively. Then error in measurement of moment of inertia with respect to its diameter is :-

(1) 3 % (2) 6 % (3) 5 % (4) 4 %

Q.37 The heat generated in a circuit is dependent upon the resistance, current and time for which the current is flown. If the error in measuring the above are as 1%, 2% and 1% the maximum error in measuring heat will be

(1) 2% (2) 3% (3) 6% (4) 1%

Q.38 The percentage errors in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimate of kinetic energy obtained by measuring mass and speed ?

(1) 11 % (2) 8 % (3) 5 % (4) 1 %

Q.39 While measuring acceleration due to gravity by a simple pendulum a student makes a positive error of 1% in the length of the pendulum and a negative error of 3% in the value of the time period. His percentage error in the measurement of the value of g will be -

(1) 2 % (2) 5 % (3) 7 % (4) 10 %

Q.40 If the error in the measurement of radius of a sphere is 2%, then the error in the determination of volume of the sphere will be :

(1) 4% (2) 6% (3) 8% (4) 2%

Q.41 A student measures the distance traversed in free fall of a body, initially at rest, in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is :

(1) $e_2 - e_1$ (2) $e_1 + 2e_2$

(3) $e_1 + e_2$ (4) $e_1 - 2e_2$

Q.42 In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows:

$P = \frac{a^3b^2}{cd}$ % error in P is :

(1) 10% (2) 7% (3) 4% (4) 14%

Q.43 The number of significant figures in all the given numbers 25.12,2009, 4.156 and 2217×10^{-4} is

(1) 4 (2) 3 (3) 2 (4) 1

Q.44 The edge of a cube is $a = 1.2 \times 10^{-2}$ m. Then its volume will be recorded as :

(1) 1.72×10^{-6} m^3 (2) 1.728×10^{-6} m^3

(3) 1.7×10^{-6} m^3 (4) 1.73×10^{-6} m^3

Q.45 A wire has a mass (0.3 ± 0.003)g, radius (0.5 ± 0.005)mm and length (6 ± 0.06)cm. The maximum percentage error in the measurement of its density is :

(1) 1 (2) 2 (3) 3 (4) 4

Q.46 When a copper sphere is heated, maximum percentage change will be observed in–

(1) radius (2) area

(3) volume (4) none of these

Questions 47 to 52

Find significant figures in the following observations-

Q.47 0.007 gm

(1) 1 (2) 2 (3) 3 (4) 4

Q.48 2.64×10^{24} kg

(1) 1 (2) 2 (3) 3 (4) 4

Q.49 0.2370 gm/cm^3

(1) 1 (2) 2 (3) 3 (4) 4

Q.50 6.320 J/K

(1) 1 (2) 2 (3) 3 (4) 4

Q.51 6.032 N/m^2

(1) 1 (2) 2 (3) 3 (4) 4

Q.52 0.0006032 K^{-1}

(1) 1 (2) 2 (3) 3 (4) 4

Q.53 Dimensional formula of a physical quantity is $[M^{-1}L^3T^{-2}]$. The errors in measuring quantities M, L and T respectively are 2%, 3% and 4%. The maximum percentage error that occurs in measuring the quantity is

(1) 9 (2) 10 (3) 14 (4) 19

Q.54 If length of a rectangle is 2.1 m and width is 1.62 m then its area will be

(1) 3.402 m^2 (2) 3.4 m^2

(3) 3.40 m^2 (4) 3 m^2

ANSWER KEY

PRACTICE SECTION -01

Que.	1	2	3	5	6	7	8	9	10
Ans.	4	1	3	3	2	1	1	4	1

Q.4 (a) $[M^0L^0T^0K^1]$ (b) $[ML^2T^{-2}]$ (c) $[M\,L^{-1}\,T^{-2}]$ (d) $[M^0L^0T^{-1}]$

PRACTICE SECTION -02

Que.	2	3	4	5	6	7	8	9	10
Ans.	3	1	1	1	3	2	2	1	3

Q. 1 (a) 3, (b) 5, (c) 3, (d) 3, (e) 2, (f) 4, (g) 3, (h) 4

TOPIC WISE QUESTIONS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	3	1	4	1	4	3	4	1	3	4	1	4	3	3
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	2	2	2	1	1	2	1	2	1	4	3	2	1	3
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	1	2	2	1	3	3	3	2	3	2	2	4	1	3	4
Que.	46	47	48	49	50	51	52	53	54						
Ans.	3	1	3	4	4	4	4	4	2						

NEET - RANKER'S STUFF

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	2	3	2	1	3	3	3	1	3	2	4	4	1	3
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	1	1	1	1	4	2	3	1	4	3	3	2	3	4	1
Que.	31	32	33	34	35	36	37								
Ans.	1	1	1	2	3	1	3								

NEET- FLASHBACK

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	2	1	4	2	3	1	3	3	1	2	4	2	2	3
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	4	4	2	4	3	3	1	4	4	2	4	1	1	3	3
Que.	31														
Ans.	2														