	Roll No : Date : 2026-02-15	School : ACHIEVERS FOUNDATION Assessment : Units and Measurements 1 marks Subject : physics Class : XI	Time : 00 Marks: 88

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1   Which of the following have same dimensions?   1

(a) Specific heat and latent heat

(b) Momentum and impulse

(c) Moment of inertia and moment of momentum.

(d) Tension and surface tension.

Ans :(b)

2   Which of the following is a dimensional constant?   1

(a) refractive index

(b) dielectric constant

(c) relative density

(d) gravitational constant.

Ans :(d)

3   The dimensional formula for latent heat is   1

(a) $M°L^2T^{-1}$

(b) ML^2T^{-1}

(c) MLT^{-2}

(d) $ML2T^{-2}$

Ans :(a)

4   The length of a rod is (11.05 ± 0.05) cm. What is the total length of 2 such   1
rods?

(a) (22.1 ± 0.05) cm

(b) (22.10 ± 0.05) cm

(c) (22.1 ± 0.11) cm

(d) (22.1 ± 0.10) cm

Ans :(d)

5   The velocity v of a particle is given in terms of time t is $v = at + \dfrac{b}{t+c}$ 1

The dimensions of a, b, c are

(a) L^2; TLT^{-2}

(b) LT^2; LT; L

(c) LT^{-2}; L; T

(d) L; LT; T^2

Ans :

(c) As c is added to t, therefore, c has the dimensions of $[T]$ As, $\frac{b}{t} = v$

$\therefore b = v \times t = LT^{-1} \times T = [L]$ **from** $v = at$, $\mathbf{a} = \frac{v}{t} = \frac{LT^{-1}}{T} = [LT^{-2}]$

6   Which of the following sets cannot enter into the list of fundamental quantities   1

in any system of units?

(a) Length, time and velocity

(b) Length, mass and velocity

(c) Mass, time and velocity

(d) Length, time and mass.

Ans :

(a) Length, time and velocity can be deduced from one another. Therefore, they

cannot enter into the list of fundamental quantities in any system

7   In the standard equation $S_{nth} = u + \frac{a}{2}[2n - 1]$, what dimensions do you view   1

for S_{nth}?

(a) $M°L^1T°$

(b) $M°L^{-1}T^1$

(c) $M°L^1T^{-1}$

d) $M°L°T^1$

Ans :(c)

8   Which one of the following quantities has not been expressed in proper units?   1
(a) Coeff. of elasticity: N/m^2

(b) Surface tension: N/m

(c) Energy: kg m/s

(d) Pressure: N/m^2

Ans :(c) Energy $= [M^1 L^2 T^{-2}] = Kgm^2 g^{-2}$

9   The number of significant figures in 3400 is   1

(a) 3

(b) 4

(c) 2

(d) 1

Ans :

(c)

In x = 3400, zero are not significant. Therefore, number of significant figure = 2.

10 Match List I with List II and select the correct answer: 1

	List I		List II
A.	Spring constant	1.	$M^1L^2T^{-2}$
B.	Pascal	2.	$M^0 L^0 T^{-1}$
C.	Hertz	3.	$M^1L^0T^{-2}$
D.	Joule	4.	$M^1L^{-1}T^{-2}$

(a) A-3, B-4, C-2, D-1

(b) A-4, B-3, C-1, D-2

(c) A-4, B-3, C-2, D-1

(d) A-3, B-4, C-1, D-2

Ans :

$$\text{Spring constant} = \frac{F}{x} = \frac{MLT^{-2}}{L} = [M^1L^0T^{-2}]$$

(a) Pascal = unit of pressure

$$\frac{F}{a} = \frac{MLT^{-2}}{L^2} = [ML^{-1}T^{-2}]$$

Hertz = unit of frequency = $[M^0 L^0 T^{-1}]$ Joule = unit of work = $[M1L^2T^{-2}]$

11 The length and breadth of a metal sheet are 3.124 m and 3.002 m respectively.   1
   The area of this sheet up to four correct significant figures is:

(a) 9.37 m^2

(b) 9.378 m^2

(c) 9.3782 m^2

(d) 9.378248 m^2

Ans :(b)

As area = length × breadth, therefore, as per rules
numerical value of area has four significant digits.

12 Which of the following quantities can be written in SI units in kg^2 m^2 A^{-2} s$^-$ 1
    ^{3}?

(a) Resistance

(b) Inductance

(c) Capacitance

(d) Magnetic flux

Ans :(a)

$$R = M^1 L^2 T^{-3} A^{-2} \ \dots \text{ from}$$

$$R = \frac{V}{I} = \frac{W/q}{I} = \frac{ML^2 T^{-2}}{AT \ A} = [M^1 L^2 \ T^{-3} A^{-2}]$$

$$C = \frac{q}{V} = \frac{q}{W/q} = \frac{q^2}{W} = \frac{(AT)^2}{ML^2 T^{-2}} = [M^{-1} L^{-2} T^4 A^2]$$

$$I = \frac{E}{dI/dt} = \frac{W/q}{dI/dt} = \frac{ML^2 T^{-2} T}{AT \ A} = [ML^2 T^{-2} T^{-2}]$$

Now $RC = [M^1 L^2 T^{-3} T^{-2}] \ [M^{-1} L^{-2} T^4 T^2] = T^1$

and $L/R = \dfrac{[ML^2 T^{-2} A^{-2}]}{[M^1 L^2 T^{-3} A^{-2}]} = T^1$

13 If C represents capacitance and R represents resistance, then the unit of CR^2 are: 1

(a) Henry

(b) $\dfrac{\text{Volt} - \text{Second}}{\text{Ampere}}$

(c) Volt/ampere

(d) Joule/ampere^2

Ans :

$$\frac{L}{R} = RC \ \text{ or } \ CR^2 = L$$

Unit of CR^2 are the same as unit of L, which is henry.

