ULTIMATE KCET CRASH COURSE

PHYSICS

Units and measurements and Motion in a straight line **DPP :- 01**

Q1 The SI unit of g is

(A) m^2/s (B) m/s^2

(C) s/m^2 (D) m/s

Q2 $ML^{-1}T^{-2}$ is the dimensional formula of

(A) force

(B) coefficient of friction

(C) modulus of elasticity

(D) energy

Q3 Which of the following is dimensionless?

(A) $\frac{v^2}{rg}$ (B) $\frac{v^2 g}{r}$

(C) $\frac{vg}{r}$ (D) $\frac{vg}{r}$

Q4 The dimensional formula of electric potential is

(A) $\left[ML^2T^{-3}A^{-1}\right]$

(B) $\left[M^{-1}L^2T^{-2}A\right]$

(C) $\left[M^{-1}L^2T^{-2}A^{-1}\right]$

(D) $\left[ML^2T^{-2}A\right]$

Q5 The ratio of the dimensions of Planck's constant and that of moment of inertia has the dimension of

(A) time

(B) frequency

(C) angular momentum

(D) velocity

Q6 'Lumen' is the unit of

(A) Luminous flux

(B) Luminous intensity

(C) Illuminance

(D) Light frequency

Q7 Young's modulus of steel is 1.9×10^{11} Nm^{-2}. When expressed in CGS units of dynes cm^{-2}, it will be equal to

(A) 1.9×10^{10}

(B) 1.9×10^{11}

(C) 1.9×10^{12}

(D) 1.9×10^{13}

Q8 A cylinder has a length of 1.0×10^{-1} m and diameter of 2.40×10^{-3} m. Find the cross-sectional area of the cylinder with due consideration of significant figures(in micrometer).

(A) 4.52 (B) 4.15

(C) 3.96 (D) 4.80

Q9 How many quintals are there in one metric ton?

(A) 10 (B) 100

(C) 1000 (D) none of these

Q10 Which one of the following represents the correct dimensions of the gravitational constant?

(A) $\left[M^{-1}L^3T^{-2}\right]$

(B) $\left[MLT^{-1}\right]$

(C) $\left[ML^{-1}T^{-2}\right]$

(D) $\left[ML^{-2}T^{-2}\right]$

Q11 If force (*F*) and density (*d*) are related as *F* = $F = \frac{a}{\left(\beta + \sqrt{d}\right)}$ Find the dimension of (β).

(A) $[M^{-2/3}\ L^{1/2}$

(B) $[M^{3/2}\ L^{-1/2}]$

(C) $[M^{1/2}\ L^{-3/2}]$

(D) $[M^{-1/2}\ L^{3/2}]$

Q12 1 kWh is equal to

(A) $3.6 \times 10^6\ MJ$

(B) $3.6 \times 10^5\ MJ$

(C) $3.6 \times 10^2\ MJ$

(D) $3.6\ MJ$

Q13 The equation of state of a gas is given by $\left(P + \frac{a}{V^2}\right)\left(V - b^2\right) = cT$, where P,V,T are pressure, volume and temperature respectively, and a,b,c are constants. The dimensions of a and b are respectively

(A) $\left[ML^8T^{-2}\right]\ and\ \left[L^{3/2}\right]$

(B) $\left[ML^5T^{-2}\right]\ and\ \left[L^3\right]$

(C) $\left[ML^5T^{-2}\right]\ and\ \left[L^6\right]$

(D) $\left[ML^6T^{-2}\right]\ and\ \left[L^{3/2}\right]$

Q14 In the CGS system of units, the magnitude of the force is 100 dyne. If in another system of units, the fundamental physical quantities like mass, length and time are expressed in kilogram, metre and minute respectively, the magnitude of the force in this system of units is

(A) 0.036 (B) 0.36

(C) 3.6 (D) 36

Q15 Which of the following has the dimensions of pressure?

