

**Q1.** The dimensional formula of latent heat is :

09 Apr 2024 (M)

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

**Q2.** The de-Broglie wavelength associated with a particle of mass  $m$  and energy  $E$  is  $h/\sqrt{2mE}$ . The dimensional formula for Planck's constant is :

09 Apr 2024 (E)

- (1)  $[ML^2 T^{-1}]$  (2)  $[ML^{-1} T^{-2}]$   
 (3)  $[MLT^{-2}]$  (4)  $[M^2 L^2 T^{-2}]$

**Q3.** If  $\epsilon_0$  is the permittivity of free space and  $E$  is the electric field, then  $\epsilon_0 E^2$  has the dimensions : 08 Apr 2024 (E)

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

**Q4.** Match List I with List II

LIST I	LIST II		
A.	Torque	I.	$[M^1 L^1 T^{-2} A^{-2}]$
B.	Magnetic field	II.	$[L^2 A^1]$
C.	Magnetic moment	III.	$[M^1 T^{-2} A^{-1}]$
D.	Permeability of free space	IV.	$[M^1 L^2 T^{-2}]$

Choose the correct answer from the options given below:

06 Apr 2024 (M)

- (1) A-III, B-I, C-II, D-IV (2) A-IV, B-II, C-III, D-I  
 (3) A-IV, B-III, C-II, D-I (4) A-I, B-III, C-II, D-IV

**Q5.** Given below are two statements

Statement (I) : Dimensions of specific heat is  $[L^2 T^{-2} K^{-1}]$ .

Statement (II) : Dimensions of gas constant is  $[ML^2 T^{-1} K^{-1}]$ .

In the light of the above statements, choose the most appropriate answer from the options given below.

06 Apr 2024 (E)

- (1) Both statement (I) and statement (II) are correct  
 (2) Statement (I) is correct but statement (II) is incorrect  
 (3) Both statement (I) and statement (II) are incorrect Statement (I) is incorrect but statement (II) is correct  
 (4) Statement (I) is incorrect but statement (II) is correct

**Q6.** If  $G$  be the gravitational constant and  $u$  be the energy density then which of the following quantity have the dimensions as that of the  $\sqrt{uG}$  :

05 Apr 2024 (M)

- (1) pressure gradient per unit mass (2) Gravitational potential  
 (3) Energy per unit mass (4) Force per unit mass

**Q7.** What is the dimensional formula of  $ab^{-1}$  in the equation  $\left(P + \frac{a}{V^2}\right)(V - b) = RT$ , where letters have their usual meaning.

05 Apr 2024 (E)

- (1)  $[M^{-1} L^5 T^3]$  (2)  $[M^6 L^7 T^4]$   
 (3)  $[ML^2 T^{-2}]$  (4)  $[M^0 L^3 T^{-2}]$

**Q8.** The equation of stationary wave is:  $y = 2a \sin\left(\frac{2\pi nt}{\lambda}\right) \cos\left(\frac{2\pi x}{\lambda}\right)$ .

Which of the following is NOT correct :

04 Apr 2024 (M)

- (1) The dimensions of  $n/\lambda$  is [T] (2) The dimensions of  $n$  is  $[LT^{-1}]$   
 (3) The dimensions of  $x$  is [L] (4) The dimensions of  $nt$  is [L]

**Q9.** Applying the principle of homogeneity of dimensions, determine which one is correct, where  $T$  is time period,  $G$  is gravitational constant,  $M$  is mass,  $r$  is radius of orbit.

04 Apr 2024 (E)

- (1)  $T^2 = \frac{4\pi^2 r^2}{GM}$  (2)  $T^2 = \frac{4\pi^2 r}{GM^2}$   
 (3)  $T^2 = \frac{4\pi^2 r^3}{GM}$  (4)  $T^2 = 4\pi^2 r^3$

**Q10.** The dimensional formula of angular impulse is :

01 Feb 2024 (M)

- (1)  $[ML^{-2}T^{-1}]$  (2)  $[ML^2T^{-2}]$   
 (3)  $[MLT^{-1}]$  (4)  $[ML^2T^{-1}]$

**Q11.** A force is represented by  $F = ax^2 + bt^{\frac{1}{2}}$ , where  $x$  = distance and  $t$  = time. The dimensions of  $\frac{b^2}{a}$  are :

31 Jan 2024 (M)

- (1)  $[ML^3T^{-3}]$  (2)  $[MLT^{-2}]$   
 (3)  $[ML^{-1}T^{-1}]$  (4)  $[ML^2T^{-3}]$

**Q12.** Consider two physical quantities  $A$  and  $B$  related to each other as  $E = \frac{B-x^2}{At}$  where  $E$ ,  $x$  and  $t$  have dimensions of energy, length and time respectively. The dimension of  $AB$  is

31 Jan 2024 (E)

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

**Q13.** Match List-I with List-II.

	List-I		List-II
A.	Coefficient of viscosity	I.	$[ML^2T^{-2}]$
B.	Surface Tension	II.	$[ML^2T^{-1}]$
C.	Angular momentum	III.	$[ML^{-1}T^{-1}]$
D.	Rotational kinetic energy	IV.	$[ML^0T^{-2}]$

30 Jan 2024 (M)

- (1) A-II, B-I, C-IV, D-III (2) A-I, B-II, C-III, D-IV  
 (3) A-III, B-IV, C-II, D-I (4) A-IV, B-III, C-II, D-I

**Q14.** If mass is written as  $m = kc^P G^{-1/2} h^{1/2}$ , then the value of  $P$  will be : (Constants have their usual meaning with  $k$  a dimensionless constant)

30 Jan 2024 (E)

- (1)  $\frac{1}{2}$  (2)  $\frac{1}{3}$   
 (3) 2 (4)  $-\frac{1}{3}$

**Q15.** The equation of state of a real gas is given by  $\left(P + \frac{a}{V^2}\right)(V - b) = RT$ , where  $P$ ,  $V$  and  $T$  are pressure, volume and temperature respectively and  $R$  is the universal gas constant. The dimensions of  $\frac{a}{b^2}$  is similar to that of :

27 Jan 2024 (E)

- (1)  $PV$  (2)  $P$   
 (3)  $RT$  (4)  $R$

**Q16.** Given below are two statements:

Statement (I) : Planck's constant and angular momentum have the same dimensions.

Statement (II) : Linear momentum and moment of force have the same dimensions.

In light of the above statements, choose the correct answer from the options given below :

27 Jan 2024 (M)

- (1) Statement I is true but Statement II is false (2) Both Statement I and Statement II are false  
 (3) Both Statement I and Statement II are true (4) Statement I is false but Statement II is true

**Q17.** The speed of a wave produced in water is given by  $v = \lambda^a g^b \rho^c$ . Where  $\lambda$ ,  $g$  and  $\rho$  are wavelength of wave, acceleration due to gravity and density of water respectively. The values of  $a$ ,  $b$  and  $c$  respectively, are

15 Apr 2023 (M)

- (1) 1, -1, 0 (2)  $\frac{1}{2}$ , 0,  $\frac{1}{2}$   
 (3) 1, 1, 0 (4)  $\frac{1}{2}$ ,  $\frac{1}{2}$ , 0

**Q18.** In the equation  $\left[X + \frac{a}{Y^2}\right][Y - b] = RT$ ,  $X$  is pressure,  $Y$  is volume,  $R$  is universal gas constant and  $T$  is temperature. The physical quantity equivalent to the ratio  $\frac{a}{b}$  is:

13 Apr 2023 (E)

- (1) Pressure gradient (2) Energy  
 (3) Impulse (4) Coefficient of viscosity

**Q19.** Match List I with List II

List-I	List-II
A Spring constant	I $[T^{-1}]$
B Angular speed	II $[MT^{-2}]$
C Angular momentum	III $[ML^2]$
D Moment of Inertia	IV $[ML^2T^{-1}]$

Choose the correct answer from the options given below:

12 Apr 2023 (M)

- (1) A-I, B-III, C-II, D-IV (2) A-IV, B-I, C-III, D-II  
 (3) A-II, B-I, C-IV, D-III (4) A-II, B-III, C-I, D-IV

**Q20.** Given below are two statements :

**Statement I :** Astronomical unit (Au), Parsec (Pc) and Light year (ly) are units for measuring astronomical distances.

**Statement II :**  $\text{Au} < \text{Parsec (Pc)} < \text{ly}$

In the light of the above statements, choose the most appropriate answer from the options given below:

11 Apr 2023 (M)

- (1) Both Statements I and Statements II are incorrect  
 (2) Statements I is correct but Statements II is incorrect  
 (3) Both Statements I and Statements II are correct  
 (4) Statements I is incorrect but Statements II is correct

**Q21.** If force ( $F$ ), velocity ( $V$ ) and time ( $T$ ) are considered as fundamental physical quantity, then dimensional formula of density will be : **11 Apr 2023 (E)**

- (1)  $F V^4 T^{-6}$  (2)  $F V^{-4} T^{-2}$   
 (3)  $F^2 V^{-2} T^6$  (4)  $F V^{-2} T^2$

**Q22.** Match List I with List II

List I	List II
A. Torque	I. $M L^{-2} T^{-2}$
B. Stress	II. $M L^2 T^{-2}$
C. Pressure gradient	III. $M L^{-1} T^{-1}$
D. Coefficient of viscosity	IV. $M L^{-1} T^{-2}$

Choose the correct answer from the options given below : **08 Apr 2023 (E)**

- (1) A-II, B-I, C-IV, D-III (2) A-IV, B-II, C-III, D-I  
 (3) A-II, B-IV, C-I, D-III (4) A-III, B-IV, C-I, D-II

**Q23.** Dimension of  $\frac{1}{\mu_0 \epsilon_0}$  should be equal to **08 Apr 2023 (M)**

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

**Q24.**  $\left(P + \frac{a}{V^2}\right)(V - b) = RT$  represents the equation of state of some gases. Where  $P$  is the pressure,  $V$  is the volume,  $T$  is the temperature and  $a$ ,  $b$ ,  $R$  are the constants. The physical quantity, which has dimensional formula as that of  $\frac{b^2}{a}$ , will be : **01 Feb 2023 (M)**

- (1) Bulk modulus (2) Modulus of rigidity  
 (3) Compressibility (4) Energy density

**Q25.** If the velocity of light  $c$ , universal gravitational constant  $G$  and planck's constant  $h$  are chosen as fundamental quantities. The dimensions of mass in the new system is: **01 Feb 2023 (E)**

- (1)  $[h^{\frac{1}{2}} c^{\frac{1}{2}} G^1]$  (2)  $h^1 c^1 G^{-1}$   
 (3)  $[h^{-\frac{1}{2}} c^{\frac{1}{2}} G^{\frac{1}{2}}]$  (4)  $[h^{\frac{1}{2}} c^{\frac{1}{2}} G^{-\frac{1}{2}}]$

**Q26.** Match List I with List II

List I	List II
A Angular momentum	I $[ML^2 T^{-2}]$
B Torque	II $[ML^{-2} T^{-2}]$
C Stress	III $[ML^2 T^{-1}]$
D Pressure gradient	IV $[ML^{-1} T^{-2}]$

Choose the correct answer from the options given below :

31 Jan 2023 (E)

(1) A-I, B-IV, C-III, D-II

(2) A-III, B-I, C-IV, D-II

(3) A-II, B-III, C-IV, D-I

(4) A-IV, B-II, C-I, D-III

**Q27.** If  $R$ ,  $X_L$  and  $X_C$  represent resistance, inductive reactance and capacitive reactance. Then which of the following is dimensionless:

31 Jan 2023 (M)

(1)  $R X_L X_C$

(2)  $\frac{R}{\sqrt{X_L X_C}}$

(3)  $\frac{R}{X_L X_C}$

(4)  $R \frac{X_L}{X_C}$

**Q28.** Match List I with List II

**List I**

- A Torque
- B Energy density
- C Pressure gradient
- D Impulse

**List II**

- I  $\text{kg m}^{-1} \text{s}^{-2}$
- II  $\text{kg m s}^{-1}$
- III  $\text{kg m}^{-2} \text{s}^{-2}$
- IV  $\text{kg m}^2 \text{s}^{-2}$

Choose the correct answer from the options given below :

30 Jan 2023 (E)

(1) A-IV, B-III, C-I, D-II

(2) A-I, B-IV, C-III, D-II

(3) A-IV, B-I, C-II, D-III

(4) A-IV, B-I, C-III, D-II

**Q29.** Electric field in a certain region is given by  $\vec{E} = \left( \frac{A}{x^2} \hat{i} + \frac{B}{y^3} \hat{j} \right)$ . The SI unit of  $A$  and  $B$  are : 30 Jan 2023 (M)

(1)  $\text{N m}^3 \text{C}^{-1}$ ;  $\text{N m}^2 \text{C}^{-1}$

(2)  $\text{N m}^2 \text{C}^{-1}$ ;  $\text{N m}^3 \text{C}^{-1}$

(3)  $\text{N m}^3 \text{C}$ ;  $\text{N m}^2 \text{C}$

(4)  $\text{N m}^2 \text{C}$ ;  $\text{N m}^3 \text{C}$

**Q30.** Match List I with List II :

**List-I (Physical Quantity)**

- A Pressure gradient
- B Energy density
- C Electric Field
- D Latent heat

**List-II (Dimensional Formula)**

- I  $[M^0 L^2 T^{-2}]$
- II  $[M^1 L^{-1} T^{-2}]$
- III  $[M^1 L^{-2} T^{-2}]$
- IV  $[M^1 L^1 T^{-3} A^{-1}]$

Choose the correct answer from the options given below:

29 Jan 2023 (M)

(1) A-III, B-II, C-I, D-IV

(2) A-II, B-III, C-IV, D-I

(3) A-III, B-II, C-IV, D-I

(4) A-II, B-III, C-I, D-IV

**Q31.** The equation of a circle is given by  $x^2 + y^2 = a^2$ , where  $a$  is the radius. If the equation is modified to change the origin other than  $(0, 0)$ , then find out the correct dimensions of  $A$  and  $B$  in a new equation:

$$(x - At)^2 + \left(y - \frac{t}{B}\right)^2 = a^2$$

The dimensions of  $t$  is given as  $[T^{-1}]$

29 Jan 2023 (E)

$$(1) A = [L^{-1}T], B = [LT^{-1}]$$

$$(3) A = [L^{-1}T^{-1}], B = [LT^{-1}]$$

$$(2) A = [LT], B = [L^{-1}T^{-1}]$$

$$(4) A = [L^{-1}T^{-1}], B = [LT]$$

**Q32.** Match List I with List II

**List - I**

- A Surface tension  
B Pressure  
C Viscosity  
D Impulse

**List - II**

- I.  $\text{kg m}^{-1} \text{s}^{-1}$   
II.  $\text{kg m s}^{-1}$   
III.  $\text{kg m}^{-1} \text{s}^{-2}$   
IV.  $\text{kg s}^{-2}$

Choose the correct answer from the options given below:

- (1) A-IV, B-III, C-II, D-I  
(3) A-III, B-IV, C-I, D-II

- (2) A-IV, B-III, C-I, D-II  
(4) A-II, B-I, C-III, D-IV

25 Jan 2023 (M)

**Q33.** Match List I with List II

**List**

- A Young's Modulus ( $Y$ )  
B Co-efficient of Viscosity ( $\eta$ )  
C Planck's Constant ( $h$ )  
D Work Function ( $\phi$ )

**List II**

- I  $[ML^{-1} T^{-1}]$   
II  $[ML^2 T^{-1}]$   
III  $[ML^{-1} T^{-2}]$   
IV  $[ML^2 T^{-2}]$

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-IV, D-I  
(3) A-I, B-III, C-IV, D-II

- (2) A-III, B-I, C-II, D-IV  
(4) A-I, B-II, C-III, D-IV

25 Jan 2023 (E)

**Q34.** Match List I with List II

**List I**

- A. Planck's constant ( $h$ )  
B. Stopping potential ( $V_s$ )  
C. Work function ( $\phi$ )  
D. Momentum ( $p$ )

**List II**

- I.  $[M^1 L^2 T^{-2}]$   
II.  $[M^1 L^1 T^{-1}]$   
III.  $[M^1 L^2 T^{-1}]$   
IV.  $[M^1 L^2 T^{-3} A^{-1}]$

- (1) A – III, B – I, C – II, D – IV  
(3) A – II, B – IV, C – III, D – I

- (2) A – III, B – IV, C – I, D – II  
(4) A – I, B – III, C – IV, D – II

24 Jan 2023 (M)

**Q35.** The frequency ( $\nu$ ) of an oscillating liquid drop may depend upon radius ( $r$ ) of the drop, density ( $\rho$ ) of liquid and the surface tension ( $s$ ) of the liquid as:  $\nu = r^a \rho^b s^c$ . The values of  $a$ ,  $b$  and  $c$  respectively are

- (1)  $(-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2})$   
(3)  $(\frac{3}{2}, \frac{1}{2}, -\frac{1}{2})$

- (2)  $(-\frac{3}{2}, \frac{1}{2}, \frac{1}{2})$   
(4)  $(\frac{3}{2}, -\frac{1}{2}, \frac{1}{2})$

24 Jan 2023 (E)

**Q36.** Match List I with List II.

## List I

- (A) Torque  
(B) Stress  
(C) Latent Heat  
(D) Power

## List II

- (I)  $\text{Nms}^{-1}$   
(II)  $\text{Jkg}^{-1}$   
(III)  $\text{Nm}$   
(IV)  $\text{Nm}^{-2}$

Choose the correct answer from the options given below:

29 Jul 2022 (E)

(1) A – III, B – II, C – I, D – IV

(2) A – III, B – IV, C – II, D – I

(3) A – IV, B – I, C – III, D – II

(4) A – II, B – III, C – I, D – IV

**Q37.** Given below are two statements: One is labelled as Assertion (A) and other is labelled as Reason (R)

**Assertion (A) :** Time period of oscillation of a liquid drop depends on surface tension ( $S$ ), if density of the liquid is  $\rho$  and radius of the drop is  $r$ , then  $T = K\sqrt{\frac{\rho r^3}{S^2}}$  is dimensionally correct, where  $K$  is dimensionless.

**Reason (R) :** Using dimensional analysis we get R.H.S. having different dimension than that of time period. In the light of above statements, choose the correct answer from the options given below.

29 Jul 2022 (M)

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

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

**Q38.** The dimensions of  $\left(\frac{B^2}{\mu_0}\right)$  will be (if  $\mu_0$ : permeability of free space and  $B$  :magnetic field)

28 Jul 2022 (M)

(1)  $[\text{ML}^2 \text{T}^{-2}]$

(2)  $[\text{MLT}^{-2}]$

(3)  $[\text{ML}^{-1} \text{T}^{-2}]$

(4)  $[\text{MLL}^{-2} \text{A}^{-1}]$

**Q39.** Consider the efficiency of Carnot's engine is given by  $\eta = \frac{\alpha\beta}{\sin\theta} \log_e \frac{\beta x}{kT}$ , where  $\alpha$  and  $\beta$  are constants. If  $T$  is temperature,  $k$  is Boltzman constant,  $\theta$  is angular displacement and  $x$  has the dimensions of length. Then, choose the incorrect option.

28 Jul 2022 (E)

(1) Dimensions of  $\beta$  is same as that of force.

(2) Dimensions of  $\alpha^{-1}x$  is same as that of energy.

(3) Dimensions of  $\eta^{-1} \sin\theta$  is same as that of  $\alpha\beta$

(4) Dimensions of  $\alpha$  is same as that of  $\beta$

**Q40.** An expression of energy density is given by  $u = \frac{\alpha}{\beta} \sin\left(\frac{\alpha x}{kt}\right)$ , where  $\alpha$ ,  $\beta$  are constants,  $x$  is displacement,  $k$  is Boltzmann constant and  $t$  is the temperature. The dimensions of  $\beta$  will be

27 Jul 2022 (E)

(1)  $[\text{ML}^2 \text{T}^{-2} \theta^{-1}]$

(2)  $[\text{M}^0 \text{L}^2 \text{T}^{-2}]$

(3)  $[\text{M}^0 \text{L}^0 \text{T}^0]$

(4)  $[\text{M}^0 \text{L}^2 \text{T}^0]$

**Q41.** If momentum  $[P]$ , area  $[A]$  and time  $[T]$  are taken as fundamental quantities, then the dimensional formula for coefficient of viscosity is

25 Jul 2022 (M)

(1)  $[\text{PA}^{-1} \text{T}^0]$

(2)  $[\text{PAT}^{-1}]$

(3)  $[\text{PA}^{-1} \text{T}]$

(4)  $[\text{PA}^{-1} \text{T}^{-1}]$

**Q42.** Which of the following physical quantities have the same dimensions?

25 Jul 2022 (M)

- (1) Electric displacement  $(\vec{D})$  and surface charge density  
 (2) Displacement current and electric field  
 (3) Current density and surface charge density  
 (4) Electric potential and energy

**Q43.** In van der Waals equation  $\left[P + \frac{a}{V^2}\right][V - b] = RT$ ;  $P$  is pressure,  $V$  is volume,  $R$  is universal gas constant and  $T$  is temperature. The ratio of constants  $\frac{a}{b}$  is dimensionally equal to : **29 Jun 2022 (M)**

- (1)  $\frac{P}{V}$  (2)  $\frac{V}{P}$   
 (3)  $PV$  (4)  $PV^3$

**Q44. Assertion A:** Product of Pressure ( $P$ ) and time ( $t$ ) has the same dimension as that of coefficient of viscosity.

**Reason:** Coefficient of viscosity =  $\frac{\text{Force}}{\text{Velocity gradient}}$

**28 Jun 2022 (M)**

- (1) Both A and R true, and R is correct explanation of A.  
 (2) Both A and R are true but R is NOT the correct explanation of A.  
 (3) A is true but R is false.  
 (4) A is false but R is true.

**Q45.** The SI unit of a physical quantity is Pascal - sec. The dimensional formula of this quantity will be

**27 Jun 2022 (E)**

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

**Q46.** If  $L$ ,  $C$  and  $R$  are the self inductance, capacitance and resistance respectively, which of the following does not have the dimension of time? **27 Jun 2022 (E)**

- (1)  $\sqrt{LC}$  (2)  $\frac{L}{R}$   
 (3)  $CR$  (4)  $\frac{L}{C}$

**Q47.** An expression for a dimensionless quantity  $P$  is given by  $P = \frac{\alpha}{\beta} \log_e\left(\frac{kT}{\beta x}\right)$ ; where  $\alpha$  and  $\beta$  are constants,  $x$  is distance;  $k$  is Boltzmann constant and  $T$  is the temperature. Then the dimensions of  $\alpha$  will be

**26 Jun 2022 (M)**

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

**Q48.** The dimension of mutual inductance is

**26 Jun 2022 (E)**

- (1)  $ML^2T^{-2}A^{-1}$  (2)  $ML^2T^{-2}A^{-2}$   
 (3)  $ML^2T^{-3}A^{-1}$  (4)  $ML^2T^{-3}A^{-2}$

**Q49.** Identify the pair of physical quantities which have different dimensions:

**24 Jun 2022 (M)**

- (1) Wave number and Rydberg's constant (2) Stress and Coefficient of elasticity  
 (3) Coercivity and Magnetisation (4) Specific heat capacity and Latent heat

**Q50.** Identify the pair of physical quantities that have same dimensions:

**24 Jun 2022 (E)**

- (1) Velocity gradient and decay constant  
(3) Wave number and Avogadro number

- (2) Angular frequency and angular momentum  
(4) Wein's constant and Stephan's constant

**Q51.** Match List - I with List - II.

List - I

- a Torque  
b Impulse  
c Tension  
d Surface Tension

List - II

- i  $MLT^{-1}$   
ii  $MT^{-2}$   
iii  $ML^2 T^{-2}$   
iv  $MLT^{-2}$

Choose the most appropriate answer from the option given below :

31 Aug 2021 (M)

- (1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)  
(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

- (2) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)  
(4) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

**Q52.** Which of the following equations is dimensionally incorrect?

Where  $t$  = time,  $h$  = height,  $s$  = surface tension,  $\theta$  = angle,  $\rho$  = density,  $a, r$  = radius,  $g$  = the acceleration due to gravity,  $V$  = volume,  $p$  = pressure,  $W$  = work done,  $\tau$  = torque,  $\epsilon$  = permittivity,  $E$  = electric field,  $J$  = current density,  $L$  = length.

31 Aug 2021 (M)

- (1)  $W = \tau\theta$   
(3)  $h = \frac{2s \cos \theta}{\rho g}$

- (2)  $V = \frac{\pi p a^4}{8 \eta L}$   
(4)  $J = \epsilon \frac{\partial E}{\partial t}$

**Q53.** If velocity  $[V]$  time  $[T]$  and force  $[F]$  are chosen as the base quantities, the dimensions of the mass will be :

31 Aug 2021 (E)

- (1)  $[FVT^{-1}]$   
(3)  $[FT^2 V]$

- (2)  $[FT^{-1}V^{-1}]$   
(4)  $[FTV^{-1}]$

**Q54.** If  $E$  and  $H$  represents the intensity of electric field and magnetizing field respectively, then the unit of  $\frac{E}{H}$  will be:

27 Aug 2021 (M)

- (1) joule  
(3) newton

- (2) ohm  
(4) mho

**Q55.** Match List-(I) with List-(II).

List-(I)

- a  $R_H$  (Rydberg constant)  
b  $h$  (Planck's constant)  
c  $\mu_B$  (Magnetic field energy density)  
d  $\eta$  (coefficient of viscosity)

List-(II)

- i  $kg m^{-1} s^{-1}$   
ii  $kg m^2 s^{-1}$   
iii  $m^{-1}$   
iv  $kg m^{-1} s^{-2}$

Choose the most appropriate answer from the options given below:

27 Aug 2021 (E)

- (1) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)  
(3) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

- (2) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)  
(4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

**Q56.** Which of the following is not a dimensionless quantity?

27 Aug 2021 (M)

- (1) Power factor (2) Quality factor  
(3) Permeability of free space ( $\mu_0$ ) (4) Relative magnetic permeability ( $\mu_r$ )

**Q57.** If force (F), length (L) and time (T) are taken as the fundamental quantities. Then what will be the dimension of density:

27 Aug 2021 (E)

- (1)  $[FL^{-4} T^2]$  (2)  $[FL^{-3} T^3]$   
(3)  $[FL^{-3} T^2]$  (4)  $[FL^{-5} T^2]$

**Q58.** If  $E$ ,  $L$ ,  $M$  and  $G$  denote the quantities as energy, angular momentum, mass and constant of gravitation respectively, then the dimensions of  $P$  in the formula  $P = EL^2M^{-5}G^{-2}$  are:

26 Aug 2021 (M)

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

**Q59.** Match List - I with List - II :

List - I

List - II

- |                         |                        |
|-------------------------|------------------------|
| a Magnetic induction    | i $ML^2 T^{-2} A^{-1}$ |
| b Magnetic flux         | ii $M^0 L^{-1} A$      |
| c Magnetic permeability | iii $MT^{-2} A^{-1}$   |
| d Magnetization         | iv $MLT^{-2} A^{-2}$   |

Choose the most appropriate answer from the options given below :

26 Aug 2021 (E)

- (1) (a) – (iii), (b) – (ii), (c) – (iv), (d) – (i) (2) (a) – (iii), (b) – (i), (c) – (iv), (d) – (ii)  
(3) (a) – (ii), (b) – (iv), (c) – (i), (d) – (iii) (4) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)

**Q60.** Match List I with List II.

List-I

List-II

- |  |                             |
|--|-----------------------------|
| a Capacitance, C                           | i $M^1 L^1 T^{-3} A^{-1}$   |
| b Permittivity of free space, $\epsilon_0$ | ii $M^{-1} L^{-3} T^4 A^2$  |
| c Permeability of free space, $\mu_0$      | iii $M^{-1} L^{-2} T^4 A^2$ |
| d Electric field, E                        | iv $M^1 L^1 T^{-2} A^{-2}$  |

Choose the correct answer from the options given below

27 Jul 2021 (E)

- (1) (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (ii), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (i)  
(2) (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (iv), (c)  $\rightarrow$  (ii), (d)  $\rightarrow$  (i)  
(3) (a)  $\rightarrow$  (iv), (b)  $\rightarrow$  (ii), (c)  $\rightarrow$  (iii), (d)  $\rightarrow$  (i)  
(4) (a)  $\rightarrow$  (iv), (b)  $\rightarrow$  (iii), (c)  $\rightarrow$  (ii), (d)  $\rightarrow$  (i)

**Q61.** The force is given in terms of time  $t$  and displacement  $x$  by the equation  $F = A \cos Bx + C \sin Dt$ . The dimensional formula of  $\frac{AD}{B}$  is:

25 Jul 2021 (E)

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

**Q62.** If time ( $t$ ), velocity ( $v$ ), and angular momentum ( $l$ ) are taken as the fundamental units. Then the dimension of mass ( $m$ ) in terms of  $t$ ,  $v$  and  $l$  is: 20 Jul 2021 (E)

- (1)  $[t^{-1}v^1l^{-2}]$  (2)  $[t^1v^2l^{-1}]$   
 (3)  $[t^{-2}v^{-1}l^1]$  (4)  $[t^{-1}v^{-2}l^1]$

**Q63.** In a typical combustion engine the workdone by a gas molecule is given by  $W = \alpha^2 \beta e^{-\frac{\beta x^2}{kT}}$ , where  $x$  is the displacement,  $k$  is the Boltzmann constant and  $T$  is the temperature. If  $\alpha$  and  $\beta$  are constants, dimensions of  $\alpha$  will be: 26 Feb 2021 (M)

- (1)  $[MLT^{-2}]$  (2)  $[M^2LT^{-2}]$   
 (3)  $[MLT^{-1}]$  (4)  $[M^0LT^0]$

**Q64.** If  $C$  and  $V$  represent capacity and voltage respectively then what are the dimensions of  $\lambda$  where  $C/V = \lambda$ ? 26 Feb 2021 (E)

- (1)  $[M^{-2}L^{-4}I^3T^7]$  (2)  $[M^{-2}L^{-3}I^2T^6]$   
 (3)  $[M^{-1}L^{-3}I^{-2}T^{-7}]$  (4)  $[M^{-3}L^{-4}I^3T^7]$

**Q65.** Match List - I with List - II :

List - I

List - II

- |                              |                           |
|------------------------------|---------------------------|
| (a) $h$ (Planck's constant)  | (i) $[MLT^{-1}]$          |
| (b) $E$ (kinetic energy)     | (ii) $[ML^2T^{-1}]$       |
| (c) $V$ (electric potential) | (iii) $[ML^2T^{-2}]$      |
| (d) $P$ (linear momentum)    | (iv) $[ML^2I^{-1}T^{-3}]$ |

Choose the correct answer from the options given below:

25 Feb 2021 (M)

- (1) (a)  $\rightarrow$  (ii), (b)  $\rightarrow$  (iii), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (i) (2) (a)  $\rightarrow$  (i), (b)  $\rightarrow$  (ii), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (iii)  
 (3) (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (ii), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (i) (4) (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (iv), (c)  $\rightarrow$  (ii), (d)  $\rightarrow$  (i)

**Q66.** If  $e$  is the electronic charge,  $c$  is the speed of light in free space and  $h$  is Planck's constant, the quantity  $\frac{1}{4\pi\epsilon_0} \frac{|e|^2}{hc}$  has dimensions of : 25 Feb 2021 (E)

- (1)  $[MLT^0]$  (2)  $[M^0L^0T^0]$   
 (3)  $[MLT^{-1}]$  (4)  $[LC^{-1}]$

**Q67.** The work done by a gas molecule in an isolated system is given by,  $W = \alpha \beta^2 e^{-\frac{x^2}{\alpha kT}}$ , where  $x$  is the displacement,  $k$  is the Boltzmann constant and  $T$  is the temperature.  $\alpha$  and  $\beta$  are constants. Then the dimensions of  $\beta$  will be: 24 Feb 2021 (M)

- (1)  $[M^2LT^2]$  (2)  $[ML^2T^{-2}]$   
 (3)  $[MLT^{-2}]$  (4)  $[M^0LT^0]$

**Q68.** The quantities  $x = \frac{1}{\sqrt{\mu_0\epsilon_0}}$ ,  $y = \frac{E}{B}$  and  $z = \frac{l}{CR}$  are defined where  $C$ -capacitance,  $R$ -Resistance,  $\ell$ -length,  $E$ -Electric field,  $B$ -magnetic field and  $\epsilon_0$ ,  $\mu_0$ ,  $\mu_0$ -free space permittivity and permeability respectively. Then: 05 Sep 2020 (E)

- (1)  $x$ ,  $y$  and  $z$  have the same dimension. (2) Only  $x$  and  $z$  have the same dimension  
 (3) Only  $x$  and  $y$  have the same dimension (4) Only  $y$  and  $z$  have the same dimension.

**Q69.** Dimensional formula for thermal conductivity is (here  $K$  denotes the temperature): **04 Sep 2020 (M)**

- (1)  $MLT^{-2}K$  (2)  $MLT^{-2}K^{-2}$   
 (3)  $MLT^{-3}K$  (4)  $MLT^{-3}K^{-1}$

**Q70.** A quantity  $x$  is given by  $(1Fv^2/WL^4)$  in terms of moment of inertia  $I$ , force  $F$ , velocity  $v$ , work  $W$  and length  $L$ . The dimensional formula for  $x$  is same as that of : **04 Sep 2020 (E)**

- (1) planck's constant (2) force constant  
 (3) energy density (4) coefficient of viscosity

**Q71.** Amount of solar energy received on the earth's surface per unit area per unit time is defined a solar constant. Dimension of solar constant is: **03 Sep 2020 (E)**

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

**Q72.** If speed  $V$ , area  $A$  and force  $F$  are chosen as fundamental units, then the dimension of Young's modulus will be : **02 Sep 2020 (M)**

- (1)  $FA^2V^{-1}$  (2)  $FA^2V^{-3}$   
 (3)  $FA^2V^{-2}$  (4)  $FA^{-1}V^0$

**Q73.** If momentum( $P$ ), area ( $A$ ) and time ( $T$ ) are taken to be the fundamental quantities then the dimensional formula for energy is : **02 Sep 2020 (E)**

- (1)  $[P^2 AT^{-2}]$  (2)  $[PA^{-1} T^{-1}]$   
 (3)  $[PA^{1/2} T^{-1}]$  (4)  $[P^{1/2} AT^{-1}]$

**Q74.** A quantity  $f$  is given by  $f = \sqrt{\frac{hc^5}{G}}$  where  $c$  is speed of light,  $G$  univasal gravitational constant and  $h$  is the Planck's constant. Dimension of  $f$  is that of: **09 Jan 2020 (M)**

- (1) area (2) energy  
 (3) momentum (4) volume

**Q75.** The dimension of stopping potential  $V_0$  in photoelectric effect in units of Planck's constant ' $h$ ', speed of light ' $c$ ' and Gravitational constant ' $G$ ' and ampere  $A$  is: **08 Jan 2020 (M)**

- (1)  $h^{\frac{1}{3}}G^{\frac{2}{3}}c^{\frac{1}{3}}A^{-1}$  (2)  $h^0c^5G^{-1}A^{-1}$   
 (3)  $h^{-\frac{2}{3}}c^{-\frac{1}{3}}G^{\frac{4}{3}}A^{-1}$  (4)  $h^2G^{\frac{3}{2}}c^{\frac{1}{3}}A^{-1}$

**Q76.** Given,  $B$  is magnetic field induction, and  $\mu_0$  is the magnetic permeability of vacuum. The dimension of  $\frac{B^2}{2\mu_0}$  is: **07 Jan 2020 (E)**

- (1)  $MLT^{-2}$  (2)  $ML^2T^{-1}$   
 (3)  $ML^2T^{-2}$  (4)  $ML^{-1}T^{-2}$

**Q77.** Which of the following combinations has the dimension of electrical resistance ( $\epsilon_0$  is the permittivity of vacuum and  $\mu_0$  is the permeability of vacuum)? **12 Apr 2019 (M)**

- (1)  $\frac{\epsilon_0}{\mu_0}$  (2)  $\sqrt{\frac{\epsilon_0}{\mu_0}}$   
 (3)  $\frac{\mu_0}{\epsilon_0}$  (4)  $\sqrt{\frac{\mu_0}{\epsilon_0}}$

**Q78.** In the formula  $X = 5YZ^2$ ,  $X$  and  $Z$  have dimensions of capacitance and magnetic field, respectively. What are the dimensions of  $Y$  in SI units?

10 Apr 2019 (E)

- (1)  $[M^{-1} L^{-2} T^4 A^2]$  (2)  $[M^{-2} L^0 T^{-4} A^{-2}]$   
 (3)  $[M^{-2} L^{-2} T^6 A^3]$  (4)  $[M^{-3} L^{-2} T^8 A^4]$

**Q79.** If Surface tension ( $S$ ), Moment of Inertia ( $I$ ) and Planck's constant ( $h$ ), were to be taken as the fundamental units, the dimensional formula for linear momentum would be:

08 Apr 2019 (E)

- (1)  $S^{1/2} I^{1/2} h^0$  (2)  $S^{1/2} I^{3/2} h^{-1}$   
 (3)  $S^{3/2} I^{1/2} h^0$  (4)  $S^{1/2} I^{1/2} h^{-1}$

**Q80.** In SI units, the dimensions of  $\sqrt{\frac{\epsilon_0}{\mu_0}}$  is:

08 Apr 2019 (M)

- (1)  $AT^2 M^{-1} L^{-1}$  (2)  $A^2 T^3 M^{-1} L^{-2}$   
 (3)  $A^{-1} TML^3$  (4)  $AT^{-3} ML^{3/2}$

**Q81.** Let  $L$ ,  $R$ ,  $C$  and  $V$  represent inductance, resistance, capacitance and voltage, respectively. The dimension of  $\frac{L}{RCV}$  in SI units will be:

12 Jan 2019 (E)

- (1)  $[LTA]$  (2)  $[A^{-1}]$   
 (3)  $[LT^2]$  (4)  $[LA^{-2}]$

**Q82.** The force of interaction between two atoms is given by  $F = \alpha \beta \exp\left(-\frac{x^2}{\alpha k T}\right)$ ; where  $x$  is the distance,  $k$  is the Boltzmann constant and  $T$  is temperature and  $\alpha$  and  $\beta$  are two constants. The dimensions of  $\beta$  is:

11 Jan 2019 (M)

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

**Q83.** If speed ( $V$ ), acceleration ( $A$ ) and force ( $F$ ) are considered as fundamental units, the dimension of Young's modulus will be :

11 Jan 2019 (E)

- (1)  $V^{-2} A^2 F^{-2}$  (2)  $V^{-2} A^2 F^2$   
 (3)  $V^{-4} A^{-2} F$  (4)  $V^{-4} A^2 F$

**Q84.** The density of a material in SI units is  $128 \text{ kg m}^{-3}$ . In certain units in which the unit of length is 25 cm and the unit of mass is 50g, the numerical value of density of the material is:

10 Jan 2019 (M)

- (1) 410 (2) 16  
 (3) 40 (4) 640

**Q85.** Expression for time in terms of  $G$  (universal gravitational constant),  $h$  (Planck constant) and  $c$  (speed of light) is proportional to:

09 Jan 2019 (E)

- (1)  $\sqrt{\frac{Gh}{c^3}}$  (2)  $\sqrt{\frac{hc^5}{G}}$   
 (3)  $\sqrt{\frac{Gh}{c^5}}$  (4)  $\sqrt{\frac{c^3}{Gh}}$

## ANSWER KEYS

1. (2)	2. (1)	3. (4)	4. (3)	5. (2)	6. (4)	7. (3)	8. (1)
9. (3)	10. (4)	11. (1)	12. (2)	13. (3)	14. (1)	15. (2)	16. (1)
17. (4)	18. (2)	19. (3)	20. (2)	21. (2)	22. (3)	23. (3)	24. (3)
25. (4)	26. (2)	27. (2)	28. (4)	29. (2)	30. (3)	31. (2)	32. (2)
33. (2)	34. (2)	35. (1)	36. (2)	37. (4)	38. (3)	39. (4)	40. (4)
41. (1)	42. (1)	43. (3)	44. (3)	45. (3)	46. (4)	47. (3)	48. (2)
49. (4)	50. (1)	51. (2)	52. (2)	53. (4)	54. (2)	55. (3)	56. (3)
57. (1)	58. (4)	59. (2)	60. (1)	61. (2)	62. (4)	63. (4)	64. (1)
65. (1)	66. (2)	67. (3)	68. (1)	69. (4)	70. (3)	71. (2)	72. (4)
73. (3)	74. (2)	75. (2)	76. (4)	77. (4)	78. (4)	79. (1)	80. (2)
81. (2)	82. (2)	83. (4)	84. (3)	85. (3)			