(a, b, d) From $e = L = \dfrac{edt}{dI} = \dfrac{\text{Volt sec}}{\text{Ampere}}$

From $U = \dfrac{1}{2} LI^2$, $L = \dfrac{2U}{I^2} = \dfrac{\text{Joule}}{\text{Ampere}^2}$

14 The pair(s) of physical quantities that have the same dimensions is (are):   1

(a) volumetric strain and coefficient of friction.

(b) disintegration constant of a radioactive substance and frequency of light wave.

(c) heat capacity and gravitational potential.

(d) Planck's constant and torque.

Ans :

(a) Volumetric strain $\dfrac{\Delta V}{V} = \dfrac{L^3}{L^3} = 1$

(a, b, c)   Coefficient of friction $\mu = \dfrac{F}{R} = \dfrac{MLT^{-2}}{MLT^{-2}} = 1$

(b) $\lambda = \dfrac{0.693}{T} = T^{-1}$ $v = \dfrac{1}{T} = T^{-1}$

Both have same dimensions.

(c) Heat capacity is measured in cal/kg and gravitational potential is measured in joule/kg. Both have the same dimensions $[L^2T^{-2}]$.

15 Which of the following combinations have the dimensions of time? L, C, R represent inductance, capacitance and resistance respectively?   1

(a) RC

(b) LC

(c) R/L

(d) C/L

Ans :(a, b)

We know, $R = [M^1L^2T^{-3}A^{-2}]$

$L = [M^1L^2T^{-2}A^{-2}]$

$C = [M^{-1}L^{-2}T^4A^2]$

$\therefore RC = T$ and $\sqrt{LC} = T$

16 The dimensions of capacitance are (where Q is the dimension of charge):   1

(a) $M^{-1}L^{-2}T^2Q^2$

(b) $MLT^{-2}Q^{-2}$

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

(d) $M^{-1}L^{-2}T^2Q$

Ans :(a) $C = \dfrac{Q}{V} = \dfrac{Q}{ML^2T^{-2}/Q} = [M^{-1}L^{-2}T^2Q^2]$

17 The unit of charge is: 1

(a) Ampere

(b) Coulomb

(c) Ampere/sec

(d) Ampere-second

Ans :(c, d)

Unit of charge = Coulomb = Ampere × Sec

18 The units of electrical permittivity are: 1

(a) $N^{-1}m^{-2}C^2$

(b) $Nm^{-2}C^2$

(c) C^2/Nm^2

(d) n/Cm^2

Ans :

(a, c)

From $F = \dfrac{1}{4\pi\in}\dfrac{q_1 q_2}{r^2}$

$\in = \dfrac{q_1 q_2}{4\pi F r^2} = \dfrac{C^2}{Nm^2} = N^{-1}m^{-2}C^2$

19 The pairs of physical quantities that have the same dimensions are: 1

(a) Reynolds number and coefficient of friction

(b) Latent heat and gravitational potential

(c) Curie and frequency of light wave

(d) Planck's constant and torque.

Ans : (a, b, c)

(a) Reynolds number and coefficient of friction, both are dimensionless.

(b) $L = \dfrac{Q}{m} = \dfrac{ML^2T^{-2}}{M} = [L^2T^{-2}]$

(c) 1 curie = 3.7×10^{10} disintegrations/sec = T^{-1} Frequency = T^{-1}

20 Pressure is defined as: 1

(a) Momentum per unit area

(b) Momentum per unit area per unit time

(c) Momentum per unit volume

(d) Energy per unit volume

Ans : (b, d)

(b) Momentum per unit area per unit time

$= \dfrac{\text{Momentum}}{\text{Area} \times \text{Time}} = \dfrac{MLT^{-1}}{L^2 T} = [M^1 L^{-2} T^{-2}]$

(d) Energy per unit volume $= \dfrac{ML^2 T^{-2}}{T^3} = [M^1 L^{-1} T^{-2}]$

21 Which of the following set have different dimensions? 1

(a) Pressure, Young's modulus, Stress

(b) Emf, potential difference, Electric potential

(c) Heat, Work done, Energy

(d) Dipole moment, Electric flux, Electric field

Ans : (d)

Dimensions of dipole moment,

$p = q \times 2a = (AT) \times L = [M^0 L^1 T^1 A^1]$

Dimensions of electric field

$$E = \frac{F}{q} = \frac{MLT^{-2}}{AT} = [MLT^{-3}A^{-1}]$$

Dimensions of electric flux,

$$\phi = \vec{E} \cdot \vec{A} = EA \cos \theta$$

$$= \frac{F}{q} A \cos \theta = \left[\frac{MLT^{-2}}{AT} \times L^2 \times 1\right]$$

$$= [M^1 L^3 T^{-3} A^{-1}]$$

22 The number of significant figures in 0.06900 is   1

    (a) 5

    (b) 4

    (c) 2

    (d) 3

Ans :(b)

    Initial zero after the decimal point is not significant.

23 The sum of the numbers 436.32, 227.2 and 0.301 in appropriate significant   1
    figures is

    (a) 663.821

    (b) 664

    (c) 663.8

    (d) 663.82

Ans :

(b)

$436.32 + 227.2 + 0.301 = 663.821 = 664$ (rounding off to three significant
figures)

24 The mass and volume of a body are 4.237 g and 2.5 cm^3, respectively. The   1
    density of the material of the body in correct significant figures is

    (a) 1.6048 g/cm^3

    (b) 1.69 g/cm^3

    (c) 1.7 g/cm^3

    (d) 1.695 g/cm^3

Ans :

(c) $\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{4.237 \text{ g}}{2.5 \text{ cm}^3} = 1.6948 \text{ g/cm}^3 = 1.7 \text{ g/cm}^3$

(rounding off to two significant figures)

25 The numbers 2.745 and 2.735 on rounding off to 3 significant figures will   1
    give

    (a) 2.75 and 2.74

    (b) 2.74 and 2.73

    (c) 2.75 and 2.73

    (d) 2.74 and 2.74

Ans :

(d)

In 2.745, the digit to be rounded off (i.e., 4) is even, hence it should be left
unchanged and in 2.735, the digit to be rounded off (i.e., 3) is odd, hence it
should increased by 1, i.e., changed to 4.

26 Which of the following measurements is most precise?   1

    (a) 5.00 mm

    (b) 5.00 cm

    (c) 5.00 m

    (d) 5.00 km

Ans :(a)

    It is a measurement of distance to second place of decimal in mm.

27 The mean length of an object is 5 cm. Which of the following measurements is   1
    most accurate?

    (a) 4.9 cm

    (b) 4.805 cm

    (c) 5.25 cm

    (d) 5.4 cm

Ans :(a)

    It is closer 5 cm and correct upto first place of decimal.

28 Young's modulus of steel is 1.9×10^{11} N/m^2. When expressed in CGS units of   1
    dynes/cm^2, it will be equal to ($1N = 10^5$ dyne, $1 m^2 = 10^4 cm^2$)

    (a) 1.9×10^{10}

    (b) 1.9×10^{11}

    (c) 1.9×10^{12}

    (d) 1.9×10^{13}

Ans :

(c) $Y = 1.9 \times 10^{11} \ N/m^2 = 1.9 \times 10^{11} \left(\dfrac{10^5 \ dyne}{10^4 \ cm^2} \right)$

29 If momentum (P), area (A) and time (T) are taken to be fundamental quantities,   **1**
   then energy has the dimensional formula
   (a) $(P^1 A^{-1} T^1)$
   (b) $(P^2 A^1 T^1)$
   (c) $(P^1 A^{-1/2} T^1)$
   (d) $(P^1 A^{1/2} T^{-1})$

Ans :(d)

   Let energy, $E \propto P^a A^b T^c$
   or $E = k P^a A^b T^c$
   or $[ML^2 T^{-2}] = [MLT^{-1}]^a [L^2]^b [T]^c = [M^a L^{a+2b} T^{-a+c}]$
   Whence, $a = 1$, $b = 1/2$, $c = -1$
   Dimensional formula for E is $[P^1 A^{1/2} T^{-1}]$

30 On the basis of dimensions, decide which of the following relation(s) for the   **1**
   displacement of a particleundergoing simple harmonic motion is (are) not
   correct:
   (a) $y = a \sin 2/\pi t / T$
   (b) $y = a \sin vt$
   (c) $y = \sin \dfrac{a}{T} \sin \left(\dfrac{t}{a} \right)$
   (d) $y = a\sqrt{2} \left(\sin \dfrac{2\pi t}{T} - \cos \dfrac{2\pi t}{T} \right)$

Ans :
(b, c)
The argument of sin and cos should be dimensionless,
which is not so in case of (vt) and (t/a). More so, in (c), (a/T) is not displacement
as it is equal to amplitude/ time period.
Refer to Higher order thinking Skills

31 If P, Q, R are physical quantities, having different dimensions, which of the   **1**
   following combinations (s) can never be a meaningful quantity?
   (a) $(P - Q)/R$
   (b) $PQ - R$
   (c) PQ/R
   (d) $(PR - Q^2)/R$
   (e) $(R + Q)/P$

Ans :(a, e)

   (P – Q) and (R + Q), being the difference and sum of two

quantities with different dimensions, are meaningless.

(b, c) : PQ may have the same dimensions as those of R.

(d) : PR and Q^2 may have same dimensions as those of R.

32 Photon is quantum of radiation with energy $E = hv$ where v is frequency and h **1**

is Planck's constant. The dimensions of h are the same as that of

(a) Linear impulse

(b) Angular impulse

(c) Linear momentum

(d) Angular momentum

Ans :(b, d)

Planck's constant = $[ML^2T^{-1}]$

(a) Linear impulse = $Ft = [MLT^{-2}][T] = [MLT^{-1}]$

(b) Angular impulse = $I\omega = [ML^2][T^{-1}] = [ML^2T^{-1}]$

(c) Linear momentum = $mv = [M] [LT^{-1}] = [MLT^{-1}]$

(d) Angular momentum = $mve = [M] [LT^{-1}][L] = [ML^2T^{-1}]$

33 If Planck's constant (h) and speed of light in vacuum (c) are taken as two   **1**

fundamental quantities, which one of the following can, in addition, be taken to

express length, mass and time in terms of the three chosen fundamental

quantities?

(a) Mass of electron (*me*).

(b) Universal gravitational constant (G).

(c) Charge of electron (e).

(d) Mass of proton (m_p).

Ans :

(a, b, d) Refer to Solved Problem 19, Page 36 and Topic Based

$$\text{Planck's length} = \sqrt{\frac{Gh}{c^3}}$$

Problems of Practice 40 and 41, Page 45. $\text{Planck's time} = \sqrt{\frac{Gh}{c^5}}$

$$\text{Planck's mass} = \sqrt{\frac{ch}{G}}$$

Mass can be expressed by m_e and m_p

34   Which of the following ratios expresses pressure?   **1**

(a) Force/Area

(b) Energy/Density

(c) Energy/Area

(d) Force/Volume

Ans :(a)

35   Which of the following are not a unit of time?   1

(a) Second

(b) Parsec

(c) Year

(d) Light year

Ans :(b, d)

   Parsec and light year are the units of length.

36   Which of the following has metre kelvin as the unit?   1

(a) Rydberg constant

(b) Wein's constant

(c) Solar constant

(d) Gas constant.

Ans :(b)

37   A dimensionless quantity   1

   (a)   may have a unit

   (b)   never has a unit

   (c)   always has a unit

   (d)   doesn't exist.

Ans :

(a)

A dimensionless quantity may have a unit. For example, angle has a unit but is dimensionless.

38   Dimensions of gravitational constant are: 1

   (a) $M^{-1} L^3 T^{-2}$ (b) $M^{-2} L^3 T^{-1}$

   (c) $M^3 L^{-1} T^{-2}$ (d) $M^{-1} L^2 T^{-3}$

Ans : (a)

From $F = \dfrac{G m_1 m_2}{r^2}$

$G = \dfrac{F r^2}{m_1 m_2} = \dfrac{(MLT^{-2}) L^2}{M^2} = [M^{-1} L^3 T^{-2}]$

39 The physical quantities not having same dimensions are: 1

(a) momentum and Planck's constant

(b) speed and $(\mu_0 \in_0)^{-1/2}$

(c) speed and $\sqrt{p/\rho}$

(d) surface tension and spring constant

Ans :

(a) Momentum $= mv = [\text{MLT}^{-1}]$

Planck's constant $= h = \dfrac{E}{v} = \dfrac{\text{ML}^2\text{L}^{-2}}{\text{T}^{-1}} = [\text{ML}^2\text{T}^{-1}]$

40 Which of the following systems of units is not based on units of mass, length   1
and time alone?

(a) S.I.

(b) MKS

(c) FPS

(d) CGS

Ans :

(a)

International system (SI) is not based on units of mass, length and time alone.

41 The length and breadth of a rectangular sheet are 16.2 cm and 10.1cm,   1
respectively. The area of the sheet in appropriate significant figures and error is

(a) $164 \pm 3 \text{ cm}^2$

(b) $163.62 \pm 2.6 \text{ cm}^2$

(c) $163.6 \pm 2.6 \text{ cm}^2$

(d) $163.62 \pm 3 \text{ cm}^2$

Ans :

(a)

As $l = 16.2$ cm, $b = 10.1$ cm, $A = lb = 163.62 \text{ cm}^2$

Since l and b contain 3 figures, i.e., $A = 164 \text{ cm}^2$

Further, $\dfrac{\Delta A}{A} = \dfrac{\Delta l}{l} + \dfrac{\Delta b}{b} = \dfrac{0.1\,\text{cm}}{16.2\,\text{cm}} + \dfrac{0.1\,\text{cm}}{10.1\,\text{cm}}$

or $\Delta A = 164\left(\dfrac{0.1}{16.2} + \dfrac{0.1}{10.1}\right)\text{cm}^2 = (1.01 + 16.2)\,\text{cm}^2$

$= 2.63 \text{ cm}^2 = 3 \text{ cm}^2$

(Rounding off to one significant figure as only the last digit in 164 is uncertain)

The, $A \pm \Delta A = (164 \pm 3)\,\text{cm}^2$

42   Which of the following pairs of physical quantities does not have same   1

dimensional formula?

(a) Work and torque.

(b) Angular momentum and Planck's constant.

(c) Tension and surface tension.

(d) Impulse and linear momentum.

Ans : (c)

(a) Work = Force × Distance = $[MLT^{-2}][L] = [ML^2\,T^{-2}]$

Torque = Force × Distance = $[ML^2 T^{-2}]$

(b) Angular momentum = $mvr = [M][ML^{-1}][L] = [ML^2\,T^{-1}]$

Plank's constant, $h = \dfrac{E}{v} = \dfrac{[ML^2T^{-2}]}{[T^{-1}]} = [ML^2\,T^{-2}]$

(c) Tension = force = $[MLT^{-2}]$

Surface tension = $\dfrac{\text{Force}}{\text{Length}} = \dfrac{[MLT^{-2}]}{[L]} = [ML^0T^{-2}]$

(d) Impulse = Force × Time = $[MLT^{-2}] = [T] = [MLT^{-1}]$

Momentum = Mass × Velocity = $[M][LT^{-1}] = [MLT^{-1}]$

43   Measure of two quantities along with the precision of respective measuring   1

instrument is

A = 2.5 m/s ± 0.5 m/s, B = 0.10 s ± 0.01 s

The value of AB will be

(a) (0.25 ± 0.08) m

(b) (0.25 ± 0.5) m

(c) (0.25 ± 0.05) m

(d) (0.25 ± 0.135) m

Ans :

(a) Z = AB = (2.5 m/s) (0.10 s) = 0.25 m

As $\dfrac{\Delta Z}{Z} = \dfrac{\Delta A}{A} + \dfrac{\Delta B}{B}$,

$\Delta Z = Z\left(\dfrac{\Delta A}{A} + \dfrac{\Delta B}{B}\right)$ = 0.25 m (0.2 + 0.1)

$= 0.25\,\text{m}\left(\dfrac{0.5\text{ m/s}}{2.5\text{ m/s}} + \dfrac{0.01\text{ s}}{0.10\text{ s}}\right)$

= 0.07 m = 0.08 m

44 You measure two quantities as A = 1.0 m ± 0.2 m, B = 2.0 m ± 0.2 m. We   1

should report correct value for AB as:

$\sqrt{AB}$

Ans : $Z = \sqrt{AB} = \sqrt{1.0 \text{ m} \times 2.0 \text{ m}} = 1.4 \text{ m}$

As $\qquad \dfrac{\Delta Z}{Z} = \dfrac{1}{2}\dfrac{\Delta A}{A} + \dfrac{1}{2}\dfrac{\Delta B}{B}$

(d) $\qquad\qquad = \dfrac{1}{2}\left(\dfrac{0.2 \text{ m}}{1\text{m}}\right) + \dfrac{1}{2}\left(\dfrac{0.2 \text{ m}}{2 \text{ m}}\right) = 0.15$

$\Delta Z = Z(0.15) = (1.4 \text{ m})(0.15) = 0.21 = 0.2 \text{ m}$

Correct value of $\sqrt{AB} = Z \pm \Delta Z = (1.4 \text{ m} \pm 0.2 \text{ m})$

45 The plane angle subtended at the centre of a circle by an arc equal in length to the radius of the circle is equal to _____.   1

Ans : 1 radian

46 Candela is the S.I. unit of physical quantity _____.   1

Ans : Luminous intensity

47 Relation between astronomical unit and light year is _____.   1

Ans : 1 ly $= 6.3 \times 10^4$ Au

48 _____ is the mass of a body which determines its inertia in translatory motion.   1

Ans : Inertial mass

49 Representation of physical quantity in terms of power of fundamental physical quantity is known as _____ of physical quantity.   1

Ans : Dimensional formulae

50 Dimensional formulae of universal gravitational constant (G) is _____.   1

Ans : $[M^{-1}L^3T^{-2}]$

51 Dimensional formulae of universal gas constant (R) is _____.   1

Ans : $[ML^2T^{-2}\,K^{-1}\,mol^{-1}]$

52 Determine π^2 with due regard to significant figures. [Given $\pi = 3.14$] [HOTS]   1

Ans : $\pi^2 = 3.14 \times 3.14 = 9.8596 = 9.86$

53 Write the dimensional formula of the following physical quantities: [NCT 2017]   1

(i) Stress   (ii) Coefficient of viscosity

Ans :(i) Dimensional formula for stress = $ML^{-1} T^{-2}$

(ii) Dimensional formula of coefficient of viscosity = $ML^{-1} T^{-1}$

54   The laws of physics can be expressed in terms of   1

(a) abstract quantities.

(b) physical quantities.

(c) fundamental quantities.

(d) derived quantities.

Ans :(b)

55   Which of the following is not an example of fundamental quantity?   1

(a) Luminous quantity.

(b) Electric current.

(c) Electric charge.

(d) Amount of substance.

Ans :(c) Electric charge

56   How is the numerical value (n) of a measure related to the size of its unit (u)   1
in physics?

(a) $n \propto u$

(b) $n \propto u^2$

(c) $n \propto 1/u^2$

(d) $n \propto 1/u$

Ans :(d)

57   In British system of units, mass is measured in   1

(a) pound.

(b) foot.

(c) kilogram.

(d) quintal.

Ans :(a)

58   Which system of units was adopted as the 11th General Conference of Weights   1
and Measures in 1960?

(a) CGS system

(b) FPS system

(c) MKS system

(d) SI system

Ans :(d)

59 Which of the following system of units is not a metric system?   **1**

(a) CGS system

(b) FPS system

(c) MKS system

(d) SI system

Ans :(b)

60 The unit of charge is: **1**

(a) Ampere

(b) Coulomb

(c) Ampere/sec

(d) Ampere-second

Ans :(b, d) Unit of charge = Coulomb = Ampere × Sec

61 The units of electrical permittivity are: **1**

(a) $N^{-1}m^{-2}C^2$

(b) $Nm^{-2}C^2$

(c) C^2/Nm^2

(d) n/Cm^2

Ans : (a, c)

$$\text{From } F = \frac{1}{4\pi\varepsilon}\frac{q_1 q_2}{r^2}$$

$$\varepsilon = \frac{q_1 q_2}{4\pi F r^2} = \frac{C^2}{Nm^2} = N^{-1}m^{-2}C^2$$

62 Which of the following sets cannot enter into the list of fundamental quantities   **1**
    in any system of units?

(a) Length, time and velocity

(b) Length, mass and velocity

(c) Mass, time and velocity

(d) Length, time and mass

Ans :

(a) Length, time and velocity can be deduced from one another. Therefore, they
cannot enter into the list of fundamental quantities in any system.

63 Which one of the following quantities has not been expressed in proper units?   **1**

(a) Coeff. of elasticity: N/m^2

(b) Surface tension: N/m

(c) Energy: kg m/s

(d) Pressure: N/m^2

Ans :(c) Energy $= [M^1 \, L^2 \, T^{-2}] = Kgm^2 \, g^{-2}$

64   Which of the following is not a device used for direct measurement of length?   **1**

    (a) Vernier Callipers

    (b) Screw gauge

    (c) Electrical oscillator

    (d) Spherometer

  Ans :(c)

65   Which of the following is an indirect method of measuring length?   **1**

    (a) Triangulation method

    (b) Parallax method

    (c) Avogadro's hypothesis method

    (d) All of these

  Ans :(d)

66   Relate the following units of length with its SI unit: **1**

    (a) fermi

    (b) angstrom

    (c) micron

    (d) nanometre

  Ans :(a)   1 fermi $= 10^{-15}$ m

        (b)   1 Å $= 10^{-10}$ m

        (c)   1 micron $= 10^{-6}$ m

        (d)   1 nm $= 10^{-9}$ m

67   Which of the following have same dimensions?   **1**

    (a) Specific heat and latent heat

    (b) Momentum and impulse

    (c) Moment of inertia and moment of momentum.

    (d) T ension and surface tension.

  Ans :(b)

68   Which of the following is a dimensional constant?   **1**

    (a) Refractive index

    (b) Dielectric constant

    (c) Relative density

(d) Gravitational constant.

Ans :(d)

69 The dimensional formula for latent heat is   1
   (a) $M^\circ L^2 T^{-1}$
   (b) $ML^2 T^{-1}$
   (c) MLT^{-2}
   (d) $ML^2 T^{-2}$

Ans :(a)

70 The velocity v of a particle is given in terms of time t is $v = at + \dfrac{b}{t+c}$ 1

   The dimensions of a, b, c are
   (a) L^2; TLT^{-2}
   (b) LT^2; LT; L
   (c) LT^{-2}; L; T
   (d) L; LT; T^2

Ans :(c) As c is added to t, therefore, c has the dimensions of $[T]$

$$As, \frac{b}{t} = v$$
$$\therefore b = v \times t = LT^{-1} \times T = [L]$$
$$from\ v = at,\ a = \frac{v}{t} = \frac{LT^{-1}}{T} = [LT^{-2}]$$

71 In the standard equation $S_{nth} =$, what dimensions do you view for S_{nth}?   1
   (a) $M^\circ L^1 T^\circ$
   (b) $M^\circ L^{-1} T^1$
   (c) $M^\circ L^1 T^{-1}$
   (d) $M^\circ L^\circ T^1$

Ans :(c)

72 The number of significant figures in numbers 36.42, 2008, 9.172 and $1.678 \times$ 1
   10^{-19} is
   (a) 1
   (b) 2
   (c) 3
   (d) 4

Ans :(d) 4 in each number.

73 The mass and volume of a body are 2.118 g and 1.25 cm^3 respectively. The   **1**
density of the material to correct significant figures is:

(a) 1.6944 g/cm^3

(b) 1.694 g/cm^3

(c) 1.69 g/cm^3

(d) 1.695 g/cm^3

Ans :(c) Density = $\dfrac{\text{Mass}}{\text{Volume}}$, upto 3 significant figures.

74 For the following question, two statements are given-one labelled Assertion (A)   **1**
and the other labelled Reason (R). Select the correct answer to these questions
from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: Dimension of force is MLT^{-2}.

Reason: Force is the product of mass and acceleration.

Ans :(a) Both A and R are true and R is the correct explanation of A.

75 For the following question, two statements are given-one labelled Assertion (A)   **1**
and the other labelled Reason (R). Select the correct answer to these questions
from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: The SI unit of time is second.

Reason: It is the duration of 9,192,631,770 periods of the radiation
corresponding to the transition between the two hyperfine levels of the ground
state of the cesium-133 atom.

Ans :(a) Both A and R are true and R is the correct explanation of A.

76 For the following question, two statements are given-one labelled Assertion (A)   **1**
and the other labelled Reason (R). Select the correct answer to these questions
from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: The SI is a coherent system of units.

Reason: All derived units can be obtained from fundamental units using multiplication or division, without using any numerical factor.

 Ans :(a) Both A and R are true and R is the correct explanation of A.

77For the following question, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.   **1**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: The numerical value of a quantity measured in pounds, is more than that measured in kilogram.

Reason: 1 kg = 0.4536 pound.

 Ans :(c) A is true but R is false.

78For the following question, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.   **1**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: The number of significant figures in 86400 is 3 and is 86400 second is 5.

Reason: All zeroes to the right of any number are significant.

 Ans :(c) A is true but R is false.

79For the following question, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.   **1**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: Dimensional analysis can be used to derive a relationship between different quantities.

Reason: Dimensional analysis can be used if a quantity depends upto three factors.

Ans :(b) Both A and R are true but R is NOT the correct explanation of A.

80 For the following question, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.   **1**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: The magnitude of a physical quantity changes if expressed in a different system of units.

Reason: The numerical value of a quantity is directly proportional to the size of its unit.

Ans :(d) A is false and R is also false.

81 For the following question, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.   **1**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

Assertion: Specific gravity and strain are examples of dimensionless variables.

Reason: Dimensionless variables have no dimensions and can take variable values.

Ans :(a) Both A and R are true and R is the correct explanation of A.

82 In an experiment to estimate the size of oleic acid molecule, 1 mL of oleic acid is dissolved in 19 mL of alcohol. Then 1 mL of this solution is diluted to 20 mL by adding alcohol. Now, 1 drop of this diluted solution is placed on water in a shallow trough. The solution spreads over the surface of water forming one molecule thick layer. Now lycopodium powder is sprinkled over the film evenly and its diameter is measured. Knowing the volume of the drop and area of the   **1**

film, we can calculate the thickness of the film which will give us the size of oleic acid molecule.

(i) We dissolve oleic acid in alcohol because
    (a) it does not react with alcohol
    (b) it reacts vigorously with water
    (c) it does not dissolve in water
    (d) both (a) and (b) are true

(ii) We sprinkle lycopodium powder evenly on water surface so that
    (a) oleic acid forms a layer over it
    (b) oleic acid forms a circular area on surface by pushing the powder away
    (c) oleic acid layer becomes thicker
    (d) oleic acid layer becomes thinner

(iii) What would be the volume of oleic acid in each mL of solution prepared?
    (a) 1/20 mL
    (b) 1/40 mL
    (c) 1/200 mL
    (d) 1/400 mL

(iv) How will you calculate the volume of n drops of this solution of oleic acid?
    (a) Using burette and measuring cylinder
    (b) Using dropper and measuring cylinder
    (c) Using weighing machine and measuring cylinder
    (d) Any of the above.

Or

(iv) What will be the volume of oleic acid in one drop of this solution?
    (a) 400/n mL
    (b) $400/n^2$ mL
    (c) n/400 mL
    (d) $n^2/400$ mL

Ans :

(i) (c)

(ii) (b) Lycopodium powder spreads evenly on water surface. Oleic acid pushes the lycopodium power away on water surface and forms a circular area, making it easier to measure.

(iii) (d) 20 mL of solution contains 1 mL oleic acid. Further, 1 mL of if it is diluted to 20 mL of solution again, hence

volume of oleic acid = $\dfrac{1}{20} \times \dfrac{1}{20} = \dfrac{1}{400}$ mL..

(iv) (a) We can find the volume of n drops by counting the drops using burette and finding their total volume by a measuring cylinder.

<center>*Or*</center>

(iv) (c) n/400 mL

83 Einstein's mass-energy relation emerging out of his famous theory of relativity   **1**
relates mass(m) and energy as $E = mc^2$. At nuclear level, magnitudes of energy are very small. This energy is measured in MeV where 1 MeV = 1.6×10^{-13} J. Masses are measured in unified atomic mass unit, where 1 u = 1.67×10^{-27} kg.

(i)   What is the energy equivalent of 1 u?

    (a) 931.5 eV

    (b) 931.5 keV

    (c) 931.5 meV

    (d) 931.5 MeV

(ii) A student writes the relation as 1 u = 931.5 MeV. The teacher points out that the relation dimensionally incorrect is

    (a) $1\text{ u} \times c^2 = 931.5$ MeV

    (b) $1\text{ u} = 931.5 \times c^2$ MeV

    (c) $1\text{ u} \times c = 931.5$ MeV

    (d) $1\text{ u} = 931.5 \times c$ MeV

(iii) Which of the following relations is correct?

    (a) $1\text{ J} = 1.6 \times 10^{-19}$ eV

    (b) $1\text{ eV} = 1.6 \times 10^{-19}$ J

    (c) $1\text{ eV} = 9.27 \times 10^{-27}$ eV

    (d) $1\text{ J} = 6.25 \times 10^{18}$ eV

(iv) The dimensions of E in $E = mc^2$ are

    (a) $[M^2L^2T^{-2}]$

    (b) $[MLT^{-1}]$

    (c) $[MLT^{-2}]$

    (d) $[ML^2T^2]$

<center>*Or*</center>

(iv) The unit 'joule' is the SI unit of

    (a) work

    (b) energy

    (c) heat absorbed/released

    (d) all of these

Ans : (i) (d) $E = mc^2$

$$= (1.67 \times 10^{-27})(3 \times 10^{8})^{2}$$
$$= 1.67 \times 9 \times 10^{-11} \text{ J}$$
$$\Rightarrow E = \frac{1.67 \times 9 \times 10^{-11}}{1.6 \times 10^{-13}} \text{ MeV} \text{ MeV}$$
$$= 931.5 \text{ MeV}$$

(ii) (a) As $E = mc^2$, $m = E/c^2$

$$1 \text{ u} = \frac{931.5 \text{ MeV}}{c^2}$$

Hence, $1 \text{ u} \times c^2 = 931.5$ MeV will be dimensionally correct.

(iii) (b) $1 \text{ eV} = 1.6 \times 10^{-19}$ J

(iv) (d) dimensions of energy.

Or

(iv) (d) all of these

84The dimensional method is a very convenient way of finding the dependence of   **1**
physical quantity on other physical quantities of a given system. This method
has its own limitations. In a complicated situation, it is often not easy to guess
the factors on which a Physical quantity will depend. Secondly, this method
gives no information about the dimensionless proportionality constant. Thirdly
this method is used only if a Physical quantity depends on the product of other
physical quantities. Fourthly this method will not work if a physical quantity
depends on another quantity being a trignometric or exponential function.
Finally this method does not give complete information in cases where a
Physical quantity depends on more than three quantities in problems in
mechanics.

(i) Expression of a physical quantity in terms of powers of fundamental
physical quantity is known as

(a) Dimensional formula

(b) Basic physical quantity

(c) Derived physical quantity

(d) Dimensional analysis

(ii) Smallest value that can be measured by a measuring instrument is called

(a) Minor length

(b) Small measuring value

(c) Least count

(d) Relative length

(iii) Method of dimensional analysis used the principle of

(a) Heterogeneity

(b) Homogeneity

(c) Power's law

(d) Associativity

(iv) Dimensional analysis will not work if a physical quantity depends on another quantity like

(a) fraction value

(b) trigonometric function

(c) sine function

(d) cosine function

Ans :(i) (a)

(ii) (c)

(iii) (b)

(iv) (b)

85In the study of Physics, we often have to measure the physical quantities. The numerical value of a measured quantity can only be approximate as it depends upon the least count of the measuring instrument used. The number of significant figures in any measurement indicates the degree of precision of that measurement. The importance of significant figures lies in calculation. A mathematical calculation cannot increase the precision of a physical measurement. Therefore, the number of significant figures in the sum or product of a group of numbers cannot be greater than the number that has the least number of significant figures because a chain cannot be stronger than its weakest link. The difference in the true value and the measured value of a quantity is the measure of error in measurement.

(i) What are significant figures?

(ii) Define least count.

(iii) Is there any relation between precision and accuracy?

(iv) State the relationship between significant figures and precision.

Ans :

(i) In the measured value of physical quantity, the digit about the correctness of which we are sure plus the last digit which is doubtful, are called significant figures.

(ii) The smallest value that can be measured by a measuring instrument is called the least count of the instrument.

(iii) Precision describes the limitation of the measuring instrument. It is determined by the least count of the measuring instrument. Smaller the least count, greater is the precision. Both accuracy and precision reflect how close a

1

measurement is to an actual value. Accuracy reflects how close a measurement is to a known or accepted value, while precision reflects how reproducible measurements are, even if they are far from the accepted value.

(iv) Larger the number of significant figures in a measurement, greater is the precision of the measurement and vice versa.

86 The velocity of light 'c', the constant of gravitation 'G' and Planck's constant   **1**
'h' be chosen as fundamental units.

(i) The dimensions of mass are

(a) $[h\,c\,G]$ (b) $[h^{1/2}\,c^{1/2}\,G^{-1/2}]$

(c) $[h^2\,c^2\,G^{-2}]$ (d) $[h\,c\,G^{-1}]$

(ii) The dimensions of length are

(a) $[h^{1/2}\,c^{1/2}\,G^{1/2}]$ (b) $[h^{1/2}\,c^{-3/2}\,G^{-1/2}]$

(c) $[h^{1/2}\,c^{-3/2}\,G^{1/2}]$ (d) $[h\,c\,G]$

(iii) The dimensions of time are

(a) $[h^{1/2}\,c^{1/2}\,G^{1/2}]$ (b) $[h^{1/2}\,c^{-5/2}\,G^{-1/2}]$

(c) $[h^{-1/2}\,c^{-5/2}\,G^{1/2}]$ (d) $[h^{1/2}\,c^{-5/2}\,G^{1/2}]$

(iv) Prof. Albert Einstein got noble prize in Physics for his work on

(a) Special theory of relativity.

(b) Equivalence of mass-energy.

(c) Photoelectric effect.

(d) Fifth state of matter BEC.

(v) The number of significant figures in 0.06900 is

(a) 5 (b) 4

(c) 2 (d) 3

(vi) Which of the following set have different dimensions?

(a) Pressure, Young's modulus, Stress

(b) Emf, potential difference, Electric potential

(c) Heat, Work done, Energy

(d) Dipole moment, Electric flux, Electric field

Ans :(i) (b)

(ii) (c)

(iii) (d)

(iv) (c)

(v) (b)

(vi) (d)

87 The velocity of light 'c', the constant of gravitation 'G' and Planck's constant   **1**

'h' be chosen as fundamental units.

(i) The dimensions of mass are

(a) $[h\ c\ G]$

(b) $[h^{1/2}\ c^{1/2}\ G^{-1/2}]$

(c) $[h^2\ c^2\ G^{-2}]$

(d) $[h\ c\ G^{-1}]$

(ii) The dimensions of length are

(a) $[h^{1/2}\ c^{1/2}\ G^{1/2}]$

(b) $[h^{1/2}\ c^{-3/2}\ G^{-1/2}]$

(c) $[h^{1/2}\ c^{-3/2}\ G^{1/2}]$

(d) $[h\ c\ G]$

(iii) The dimensions of time are

(a) $[h^{1/2}\ c^{1/2}\ G^{1/2}]$

(b) $[h^{1/2}\ c^{-5/2}\ G^{-1/2}]$

(c) $[h^{-1/2}\ c^{-5/2}\ G^{1/2}]$

(d) $[h^{1/2}\ c^{-5/2}\ G^{1/2}]$

(iv) The number of significant figures in 0.06900 is

(a) 5

(b) 4

(c) 2

(d) 3

Or

(iv) Prof. Albert Einstein got noble prize in Physics for his work on

(a) Special theory of relativity.

(b) Equivalence of mass-energy.

(c) Photoelectric effect.

(d) Fifth state of matter BEC.

Ans :(i) (b)(ii) (c)(iii) (d)

(iv) (b)

Or

(iv) (d)

88   Which of the length measurements is the most accurate and why?   **1**

(i) 500.0 cm

(ii) 0.0005 cm

(iii) 6.00 cm.

Ans :

The length measurement 500.0 cm is most accurate as it has 4 significant figures.