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

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

(C) $[ML^{-2}T^{-2}]$

(D) $[M^{-1}L^{-1}]$

Q16 The number of significant figures in 0.06900 is:-

(A) 5 (B) 4

(C) 2 (D) 3

Q17 Which of the following is not a physical quantity?

(A) Time (B) Current

(C) Hotness (D) Temperature

Q18 One angstrom (Å) is equal to:

(A) 10^{-6}mm

(B) 10^{-7}mm

(C) 10^{-8}mm

(D) 10^{-9} mm

Q19 Temperature can be expressed as a derived quantity in terms of

(A) length and mass

(B) mass and time

(C) length, mass and time

(D) none of these

Q20 Which of the following physical quantities has same unit in all the three system of units?

(A) Mass

(B) Length

(C) Time

(D) None of these

Q21 If $x = at + bt^2$ where x is the distance travelled by the body in km and t is the time taken by it in s, then the unit of b will be

(A) km/s (B) km-s

(C) km/s² (D) km-s²

Q22 Candela is the unit of:

(A) Electric intensity

(B) Luminous intensity

(C) Sound intensity

(D) None of these

Q23 The coefficient of volume expansion of a liquid is $49 \times 10^{-5}/K$ Calculate the fractional change in its density when the temperature is raised by 30° C

(A) 7.5×10^{-3}

(B) 3.0×10^{-3}

(C) 1.47×10^{-2}

(D) 1.1×10^{-3}

Q24 The numbers 2.745 and 2.735 on rounding off to 3 significant figures will 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

Q25 The speed of light (c), gravitational constant (G) and plank's constant (h) are taken as the fundamental units in a system. The dimension of time in this new system should be

(A) $G^{1/2}h^{1/2}C^{-5/2}$

(B) $G^{-1/2}h^{1/2}C^{1/2}$

(C) $G^{1/2}h^{1/2}C^{-3/2}$

(D) $G^{1/2}h^{1/2}C^{1/2}$

Q26 Statement I:Number of significant figures in 0.005 is one and that in 0.500 is three.

Statement II: Zeros are not significant.

Choose the correct option from the following.

(A) If both statement I and statement II are true and statement II is the correct explanation of statement I.

(B) If both statement I and statement II are true but statement II is not the correct explanation of statement I.

(C) If statement I is true but statement II is false.

(D) If both statement I and statement II are false.

Q27 Which of the following has the dimensions of pressure?

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

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

(C) $[ML^{-2}T^{-2}]$

(D) $[M^{-1}L^{-1}]$

Q28 Which of the following physical quantities has same unit in all the three system of units?

(A) Mass (B) Length

(C) Time (D) None of these

Q29 $kgm^2s^{-3}A^{-2}$ is the SI unit of

(A) Inductance (B) Resistance

(C) Capacitance (D) Magnetic Flux

Q30 Which of the following physical quantities is not a fundamental quantity?

(A) Velocity

(B) Time

(C) Temperature

(D) Electric current

Answer Key

Q1	B
Q2	C
Q3	A
Q4	A
Q5	B
Q6	A
Q7	C
Q8	A
Q9	A
Q10	A
Q11	C
Q12	D
Q13	A
Q14	C
Q15	B
Q16	B
Q17	C
Q18	B
Q19	D
Q20	C
Q21	C
Q22	B
Q23	C
Q24	D
Q25	A
Q26	C
Q27	B
Q28	C
Q29	B
Q30	A

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

m/s^2

Video Solution:

Q2 Text Solution:

$[Y]=\frac{[\text{Stress}]}{[\text{Strain}]}=\left[ML^{-1}T^{-2}\right]$

Video Solution:

Q3 Text Solution:

The velocity of a body at highest point of vertical circle is, $v=\sqrt{rg}$

or $v^2=rg$

or $\frac{v^2}{rg}=\text{Constant}=\frac{\left(LT^{-1}\right)^2}{L^1\left(LT^{-2}\right)}=M^0L^0T^0$

$Hence,\ \frac{v^2}{rg}\ is$ dimensionaless,

Video Solution:

Q4 Text Solution:

$[V]=\left[\frac{w}{q}\right]=\left[ML^2T^{-3}A^{-1}\right]$

Video Solution:

Q5 Text Solution:

frequency

Video Solution:

Q6 Text Solution:

'Lumen' is the international unit of luminous flux.

Video Solution:

Q7 Text Solution:

Young's Modulus of steel in SI units:

$=1.9\times10^{11}\ N/m^2$

Young's modulus of steel in CGS units:

$=1.9\times10^{11}\times\frac{10^5\,dyne}{10^4\ cm^2}$

$=1.9\times10^{12}\ dyne/cm^2$

Video Solution:

Q8 Text Solution:

Given,

Length of cylinder $=1.0\ x\ 10^{-1}\ m$

Diameter of cylinder $=2.40\ x\ 10^{-3}\ m$

we know that the cross sectional area $=\pi r^2$

$r=\frac{d}{2}=\frac{2.4\times10^{-3}}{x}=1.2\times10^{-3}$ m

$\Rightarrow\ \frac{22}{7}\times\left(1.2\times10^{-3}\right)^2$

$=\frac{22\times1.44\times10^{-6}}{7}$

Area$=4.52\times10^{-6}$ m^2

We know that

Volume $=\pi r^2h$

$=3.14\times\left(1.2\times10^{-3}\right)^2\times1.0\times10^{-1}$

45.21×10^{-6}

Volume $=4.52\times10^{-7}$ m^3 .

Video Solution:

Q9 Text Solution:

Here, quintal and ton both are the unit of mass.

$1\ quintal\ = 100kg$

$1\ ton\ = 1000kg$

$1\ ton\ = 10\ quintals$

Video Solution:

Q10 Text Solution:

$G = \frac{Fd^2}{m_1 m_2}$

$[G] = \frac{[MLT^{-2}\ L^2]}{[M^2]} = [M^{-1}L^3T^{-2}]$

Video Solution:

Q11 Text Solution:

$F = \frac{\alpha}{(\beta + \sqrt{d})}$

$Dimensionally.[\beta] = [\sqrt{d}] = [d^{1/2}]$

$= [M^{1/2}L^{-3/2}]$

Video Solution:

Q12 Text Solution:

1 kilowatt hour is the energy produced by 1 kilowatt power source in 1 hour.

$1kWh = 1\,kW \times 1\text{ hour } = 1000$

$\times 3600Ws \Rightarrow 1kWh = 3.6 \times 10^6\ J$

$\Rightarrow 1kWh = 3.6MJ$

Video Solution:

Q13 Text Solution:

Given, $\left[P + \frac{a}{V^2}\right](V - b^2) = cT$

Dimension of $\frac{a}{V^3}$ = Dimensions of P

$\therefore$ Dimensions of a = dimensions of PV^3

$[a] = [\frac{F}{A}V^3] \quad (\because P = \frac{F}{A})$

$= \frac{[MLT^{-2}]}{[L^2]} \times [L^3]^3 = [ML^8T^{-2}]$

Dimensions of b^2 = dimensions of V

$\therefore [b] = [V]^{1/2} = [L^3]^{1/2}\ or\ [b] = [L^{3/2}]$

Video Solution:

Q14 Text Solution:

For any physical quantity,

Numerical value × Unit = constant

$n_2u_2 = n_1u_1$

$n_2[M_2L_2T_2^{-2}] = n_1[M_1L_1T_1^{-2}]$

$n_2 = n_1\left(\frac{M_1}{M_2}\right)\left(\frac{L_1}{L_2}\right)\left(\frac{T_1}{T_2}\right)^{-2}$

$n_2 = 100\left(\frac{g}{kg}\right)\left(\frac{cm}{m}\right)\left(\frac{s}{min}\right)^{-2}$

$n_2 = 100 \times \left(\frac{1}{10^3}\right) \times \left(\frac{1}{100}\right) \times \left(\frac{1}{60}\right)^{-2}$

$n_2 = 3.6$

Video Solution:

Q15 Text Solution:

$[ML^{-1}T^{-2}]$

Video Solution:

Q16 Text Solution:

For a number with decimal point, the trailing zeroes are significant.

Hence 4 significant figures.

Video Solution:

Q17 Video Solution:

Q18 Text Solution:

One angstrom is equal to = 1×10^{-7} mm

$1\mathring{A} = 1^{-10}m$

$= 10^{-10}\left(10^{3}\right)mm\left\{1m = 10^{3}mm\right\}$

$= 10^{-7}mm$

Video Solution:

Q19 Text Solution:

Temperature itself is a fundamental physical quantity that cannot be expressed in terms of other physical quantities. So, temperature can not be expressed in terms of mass length and time. The unit of tempreature is kelvin.

Video Solution:

Q20 Text Solution:

Time is measured in seconds in all the three systems of units.

Video Solution:

Q21 Text Solution:

Given, $x = at + bt^2$

We know that physical quantities having the same dimensions are added or subtracted.

Therefore, the dimension of at should be the same as the dimension of bt^2.

Also, physical quantities having the same dimensions can be compared.

Therefore, the dimension of $at + bt^2$ should be the same as the dimension of x.

$[bt^2] = [x]$

$[b] = [xt^{-2}]$

$[b] = [LT^{-2}]$

Hence, the unit of b will be km/s^2.

Video Solution:

Q22 Text Solution:

Candela is the unit of Luminous intensity.

Video Solution:

Q23 Text Solution:

$\text{Then } V_t = V_o\left(1 + \upsilon\Delta t\right)$

$= V_o\left(1 + 49\times10^{-5}\times30\right)$

$V_t = V_o\left(1 + 0.01470\right) = 1.0147070V_o$

$\Rightarrow \frac{V_o}{V_t} = \frac{1}{1.01470}$

Let ρ_o and ρ_t be the initial and final densities of glycerine then initial density, $\rho_o = \frac{m}{v_o}$ and final density, $\rho_t = \frac{m}{V_t}$

where, m = mass of glycerine

$\frac{\Delta\rho}{\rho_o} =$

$\frac{\rho_t-\rho_o}{\rho_o} = \frac{m\left(\frac{1}{V_t}-\frac{1}{V_o}\right)}{\frac{m}{V_o}} = \left(\frac{V_o}{V_t}-1\right)$

$\Rightarrow \frac{\Delta\rho}{\Delta\rho_o} = \left(\frac{1}{1.01470}-1\right) = -0.0145$

Here, negative sign shows that density decreases with rise in temperature.

$\frac{\Delta\rho}{\rho_o} = 0.0145 = 1.45\times10^{-2}$

$\Rightarrow \frac{\Delta\rho}{\Lambda_n} = 1.5\times10^{-2}$

Video Solution:

Q24 **Text Solution:**

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 be increased by 1, i.e., changed to 4.

Video Solution:

Q25 **Text Solution:**

$T = k C^x G^y h^z$

$[M^0 L^0 T^1] =$

$[LT^{-1}]^x [M^{-1} L^3 T^{-2}]^y [ML^2 T^{-2}]^z$

comparing powers of M, L and T

$x = -5/2$

$y = 1/2$

$z = 1/2$

Video Solution:

Q26 **Text Solution:**

in a number less then one, zero between the decimal point and first non zero digit are not significant.

But zeros to the right of last non zero digit are significant.

Statement-1 is true, but statement - 2 is false.

Video Solution:

Q27 **Text Solution:**

$[ML^{-1}T^{-2}]$

Video Solution:

Q28 **Text Solution:**

Time has same unit in all the three system of units.

Video Solution:

Q29 **Video Solution:**

Q30 **Text Solution:**

The seven fundamental quantity are given below -

1. Length
2. Mass
3. Time
4. Electric current
5. Thermodynamic temperature
6. Amount of substance
7. Luminous intensity

Hence,

Velocity is not a fundamental quantity.

Video Solution: