Objective

PHYSICS

Mechanics

Chapterwise & Subtopicwise

MCQ's

50,000

VOLUME-I

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CONTENT

01. Unit and Measurement

(a) Physical Quantities

1. The two principal thrusts in physics are
(a) Diversification and complete
(b) Unification and simplification
(c) Unification and reduction
(d) Diversification and simplification

AP EAMCET-08.07.2022, Shift-II

Ans. (c) : The two principal thrusts in physics are Unification and Reduction.

2. Choose the correct statement from following.
(a) Not all basic laws of physics are universal
(b) Conservation laws have a deep connection with symmetries of nature
(c) There are four to six fundamental forces in nature that govern the diverse phenomena of the world
(d) Physics can generate new technology but new physics cannot come out from technology

TS EAMCET 18.07.2022, Shift-I

Ans. (b) : A conservation law is a hypothesis based on observations and experiments.
- Conservation of law is a principle that states that a certain physical property does not change in the course of time within an isolated physical system.
- Conservation laws have a deep connection with symmetries of nature.

3. One angstrom (Å) is equal to:
(a) 10^{-6}mm (b) 10^{-7}mm
(c) 10^{-8}mm (d) 10^{-9} mm

AP EAMCET-20.08.2021, Shift-II

Ans. (b) : One angstrom is equal to = 1×10^{-7} mm

$\because 1\ \text{Å} = 10^{-10}$ m
$= 10^{-10}\ (10^3)$ mm {1 m = 10^3 mm}
$= 10^{-7}$ mm

4. In which physical quantity, maximum percentage change will be observed, when a copper sphere is heated?
(a) radius (b) area
(c) volume (d) length

AP EAMCET-25.09.2020, Shift-I

Ans. (c) : When a copper sphere is heated then maximum percentage change will be observed in its volume.
- Change in Area (A) = $4\pi r^2$

$\therefore \frac{\Delta A}{A} = 2\left(\frac{\Delta r}{r}\right)$ = Two times the percentage change

- Change in volume

$V = \frac{4}{3}\pi r^3$

$\therefore \frac{\Delta V}{V} = 3\left(\frac{\Delta r}{r}\right)$ = 3 times the percentage change in radius

So, maximum change will occur in volume, when a copper sphere is heated.

5. The angle of 1′ (minute of arc) in radian is nearly equal to
(a) 2.91×10^{-4} rad (b) 4.85×10^{-4} rad
(c) 4.80×10^{-6} rad (d) 1.75×10^{-2} rad

[NEET (Oct.) 2020]

Ans. (a) : We know that,

$$1' \text{ (minute of arc)} = \left(\frac{1}{60}\right)^\circ$$
$$= \frac{1}{60}\times\frac{\pi}{180} \text{ radian}$$
$$= \frac{\pi}{60\times180}$$
$$= \frac{3.14}{10800}$$
$$= 0.0291\times10^{-2}$$
$$= 2.91\times10^{-4} \text{ radian}$$

6. A dimensionless physical quantity ______
(a) may have a unit (b) always has a unit
(c) never has a unit (d) does not exist

AP EAMCET-24.09.2020, Shift-II

Ans. (a) : A dimesnsionless physical quantity may have a unit. It cannot be expressed in term of SI. quantities.
e.g. Radian in the unit for an angle, but it is dimesionless
because it is defined to be the ratio of two lengths.

7. The density of a material in SI units is 128 kg m^{-3}. In certain units in which the unit of length is 25 cm and the unit of mass is 50 g, the numerical value of density of the material is
(a) 40 (b) 16
(c) 640 (d) 410

JEE Main-10.01.2019, Shift-I

Ans. (a) : We know that

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{M}{V} = \frac{M}{L^3}$$

Then, $n_1u_1 = n_2u_2$

$128\ [M_1L_1^{-3}] = n_2\ [M_2L_2^{-3}]$

$$n_2 = \frac{128[M_1L_1^{-3}]}{[M_2L_2^{-3}]}$$

n_1 = numerical value in S.I unit
u_1 = unit in S.I.
n_2 = numerical value in other unit
u_2 = unit in other system

In second unit system m = 50g = $\frac{50}{1000}$ kg.

L = 25cm = $\frac{25}{100}$ mtr

$$n_2 = 128\left[\frac{M_1}{M_2}\right]\left[\frac{L_2}{L_1}\right]^3$$

$$= 128 \times \left[\frac{1}{\frac{50}{1000}}\right] \times \left[\frac{\frac{25}{100}}{1}\right]^3$$

$$= 128 \times 20 \times \left(\frac{1}{4}\right)^3$$

$$= 128 \times 20 \times \left(\frac{1}{64}\right)$$

= 40

8. The range of masses we study in Physics is

(a) 10^{-27} to 10^{60} kg (b) 10^{-27} to 10^{55} kg
(c) 10^{-30} to 10^{55} kg (d) 10^{-30} to 10^{60} kg

COMEDK 2019

Ans. (c): The electron is considered to be the particle with least mass of 10^{-30} kg. The mass of the known universe is considered to have the highest mass of 10^{55} kg.

9. How many astronomical units are there in 1 metre

(a) 6.68×10^{12} Au (b) 6.68×10^{-10} Au
(c) 6.68×10^{10} Au (d) 6.68×10^{-12} Au

SRMJEE-2019

Ans. (d) : 1 Au = 1.496×10^{11} m

$$1 \text{ m} = \frac{1}{1.496 \times 10^{11}} \text{ Au}$$

1 m = 6.68×10^{-12} Au

10. What is dimensions of energy in terms of linear momentum (P), area of (A) and Time (T)

(a) $[P^1A^1T^1]$ (b) $[P^2A^2T^{-1}]$
(c) $[P^1A^{1/2}T^{-1}]$ (d) $[P^{1/2}A^{1/2}T^{-1}]$

JIPMER-2019

Ans. (c) : Let,

Energy E = k $P^a A^b T^c$ ……(i)

Where k is a dimensionless constant of proportionality–

Writing dimension on both sides–

$[ML^2T^{-2}] = [MLT^{-1}]^a[M^0L^2T^0]^b [M^0L^0T]^c$

$[ML^2T^{-2}] = [M^aL^{a+2b}T^{-a+c}]$

Comparing the power from both sides–

a = 1 …..(ii)

a+2b = 2 …..(iii)

–a+c= –2 …..(iv)

On solving (ii), (iii) and (iv), we have–

a = 1, b= 1/2, c = –1

So, $[E] = [P^1A^{1/2}T^{-1}]$

11. If 10 g cms^{-1} = x Ns. then the number is____

(a) 1×10^{-5} (b) 1×10^{-4}
(c) 1×10^{-6} (d) 1×10^{-3}

AP EAMCET-24.04.2018, Shift-II

Ans. (a) : We know that

1g = 10^{-3} kg

1 cm = 10^{-2} m

According to question–

10 $gcms^{-1}$ = 10^{-3} kg $\times 10^{-2}$m$\times$sec^{-1}

$= 10^{-5}$ kg m.sec^{-1}

= 10^{-5} Ns $\left[N = \frac{kgm}{sec}\right]$

12. Order of magnitude of a physical quantity is the

(a) Power of 5 of the number that describes the quantity
(b) Power of 10 of the number that describes the quantity
(c) Power of 100 of the number that describes the quantity
(d) Power of 0.01 of the number that describes the quantity

J&K-CET-2018

Ans. (b) : The order of magnitude of a physical quantity is the power of 10 of the number that describes the quantity. It tells us about the largeness or smallness of a physical quantity. It is expressed in the form of a × 10^b where $1 \le a < 10$ and b is a positive or negative integer.

13. A star is very far from earth. If light 10 years from it to reach the earth, calculate the distance between star and earth.

(a) 9.45×10^{16}m (b) 9.46×10^{-16}m
(c) 9.46×10^{17}m (d) 9.46×10^{-17}m

SRM JEE-2018

Ans. (a) :

We know that One-light year is the distance Travelled by light in one year.

1 light year = 9.46×10^{12}km = 9.46×10^{15}m

So,

10 light year = $9.4 \times 10^{15} \times 10$ m

= 9.46×10^{16}m

14. It is estimated that cm^2 of earth receives about 2 calorie of heat energy per minute from the sun. This is called solar constant, the value of solar constant in S.I. units is

(a) 2 J m^2s^{-1} (b) 1.4 Wm^{-2}
(c) 2.4 kWm^{-2} (d) 1.4 $kJm^{-2}s^{-1}$

AP EAMCET-25.04.2017, Shift-I

Ans. (d) : Given that,

It is estimated that cm^2 of earth receives about 2 calorie of heat energy per minute from the sun.

S = 2 cal/cm^2-min

We know that,

1 cal = 4.18 J

1 cm = 10^{-2} m

1 min = 60 sec

$$\therefore S = \frac{2 \times 4.18}{(10^{-2})^2 \times 60} \frac{J}{m^2 - sec}$$

$$S = \frac{2 \times 4.18}{10^{-4} \times 60}$$

$$S = \frac{4.18\times10^4}{30}$$
$S = 0.13933 \times 10^4$
$S = 0.14 \times 10^4$
$$S = 1.4\times10^3 \ \frac{J}{m^2-sec}$$
$$S = 1.4 \ \frac{kJ}{m^2-sec}$$

15. A physical quantity of the dimensions of length that can be formed out of C, G and $\frac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge]

(a) $\frac{1}{C^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ (b) $C^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

(c) $\frac{1}{C^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]$ (d) $\frac{1}{C^2}G\frac{e^2}{4\pi\varepsilon_0}$

[NEET 2017]

Ans. (a) : Let,
$$L \propto C^x G^y \left(\frac{e^2}{4\pi\varepsilon_0}\right)^z$$
So, $$[L] = [C]^x[G]^y\left[\frac{e^2}{4\pi\varepsilon_0}\right]^Z$$
Dimension of [L]= $[M^0L^1T^0]$
Dimension of [C]= $[M^0L^1T^{-1}]$
Dimension of [G]= $\left[\frac{Fr^2}{m_1m_2}\right] = \frac{[M^1L^1T^{-2}][L]^2}{M^2}$
$=[M^{-1}L^3T^{-2}]$
$$\text{Dimension}\left(\frac{e^2}{4\pi\varepsilon_0}\right) = \frac{(I.T.)^2}{[M^{-1}L^{-3}T^4I^2]} = [M^1L^3T^{-2}I^0]$$
$$[L] = [C]^x[G]^y\left[\frac{e^2}{4\pi\varepsilon_0}\right]^z$$
Putting dimension both sides-
$[M^0L^1T^0] = [M^0L^1T^{-1}]^x.[M^{-1}L^3T^{-2}]^y[M^1L^3T^{-2}]^z$
$=[M^0L^xT^{-2x}][M^{-y}L^{3y}T^{-2y}][M^zL^{3z}T^{-2z}]$
$=[M^{-y+z}L^{x+3y+3z}T^{-x-2y-2z}]$
Comparing the powers from both sides.
$-y+z=0$....................(i)
$z=y$
$x+3y+3z=1$..............(ii)
$-x-2y-2z=0$............(iii)
Now putting the value of 'z' in eq^n (ii)
$x+3y+3z = 1$
$x+3y+3y = 1$
$x+6y = 1$.....................(iv)
Putting the value of z in eq^n.............(iii)
$-x-2y-2z=0$
$-x-2y-2y=0$
$-x-4y=0$
$x=-4y$
Now putting the value of x in eq^n........(iv)
$x + 6y = 1$
$-4y + 6y = 1$
$2y = 1$
$y = \frac{1}{2}$
from eq^n (i)
$z = y$
So, $z = \frac{1}{2}$
Now, Putting the value as 'y' in eq^n..(iv)
$x+6y = 1$
$x + 6\times\frac{1}{2} = 1$
$x+3 = 1$
$\boxed{x=-2}$
Now, Put the value of x, y, z
$$L = KC^{-2}G^{1/2}\left(\frac{e^2}{4\pi\varepsilon_0}\right)^{\frac{1}{2}}$$
Then, $$L = \frac{1}{C^2}\left(\frac{Ge^2}{4\pi\varepsilon_0}\right)^{1/2}$$

16. In CGS system the magnitude of the force is 100 dynes. In another system, where the fundamental physical quantities are kilogram, metre and minutes. The magnitude of the force is

(a) 0.9 (b) 3.6
(c) 2.7 (d) 1.8

TS EAMCET 28.09.2020, Shift-II
EAMCET-2001

Ans. (b) : Let, $n_1u_1 = n_2u_2$
on writing their dimension both sides-
$n_1 \ [M_1L_1T_1^{-1}]$...............(i)
$n_2 \ [M_2L_2T_2^{-2}]$...............(ii)
Now, $$n_2 = n_1\left(\frac{u_1}{u_2}\right)$$
$$n_2 = n_1\left[\frac{M_1}{M_2}\right]\left[\frac{L_1}{L_2}\right]\left[\frac{T_1^{-2}}{T_2^{-2}}\right]$$
$$=100\left[\frac{gm}{kg}\right]\left[\frac{cm}{m}\right]\left[\frac{sec}{min}\right]^{-2}$$
$$=100\left[\frac{1}{1000}g\right]\left[\frac{1}{100}cm\right]\left[\frac{1}{60}sec\right]^{-2}$$
$$=100\times\frac{1}{1000}\times\frac{1}{100}\times3600$$
So, $n_2 = 3.6$

17. **The major contribution of Sir C.V. Raman is**
(a) Explanation of photoelectric effect
(b) Principle of buoyancy
(c) Scattering of light by molecules of a medium
(d) Electromagnetic theory
AP EAMCET(Medical)-2014

Ans. (c) : The academy of sciences has resolved to accord the Noble Prize in Physics for 1930 to Sir Chandrasekhara Venkata Raman for his work on the scattering of light and for the discovery of the effect namad after him.

18. **Pick out the stranger**
(a) Newton-Meter (b) Coulomb-Volt
(c) Coulomb-Farad (d) Watt-Second
SRMJEE - 2014

Ans. (c) : Newton – meter = J
Coulomb – volt = J
Watt – sec = J
and Coulomb – farad ≠ J

19. **The prefix atto means**
(a) 10^{-21} (b) 10^{-15}
(c) 10^{-18} (d) 10^{-12}
SRMJEE - 2015

Ans. (c) : Atto stands for 10^{-18}.

20. **A bus travels at 110 km/hr (kilometers per hour) on open highway. Its speed in meters per second is**
(a) 30.6m/s (b) 60.2m/s
(c) 40m/s (d) 50.4m/s
SRMJEE - 2015

Ans. (a) : $S = \frac{110\text{km}}{\text{hr}} = \frac{110\times1000}{60\times60}$
$= 110\times\frac{5}{18}\text{ m/s}$
$= 30.6\text{ m/s}$

21. **The prefix giga means**
(a) 10^{-9} (b) 10^{9}
(c) 10^{6} (d) 10^{-6}
SRMJEE - 2016

Ans. (b) : Giga stands for 10^9.

22. **In a new system of units, unit of mass is 10 kg, unit of length is 1 km and unit of time is 1 minute. The value of 1 joule in this new hypothetical system is**
(a) 3.6×10^{-4} new units
(b) 6×10^{7} new units
(c) 10^{11} new units
(d) 1.67×10^{4} new units
COMEDK 2016

Ans. (a): Given, M = 10 kg, L = 1 km, T = 1 minute
Now, let n_1 and n_2 are the S.I unit and unit of new system.
Here, $n_1 = 1J$
The dimensional formula of energy is $[ML^2T^{-2}]$
So, S.I unit of energy = new system

$$n_1\left(\left[M_1L_1^2T_1^{-2}\right]\right) = n_2\left(\left[M_2L_2^2T_2^{-2}\right]\right)$$

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

$$\frac{n_2}{n_1} = \left(\frac{1}{10}\right)\times\left(\frac{1}{1000}\right)^2\times\left(\frac{1}{60}\right)^{-2}$$

$$\frac{n_2}{n_1} = 1\times\frac{36}{100000}$$

$n_2 = 1 \times 3.6 \times 10^{-4}$ J
$n_2 = 3.6 \times 10^{-4}$ J

23. **Which of the following physical quantity unit is not a fundamental unit?**
(a) Length (b) Mass
(c) Magnetic field (d) Current
J&K-CET-2013

Ans. (c) : Magnetic field is not a fundamental unit. Fundamental units are length, mass, time, temperature, amount of substance, current, luminous intensity. These units are used to measure the fundamental quantities.

24. **Density of liquid in CGS system is 0.625 g/cm³. What is its magnitude in SI system?**
(a) 0.625 (b) 0.0625
(c) 0.00625 (d) 625
J&K CET- 2005

Ans. (d) : Given that,

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = 0.625\text{g/cm}^3$$

$$= \frac{0.625\times10^{-3}\text{kg}}{10^{-6}\text{m}^3}$$

$= 0.625 \times 10^3$ kg/m³
$= 625$ kg/m³

25. **The following physical quantities has a ratio of 10^3 between its SI units and CGS units**
(a) Universal gravitational constant
(b) Boltzman's constant
(c) Planck's constant
(d) Young's modulus of elasticity
EAMCET-1994

Ans. (a) : Universal gravitational constant

$$\text{SI unit} = \frac{\text{N-m}^2}{\text{kg}^2}$$

$$\text{CGS unit} = \frac{\text{dyne-cm}^2}{\text{gm}^2}$$

$$\text{Ratio} = \frac{\text{SI unit}}{\text{CGS unit}} = \frac{\text{N-m}^2}{\text{kg}^2}\times\frac{\text{gm}^2}{\text{dyne-cm}^2}$$

$$= \frac{\text{N-m}^2}{\text{kg}^2}\times\frac{\left(10^{-3}\text{kg}\right)^2}{10^{-5}\text{N}\times10^{-4}\text{m}^2}$$

$$= \frac{\text{N}-\text{m}^2}{\text{kg}^2}\times\frac{10^{-6}\text{kg}^2}{10^{-9}\text{N}-\text{m}^2}$$

$= 10^{-6+9}$
$= 10^3$

Hence, the ratio of universal gravitational constant has 10^3 between its SI unit and CGS units.

26. In a particular system, the unit 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 equivalent to

(a) 0.1 N (b) 1 N
(c) 10 N (d) 100 N

[AIPMT 1994]

Ans. (a) : We know that

$$1N = \frac{1kg \times 1m}{1 - s^2}$$

$$= \frac{1000g \times 100cm}{1 - s^2}$$

$$= \frac{100 \times (10g) \times 10 \times (10cm)}{100 \times (0.1)^2}$$

So, 1 N = 10 F_{new} (F_{new} is new unit of force)

$$F_{new} = \frac{1}{10} N = 0.1 N$$

27. The value of Planck's constant in SI unit is

(a) 6.63×10^{-31} J-s (b) 6.63×10^{-30} kg-m/s
(c) 6.63×10^{-32} kg-m^2 (d) 6.63×10^{-34} J-s

[AIPMT 2002]

Ans. (d) : Value of Planck's constant in SI unit is 6.63×10^{-34} j-s.
Planck's constant defines the behaviour of particles and waves on atomic scale. S.I. unit of Planck's constant is Joule-second (J.s.).

28. In a new system of units called star units, 1kg*=10 kg, 1m*= 1 km and 1s*=1 minute, what will be the value of 1 J in the new system?

(a) $2.4 \times 10^{-5}J^*$ (b) $3.6 \times 10^{-4}J^*$
(c) $4.2 \times 10^{-3}J^*$ (d) $4.2 \times 10^{-2}J^*$

Ans. (b) : 1 kg = 10 kg
∴ [1 kg = 1/10 kg]
1 m = 1 km [∴ 1 m = 1/1000 m]
1 m = 1000 m
1 s = 1 minute
1 sec = 60 sec. [∴ 1 sec = 1/60 sec]
Energy = $[M^1L^2T^{-2}]$
1 Joule = 1 kg × 1m^2 × (sec)^2

$$= \frac{1}{10} kg \times \left(\frac{1}{1000} m\right)^2 \times \left(\frac{1}{60} s\right)^{-2}$$

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

$$= \frac{1}{10} \times 10^{-6} \times (60)^2 \frac{kg(m)^2}{(s)^2}$$

$$\therefore 1 \text{ Joule} = 3.6 \times 10^{-4} \frac{kg(m)^2}{(s)^2}$$

29. A new unit of length is so chosen that the speed of light in vacuum is unity. Calculate the distance (in this new unit) between the sun and the earth if light takes 8 min and 20 seconds to reach earth from sun.

(a) 300 (b) 400
(c) 500 (d) 600

AMU-2012

Ans. (c) : Given that,
The speed of light in a vacuum is unity,
v = 1 m/sec
Time = 8 min and 20 sec = 500 sec
We know that,
Distance = speed × time
Distance = 1 × 500
Distance = 500 unit
Hence, distance between sun and earth is 500 unit.

30. 1 ns is defined as

(a) 10^{-9} s of Kr- clock of 1650763.73 oscillations
(b) 10^{-9} s of Kr- clock of 652189.63 oscillations
(c) 10^{-9} s of Cs- clock of 1650763.73 oscillations
(d) 10^{-9}s of Cs- clock of 9192631770 oscillations

CG PET- 2009

Ans. (d) : 1 ns = 10^{-9} s of Cs-clock of 9192631770 oscillations.

(b) Units

31. The unit of specific resistance is

(a) ohm/m^2 (b) ohm/m^3
(c) ohm m (d) ohm/m

BITSAT-2013, SCRA-1989
MPPET-1984, UPCPMT-1975

Ans. (c) : We know that,

$$R = \rho \frac{l}{A}$$

ρ = specific resistance

$$\rho = \frac{RA}{l}$$

$$\rho = \frac{ohm - m^2}{m}$$

Unit of ρ = ohm − m

32. The unit of magnetic moment is

(a) A-m^2 (b) A-m
(c) A- m^3 (d) kg-m^2

CG PET- 2006, AMU-2002
MP PET-1996, 1989
MP PMT-2002, 1995

Ans. (a): Magnetic moment is the product of the current flowing and area.
M = I × A
= Ampere-m^2

33. What is the SI unit of Stefan- Boltzmann's constant σ ?

(a) W m^{-2} K^{-4} (b) W m^2 K^4
(c) W K^{-4} (d) erg s^{-2} K^{-4}

COMEDK 2018, Karnataka CET - 2006
AIPMT-2002, MP PET-1992
AFMC-1986, MP PMT-1992, 1989

Ans.(a): According to stefan's law, energy per unit time $(E/t) = \sigma AT^4$

$$\sigma = \frac{E/t}{AT^4}$$

$$\sigma = \frac{W}{m^2K^4}$$

$$= Wm^{-2}K^{-4}$$

The SI unit of Stefan's constant = $W.m^{-2}.K^{-4}$ and CGS unit is = $Erg.cm^2$

34. Match List with List II.

List- I		List -II	
(A)	Torque	(I)	Nms^{-1}
(B)	Stress	(II)	$J\ kg^{-1}$
(C)	Latent heat	(III)	Nm
(D)	Power	(IV)	Nm^{-2}

Choose the correct answer from the options given below:

(a) A-III, B-II, C-I, D-IV
(b) A-III, B-IV, C-II, D-I
(c) A-IV, B-I, C-III, D-II
(d) A-II, B-III, C-I, D-IV

JEE Main-29.07.2022, Shift-II

Ans. (b)

(A)	Torque	→	(iii)	Nm
(B)	Stress	→	(iv)	Nm^{-2}
(C)	Latent heat	→	(ii)	$J\ Kg^{-1}$
(D)	Power	→	(i)	Nms^{-1}

35. In SI units, kg m^2 s^{-2} is equivalent to which of the following?

(a) newton (b) watt
(c) joule (d) pascal

AP EAMCET-04.07.2022, Shift-II

Ans. (c) : Given unit is Kg M^2s^{-2}

Dimension of given unit is = $[ML^2T^{-2}]$

Dimension of work (Joule)

= Force × displacement

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

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

So, the SI unit of Kg m^2s^{-2} is equivalent to Joule.

36. If the unit of length, mass and time each be doubled, the unit of work is increased by

(a) 2 times (b) 4 times
(c) 6 times (d) No change

Assam CEE-31.07.2022

Ans. (a)

Dimension formula of work (W) = ML^2T^{-2}

$$= \left[M\frac{L^2}{T^2}\right]$$

if the unit of L, M, and T are doubled , then the new unit of work

$$= (2M).\frac{(2L)^2}{(2T)^2} = 2\left[M\frac{L^2}{T^2}\right] = 2W$$

∴ The unit becomes two times

37. If E and H represent the intensity of electric field and magnetising field respectively, then the unit of E / H will be

(a) ohm (b) mho
(c) joule (d) newton

JEE Main-27.08.2021, Shift-I

Ans. (a) : The impedance in free space $(z_0) = \frac{E}{H}$

Thus, unit of $\frac{E}{H}$ is ohm.

38. The unit of current element is ________

(a) A m (b) Am^{-1}
(c) Am^2 (d) Am^{-2}

AP EAMCET-06.09.2021, Shift-II

Ans. (a) : The unit of current element is ampere- meter (Am).

39. A force 'F' is given as F = Pt^{-1} + Qt, where 't' denotes time. Then, the unit of 'P' must be same as that of ______

(a) Displacement (b) Velocity
(c) Acceleration (d) Momentum

AP EAMCET-06.09.2021, Shift-II

Ans. (d) : Given as $F = Pt^{-1} + Qt$

We know that Dimensional formula of force=$[MLT^{-2}]$

From the principle of dimensional homogeneity

$F = Pt^{-1}$

$[MLT^{-2}] = P\,[T^{-1}]$

So, Dimensional formula of P = $[MLT^{-1}]$

Momentum formula = m×v ⇒ $[MLT^{-1}]$

Hence, the unit of 'P' must be same as that of momentum.

40. 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

(a) $[t^{-1}v^1I^{-2}]$ (b) $[t^1v^2I^{-1}]$
(c) $[t^{-2}v^{-1}I^1]$ (d) $[t^{-1}v^{-2}I^1]$

JEE Main-20.07.2021, Shift-II

Ans. (d) : We know,

Dimension of time (t) = [T]

Dimension of velocity (v) = $[LT^{-1}]$

Dimension of angular momentum (I) = $[ML^2T^{-1}]$

So, $m \propto t^av^bI^c$

$m \propto [T]^a[LT^{-1}]^b[ML^2T^{-1}]^c$

$ML^0T^0 = [M]^c[L]^{b+2c}[T]^{a-b-c}$

So, C = 1, b + 2c = 0. a – b – c = 0

b + 2 = 0 a + 2 – 1 = 0

b = –2 a = –1

So, $\boxed{m \propto [t^{-1}v^{-2}I^1]}$

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

	List-I		List-II
A.	R_H (Rydberg constant)	1.	$kg\,m^{-1}s^{-1}$
B.	h (Planck's constant)	2.	$kg\,m^2s^{-1}$
C.	μ_B (Magnetic field energy density)	3.	m^{-1}
D.	η (Coefficient of viscosity)	4.	$kg\,m^{-1}s^{-2}$

Choose the most appropriate answer from the options given below.

	A	B	C	D
(a)	2	3	4	1
(b)	3	2	4	1
(c)	4	2	1	3
(d)	3	2	1	4

JEE Main-27.08.2021, Shift-II

Ans. (b) : Unit of Rydbery constant (R_H) = m^{-1}
Unit of plank's constant (h) = kg m^2s^{-1}
Unit of magnetic field energy density (μ_B) = kg $m^{-1}s^{-2}$
Unit of coefficient of viscosity = $kgm^{-1}s^{-1}$
So, option (b) is correct.

42. **Which of the following is not a unit of time?**
(a) Lunar month (b) Light year
(c) Leap year (d) Microsecond

AP EAMCET (23.09.2020) Shift-I

Ans. (b) Lunar month, leap year and microsecond are the units of time but light year is the unit of distance and it is used to measure astronomical distance.

43. **The unit of magnetic induction is**
(a) Wb m^{-2} (b) Wb m^{-1}
(c) Wb A (d) Wb

AP EAMCET (21.09.2020) Shift-I

Ans. (a) : $\because \text{Magnetic Induction} = \dfrac{\text{Magnetic flux}}{\text{Area}}$

$\therefore \text{The unit of magnetic Inuction} = \dfrac{\text{Weber}}{\text{meter}^2} = \text{Wb.m}^{-2}$

44. **The SI unit of length is 'meter' suppose we adopt a new unit of length which equals x meter. Then, the area of 1 m^2 expressed in terms of new unit has a magnitude**
(a) x (b) x^2
(c) $\dfrac{1}{x}$ (d) $\dfrac{1}{x^2}$

AP EAMCET (21.09.2020) Shift-I

Ans. (d) : Given,
SI unit of length = meter (m)
New unit of length = x meter
And, $1\text{m} = \dfrac{1}{x}$ (New units)
Hence,
Area = 1m^2
A = 1 × 1m^2
$= \dfrac{1}{x}\times\dfrac{1}{x} = \dfrac{1}{x^2}$

45. **The S.I unit of inductance is**
(a) Kg. m^2. S^{-2}. A^{-2} (b) Kg. S^{-2}. A^{-1}
(c) Kg. m^2. S^{-2}. A^{-1} (d) Kg. m^2. S^{-3}. A^{-2}

TS EAMCET 29.09.2020, Shift-I

Ans. (a): Inductance: -
Electromagnetic or magnetic induction is – the production of an electromotive force across an electrical conductor in a changing magnetic field.

$$v = L \times \left(\frac{di}{dt}\right)$$

L = value of Inductance (H)
i = current
t = time
Henry (H) is - the SI unit of inductance

$$[\text{Volt}] = [L]\left[\frac{\text{Ampere}}{\text{second}}\right]$$

This can be written as–

$$[L] = \left[\frac{\text{Volt} - \text{second}}{\text{ampere}}\right]$$

$$[L] = \left[\frac{\text{Joule}}{\text{Ampere}^2}\right]$$

$$[L] = \left[\frac{kg\,m^2S^{-2}}{A^2}\right]$$

$$[L] = Kg\ m^2S^{-2}A^{-2}$$

46. **The unit of L/R is (where L= inductance and R = resistance)**
(a) sec (b) sec^{-1}
(c) volt (d) ampere

Manipal UGET-2019

Ans. (a) : $\dfrac{L}{R} = \dfrac{\text{Henry}}{\text{ohm}} = \dfrac{\left(\dfrac{\text{volt}}{A/S}\right)}{\text{ohm}} = \dfrac{\text{volt.sec}}{\text{ohm.ampere}}$

$\dfrac{L}{R} = \text{sec}$

• L/R, CR and $\sqrt{LC}$ all have dimensions of Time [T]. So unit will be second.

47. **Unit of Magnetic Flux is:**
(a) Tesla (b) Gauss
(c) Weber (d) Weber/m^2

AIIMS-26.05.2019(E) Shift-2

Ans. (c) : The SI unit of magnetic flux is weber (Wb). Weber is commonly expressed in a multitude of other units.

$$Wb = \frac{kg.m^2}{s^2.A} = V.s = H.A = T.m^2 = \frac{J}{A} = 10^8\,mx$$

where,

Wb = Weber	s = second
T = Tesla	H = Henry
V = volt	A = Ampere
J = joule	Mx = Maxwell

48. **If P, Q and R are physical quantities having different dimensions, which of the following combination can never be a meaningful quantity?**

(a) $\frac{P-Q}{R}$ (b) $PQ-R$

(c) $\frac{PQ}{R}$ (d) $\frac{PR-Q^2}{R}$

Karnataka CET-2019

Ans. (a): P , Q and R are physical quantities having different dimensions. By the principle of homogeneity, the physical quantities having different dimensions, can not be added or subtracted directly.

Hence, $\frac{P-Q}{R}$ is not a meaningful quantity.

49. **SI unit of inductance is**

(a) Ampere (b) Ohm

(c) Henry (d) Faraday

J&K-CET-2019

Ans. (c) : SI unit of inductance is Henry. Inductance is the tendency of an electrical conductor to oppose a change in the electric current flowing through. It is denoted by H.

50. **The unit of relative permittivity is**

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

(c) unitless (d) $NC^{-2}m^{-2}$

SRMJEE-2019

Ans. (c) : Relative permittivity $(\varepsilon_r) = \frac{\varepsilon}{\varepsilon_0}$

As it is the ratio of permittivities hence, it has no unit.

51. **Which of the following is both unitless and dimensionless?**

(a) Angle

(b) Solid angle

(c) Mechanical equilvalent of heat

(d) Refractive index

SRMJEE-2019

Ans. (d) : Refractive index is the property of a material to bend light when passing through one medium to another medium.

The ratio of the speed of light in a vacuum to the speed of light in a medium is called the refractive index of that medium.

Reflective index $(\eta) = \frac{\text{Speed of light in vacuum (c)}}{\text{Speed of light in medium (v)}}$

Since it is the ratio of speed, it has no dimension or units.

52. **The C.G.S. unit of magnetic field at a point, due to Biot-Savart law is**

(a) Tesla (b) Gauss

(c) Tesla meter/Amp (d) Newton/Amp

J&K-CET-2019

Ans. (b) : The Gauss is the CGS unit for the measurement of magnetic field (B) which is also called the magnetic flux density or the magnetic induction.

1 Gauss = 1×10^{-4} Tesla

The C. G. S. unit of magnetic field at a point is Gauss.

53. **In a system, unit of mass is A kg, length is B m and time is C s, then the value of 10 N in this system is**

(a) $10\ A^{-1}B^{-1}C^{-2}$ (b) $10\ A^{-1}B^{-1}C^{2}$

(c) $10\ ABC^{-2}$ (d) $5\ A^{-1}BC^{2}$

AP EAMCET (22.04.2018) Shift-II

Ans. (b) : We know that, $N_1u_1 = N_2u_2$

$$10\text{kg}\frac{\text{m}}{\text{s}^2} = N_2\left(\frac{A.B}{C^2}\right)$$

$$\Rightarrow \quad N_2 = \frac{10.C^2}{A.B}$$

$$= 10A^{-1}B^{-1}C^2$$

So, numerical value of 10N in given system is $10A^{-1}B^{-1}C^2$.

54. **kg m^2s^{-3} A^{-2} is the SI unit of**

(a) Inductance (b) Resistance

(c) Capacitance (d) Magnetic flux

AP EAMCET-25.04.2018, Shift-I

Ans. (b) : Given that,

Kg m^2s^{-2}

Dimensional formula of given unit is = $[ML^2T^{-3}A^{-2}]$

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}}$$

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

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

So, the dimensional formula of given unit is equal to the resistance.

55. **Dioptre is the unit of**

(a) Power of lens (b) focal length

(c) lonosphere (d) None

HP CET-2018

Ans. (a) : Dioptre is the unit of power of lens and it is reciprocal of focal length.

$$P = \frac{1}{f} \text{ (where f in meters)}$$

56. **Which of the following is not the unit of surface tension?**

(a) $\frac{N}{m}$ (b) $\frac{J}{m^2}$

(c) $\frac{kg}{s^2}$ (d) $\frac{W}{m}$

UPSEE - 2018

Ans. (d) : The surface tension is a measure of force per unit length.

S.I unit = N/m

or kg/s^2 or J/m^2

Only option (d) $\frac{W}{m}$ is not the unit of surface tension.

57. **The unit of Polarizability of the molecule is : ______.**

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

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

GUJCET 2018

Ans. (a) : Formula of Polarizability (α) is

$$\alpha = \frac{P}{E} = \frac{C.m}{N/C}$$

$$\alpha = C^2.m.N^{-1}$$

58. The correct unit of thermal conductivity is

(a) $Jm^{-2}\sec^{-1}(^oC)^{-1}$ (b) $Jm^{-1}\sec^{-1}(^oC)^{-2}$

(c) J-sec (d) $Jm^{-1}\sec^{-1}(^oC)^{-1}$

AIIMS-27.05.2018(E)

Ans. (d): The thermal conductivity of a material is a measure of its ability to conduct heat.

$$\text{Thermal conductivity (K)} = \frac{QL}{A.\Delta T}$$

Where,

Q = Heat transfer through the material

L = Length

A = Area

ΔT = Temperature difference

So,

$$\text{The unit of thermal conductivity} = \frac{Js^{-1}\times m}{m^2\times {}^\circ C}$$

$$= Js^{-1}m^{-1}{}^\circ C^{-1}$$

59. The SI unit of gravitational constant is _____

(a) Nm kg (b) $Nm^2\,kg^{-2}$

(c) Nm^2 kg (d) $N^{-1}\,m^{-2}$ kg

SRMJEEE-2017

Ans. (b) : The SI unit of gravitational constant is Nm^2kg^{-2}

We know that,

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

The SI unit of

F = N (Newton)

m_1 and m_2 = kg (kilogram)

r = m(meter)

From the above equation, we have

$$G = F.\ \frac{r^2}{m_1 m_2}$$

Put the SI units

$$\Rightarrow G = N\frac{(m)^2}{(kg)^2} \Rightarrow G = Nm^2kg^{-2}$$

60. _____ system of units was accepted by the scientist of the general conference on weights and measures.

(a) FPS (b) CGS

(c) MKS (d) SI

SRMJEEE-2017

Ans. (d) : The SI system of unit was accepted by the scientist of the general conference on weights and measure in 1971. In 1960 the 11th CGPM approved the International system of units, usually known as "SI".

61. The SI unit of mechanical equivalent of heat is

(a) J/cal (b) J-cal

(c) cal. erg (d) erg/J

CG PET- 2017

Ans. (a) : Mechanical equivalent of heat, if the work is completely changed to the heat energy, then the some amount of heat is generated. Mathematically,

$$J = \frac{W}{q}$$

Here, W = Amount of work required to generate heat

q = Amount of heat

$$= \frac{\text{Joule}}{\text{Calorie}}$$

So, SI unit of mechanical equivalent of heat is J/cal.

62. Siemen is the SI unit for

(a) electrical resistivity

(b) electrical conductance

(c) electrical permittivity

(d) electrical capacitance

EAMCET-1992

Ans. (b) : Conductance is defined as

$$\text{Conductance} = \frac{1}{\text{Resistance}}$$

$$= \frac{1}{\text{ohm}}$$

$= (\Omega)^{-1}$ or siemen

Hence siemen is the SI unit for electrical conductance.

63. The SI unit of moment of inertia is

(a) kgm^{-2} (b) kg m^2

(c) Nm^{-2} (d) Nm^2

EAMCET-1999

Ans. (b) : The moment of Inertia ($I=MR^2$) is specified based on the distribution of mass in the body with respect to axis of rotation.

SI unit moment of Inertia is $kg.m^2$.

64. If $x = at + bt^2$, where x is the distance travelled by the body in kilometer while t is the time in second, then the unit of b is

(a) km/s (b) km-s

(c) km/s^2 (d) $km\text{-}s^2$

[AIPMT 1989]

Ans. (c) : Given that,

$x = at + bt^2$ (where x is distance)

From principle of Homogeneity

$[x] = [at] = [bt^2]$

$[L] = b[T^2] \Rightarrow b = [LT^{-2}]$

So, Unit of b = km/s^2

65. The unit of permittivity of free space, ε_0 is

(a) coulomb/newton-metre

(b) newton-metre^2/coulomb^2

(c) coulomb^2/newton-metre^2

(d) coulomb^2/(newton-metre)^2

AIPMT 2004

Karnataka CET-2004

Ans. (c) : Coulomb law state that.

$$F = \frac{1}{4\pi\varepsilon_0}.\frac{q_1.q_2}{r^2}$$

$$\varepsilon_0 = \frac{q_1.q_2}{4\pi F.r^2}$$

When, unit of F =N

Unit of r = m

Unit of q = Coulomb (c)

$$\varepsilon_0 = \frac{\text{Coulomb} \times \text{Coulomb}}{\text{newton} - (\text{metre})^2}$$

$$\varepsilon_0 = \frac{\text{C.C}}{\text{N.m}^2} = \text{Coulomb}^2/\text{newton} - \text{metre}^2$$

66. The equation $\left(p + \frac{a}{V^2}\right)(V - b)$ = constant. The units of a is

(a) Dyne × cm^5 (b) Dyne × cm^4
(c) Dyne/cm^3 (d) Dyne/cm^2

UP CPMT-2014

Ans. (b) : Given that,

$$\left(P + \frac{a}{V^2}\right)(V - b) = \text{constant}$$

In the term $\left(P + \frac{a}{V^2}\right)$, the units of p and $\frac{a}{V^2}$ are the same

$\therefore$ a = PV^2 [here v is the volume]

$\therefore$ Unit of a = unit of P × unit of v^2

$$\therefore \text{Unit of a} = \frac{\text{dyne}}{\text{cm}^2} \times (\text{cm}^3)^2$$

$$= \frac{\text{dyne}}{\text{cm}^2} \times \text{cm}^6$$

$$= \text{dyne} \times \text{cm}^4$$

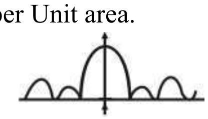
Note:– Here we use CGS system. In SI system unit of a is N-m^4

67. SI unit of intensity of wave is

(a) J $m^{-2}s^{-1}$ (b) J $m^{-1}s^{-2}$
(c) W m^{-2} (d) J m^{-2}

UP CPMT-2012

Ans. (a,c) : The intensity of waves is defined as the power delivered per Unit area.



center of pattern

$$\text{Intensity of wave} = \frac{\text{energy}}{\text{Area} \times \text{Time}}$$

$$= \frac{J}{m^2 \times S} = Wm^{-2}$$

$\therefore$ The S.I Unit of intensity of wave is Wm^{-2}.

68. Unit of electrical conductivity is

(a) ohm (b) siemen
(c) m/mho (d) mho/m

UP CPMT-2010

Ans. (d) : Resistivity and conductivity are interrelated Conductivity is the inverse of resistivity. According to this is easy to express one in terms of the other.

$$\sigma = \frac{1}{\rho} \text{ unit mho/m or siemen/m}$$

69. The Bernoulli's equation may be written as: $P + \frac{1}{2}\rho v^2 + h\rho g = K$ (a constant). The unit of K/P is same as that of:

(a) pressure (b) thrust
(c) angle (d) none of the above

SRMJEE - 2011

Ans. (d) : In the given equation

[K] = [P]

$$\Rightarrow \left[\frac{K}{P}\right] = \left[M^0L^0T^0\right]$$

$\Rightarrow$ Dimensionless and has no units.

70. The velocity of a particle depends upon t as v =A + Bt + Ct^2. If velocity is in m/s, the unit of A will be

(a) m/s (b) m/s^2
(c) ms (d) m^2/s

SRMJEE - 2012

Ans. (a) : Given that, v = A + Bt + Ct^2

According to principle of homogeneity

Unit of A = unit of Bt = unit of Ct^2 = unit of V

Unit of A = unit of V

Unit of A = m/s

71. Which one of the following physical quantities does not have unit?

(a) luminous intensity (b) momentum
(c) current (d) refractive index

SRMJEE - 2015

Ans. (d) : Refractive index of medium = $\frac{c}{v}$

72. Which of the following pairs of physical quantities may be represented in the same unit?

(a) Heat and temperature
(b) Temperature and mole
(c) Heat and work
(d) Specific heat and heat

MP PET-2012

Ans. (c) : The unit of heat is Joule.

The unit of temperature is Kelvin.

The unit of work is Joule.

The unit of specific heat is Joule/gram degree Celsius.

• The same unit is represented heat and work.

73. If mass is measure in units of α kg, length in β m and time in γ sec then calorie would be

(a) 4.2 $\alpha \beta^2 \gamma^{-2}$ (b) 4.2 $\alpha^{-1} \beta^2 \gamma^2$
(c) 4.2 $\alpha^{-1} \beta^{-2} \gamma^2$ (d) 4.2 $\alpha^{-2} \beta^{-1} \gamma^{-2}$

AMU-2012

Ans. (a) : Given data,

Unit of mass = α = [M]

Unit of length = β = [L]

Unit of time = γ = [T]

Unit of work = Joule

We know that,

Let $[ML^2T^{-2}] = \alpha^x \beta^y \gamma^z$

Both side comparing

$X = 1, y = 2, z = -2$

Dimension of work $= [ML^2T^{-2}] = \alpha \beta^2 \gamma^{-2}$

As 1 cal = 4.2 Joule

$\Rightarrow$ Calorie = 4.2 Joule

$= 4.2 \left(\alpha \beta^2 \gamma^{-2}\right)$

$\Rightarrow$ Unit of Calorie $= 4.2 \left(\alpha \beta^2 \gamma^{-2}\right)$

74. Unit of surface tension in S.I system is

(a) N-m (b) $N\text{-}m^{-1}$

(c) $N\text{-}m^2$ (d) $N\text{-}m^{-2}$

CG PET- 2013

Ans. (b) : As we know,

$$\text{Surface tension} = \frac{\text{Force}}{\text{Length}} = \frac{F}{L}$$

Unit of surface tension in :

- In S.I system = N/m
- In CGS system = Dyne/cm
- In MKS system = kgf/m

75. The velocity of a particle is given by $v = at^2 + bt + c$ If v is measured in ms^{-1} and t is measured in second, the unit of

(a) a is ms^{-1}

(b) b is ms^{-1}

(c) c is ms^{-1}

(d) a and b is same but that of c is different

CG PET- 2010

Ans. (c) : Given,

$v = at^2 + bt + c$, $v = ms^{-1}$ and t = second

Then,

Unit of v = Unit of at^2

$V = at^2$

$$a = \frac{v}{t^2} = \frac{ms^{-1}}{\text{Second}^2} = ms^{-3}$$

Unit of v = Unit of bt

$v = bt$

$$b = \frac{v}{t} = \frac{ms^{-1}}{\text{Second}} = ms^{-2}$$

Unit of v = Unit of c

$c = v = ms^{-1}$

76. In SI system the unit of dipole moment is

(a) C-m (b) $C\text{-}m^2$

(c) C/m^2 (d) C/m

CG PET- 2006

Ans. (a) : Dipole moment – The dipole moment is defined as the product of the magnitude of one of the charge of the dipole and the separation distance between them.

Dipole moment $|\vec{P}| = q \times 2a$

Where, q = magnitude of either charge of dipole

2a = separation distance

Thus, SI unit of dipole moment is C-m.

77. The unit of inductance is equal to

(a) $\frac{\text{Volt}-\text{sec}}{\text{Amp}}$ (b) $\frac{\text{Volt}\times\text{Amp}}{\text{sec}}$

(c) $\frac{\text{Volt}\times\text{sec}}{\text{Volt}}$ (d) $\frac{\text{Volt}}{\text{Amp}\times\text{sec}}$

CG PET- 2004

Ans. (a) : The unit of inductance is Henry (H) which is expressed as the amount of inductance that causes a voltage of one volt, when the current is changing at a rate of one ampere per second.

The induced voltage from electromotive force can be expressed as –

$$e = L\frac{dI}{dt}$$

The above equation can be written using corresponding SI units as

$$\text{Volt} = [L]\left[\frac{\text{Ampere}}{\text{Second}}\right]$$

This can be written as

$$L = \frac{\text{Volt}-\text{sec}}{\text{Ampere}}$$

78. Young's modulus of a material has the same units as

(a) pressure (b) strain

(c) compressibility (d) force

CG PET- 2004

Ans. (a) : We know that,

$$\text{The young's modulus is (Y)} = \frac{\text{Stress}}{\text{Strain}}$$

$$Y = \frac{F/A}{\Delta l/l} \quad [\because \text{ Strain is dimensionless}]$$

$Y = N/m^2$, which is equal to unit of pressure.

79. Which of the following quantities has a unit but dimensionless?

(a) Strain

(b) Reynold's number

(c) Angular displacement

(d) Poisson's ratio

BITSAT-2005

Ans. (c) : Among the given quantities, the angular displacement has unit (degree or radian) but it is dimensionless.

80. Which of the following is the smallest unit?

(a) Millimetre (b) Angstrom

(c) Fermi (d) Metre

UPSEE - 2010

Ans. (c) : 1 Fermi $= 10^{-15}$ m

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

1 millimeter $= 10^{-3}$ m

meter is the unit of length

So, the smallest unit is Fermi.

81. **Given that : $y = A\sin\left[\left(\frac{2\pi}{\lambda}\right)(ct - x)\right]$ where, y and x are measured in metres. Which of the following statements is true?**

(a) The unit of λ is same as that of x and A
(b) The unit of λ is same as that of x but not of A
(c) The unit of c is same as that of $\frac{2\pi}{\lambda}$
(d) The unit of (ct –x) is same as that of $\frac{2\pi}{\lambda}$

UPSEE - 2006

Ans.(a) : Here, $\frac{2\pi}{\lambda}(ct - x)$ is dimensionless.

Hence, $\frac{ct}{\lambda}$ is also dimensionless and unit of ct is same as that of x.

Therefore, unit of λ is same as that of x. Also limit of y is same as that of A, which is also same as unit of x.

82. **SI unit of coefficient of viscosity is**

(a) Nsm^{-2} (b) $Ns^{-1}m^2$
(c) Nsm^{-3} (d) $Ns^{-2}m$

JCECE-2018
J.K. CET - 2004

Ans. (a) : The Co-efficient of viscosity η is defined as the tangential force F required to maintain a unit velocity gradient between two parallel layer of liquid of unit area A.

Co-efficient of viscosity $(\eta) = \frac{Fr}{AV}$

Where, F = Force
A = Area
V = Velocity
r = Distance between the layers

$$\eta = \frac{N\text{-}m}{m^2 \times m/sec} = Nsm^{-2}$$

83. **Which is not the unit of electric field?**

(a) $\frac{N}{C}$ (b) $\frac{N - m}{C}$
(c) $\frac{V}{m}$ (d) $\frac{J}{C - m}$

JCECE-2006

Ans. (b) :

$\because$ Electric field $(E) = \frac{\text{Force}}{\text{Charge}} = N/\text{coloumb or } N/C$

$\because$ The relation between an electric field and an electric potential is

E = Potential (v) / distance (r)

$$\text{unit of E.F.} = \frac{v}{m}$$

Also,

$$E = \frac{W}{q.x} = \frac{J}{C - m}$$

84. **If the capacitance of a nanocapacitor is measured in terms of a unit 'u' made by combining the electric charge 'e', Bohr radius 'a_0', Planck's constant 'h' and speed of light 'c' then**

(a) $u = \frac{e^2h}{a_0}$ (b) $u = \frac{hc}{e^2a_0}$
(c) $u = \frac{e^2c}{ha_0}$ (d) $u = \frac{e^2a_0}{hc}$

AIIMS-2016

Ans. (d) : Let 'u' related with e, a_0, h and c as

$[u] = [e]^a [a_0]^b [h]^c [c]^d$ .....(i)

Using dimension formula,

$$[M^{-1}L^{-2}T^4A^2] = [A^1T^1]^a [L]^b [ML^2T^{-1}]^c [LT^{-1}]^d$$

$$[M^{-1}L^{-2}T^4A^2] = [M^cL^{b+2c+d}T^{a-c-d}A^a]$$

Comparing power

a = 2, c = –1,
a – c – d = 4
d = – 4 + 3 = –1

Putting the value of d,
b + 2c + d = –2
b = 1

Hence, a = 2, b = 1, c = –1, d = –1

Putting the value of a, b, c, d in equation (i)

$u = e^2 a_0^1 h^{-1} c^{-1}$

$$\therefore \quad u = \frac{e^2a_0}{hc}$$

85. **If e is the charge, V the potential difference, T the temperature, then the units of $\frac{eV}{T}$ are the same as that of**

(a) Planck's constant
(b) Stefan's constant
(c) Boltzmann's constant
(d) Gravitational constant

AIIMS-2016

Ans. (c) :

$$\because \frac{eV}{T} = \frac{\text{Work done}(W)}{T}$$

$$= \frac{PV}{T} \qquad \left(\because PV = \frac{RT}{N}\right)$$

$$= \frac{R}{N} = K = \text{Boltzmann constant}$$

86. **"Parsec" is the unit of:**

(a) time (b) distance
(c) frequency (d) angular acceleration

AIIMS-2005

Ans. (b) : Parsec is an astronomical unit of length equal to the distance at which a baseline of one astronomical unit subtends an angle of one second of arc.

1 Parsec = 3.08×10^{16} m
= 3.26 light year

87. **Which one of the following is not a unit of Young's modulus ?**
(a) Nm^{-1} (b) Nm^{-2}
(c) dyne cm^{-2} (d) mega pascal
Karnataka CET-2005

Ans. (a) : Nm^{-1} is not a unit of Young's modulus'.

$$\text{Young's modulus (y)} = \frac{\text{Stress}}{\text{Strain}} = \frac{N}{m^2}$$

CGS unit of young modulus is dyne cm^{-2} and represents the units of young's modulus in Nm^{-2} and Mega Pascal.

88. **Which one of the following units is not that of mutual inductance?**
(a) henry (b) weber
(c) ohm second (d) volt second $(\text{ampere})^{-1}$
J&K CET- 2010

Ans. (b) : Henry, ohm second, volt second $(\text{ampere})^{-1}$ are units of mutual inductance, Weber is the unit of magnetic flux.

89. **The SI unit of electron mobility is**
(a) $m^2\, s^{-1}\, V^{-1}$ (b) $m\, s\, V^{-1}$
(c) $m\, s^{-1}\, V$ (d) $m^2\, s^{-2}\, V^{-2}$
J&K CET- 2009

Ans. (a) : The SI unit of electron mobility is $m^2\, s^{-1}\, V^{-1}$

$$\text{Electron mobility } (\mu) = \frac{\text{Drift veloity}}{\text{Electric field}} = \frac{V_d}{E}$$

$$\mu = \frac{V_d}{E} = \frac{ms^{-1}}{Vm^{-1}} = m^2 s^{-1} V^{-1}$$

90. **The Poiseuille is the unit of**
(a) pressure (b) friction
(c) surface tension (d) viscosity
J&K CET- 2002

Ans. (d) : The Posieuille is the unit of viscosity. Viscosity is a measure of fluid's resistance to flow.
SI unit of viscosity is pascal second or $kg.m^{-1}$, s^{-1}

91. **Which of the following is not a unit of energy?**
(a) Ws (b) $kg\, m\, s^{-1}$
(c) N m (d) $kg\, m^2\, s^{-2}$
J&K CET- 1997

Ans. (b) : Energy = Force × distance

$$= N - m = kg.\frac{m}{s^2}.m$$

$$= \frac{kg.m^2}{s^2} = \frac{J.s}{s} = W.s$$

Energy = N.m , W.s, $Kg.m^2.s^{-2}$
Hence, $kg.m.s^{-1}$ is not a unit of energy.

92. **The unit of molar gas constant is**
(a) $J\, K^{-1}\, mol^{-1}$ (b) J
(c) J K (d) $J\, mol^{-1}$
J&K CET- 2000

Ans. (a) : Molar gas constant is a fundamental physical constant which in denoted by the symbol R.
The SI unit of the molar gas constant is Joule per Kelvin per mole ($JK^{-1}\, mol^{-1}$).

93. **What is the unit of magnetic permeability?**
(a) $Wb\, A^{-1}\, m^{-1}$ (b) $Wb^{-1}\, Am$
(c) $Wb\, A\, m^{-1}$ (d) $Wb\, A^{-1}\, m$
BITSAT-2008

Ans. (a) : The SI unit of magnetic permeability is

$$B = \frac{\mu_0}{4\pi}\frac{I dl \sin\theta}{r^2}$$

$$\mu_0 = \frac{B(4\pi)r^2}{I dl \sin\theta} = \frac{Wb}{m^2} \times \frac{m^2}{A \times m}$$

$$\mu_0 = WbA^{-1}m^{-1}$$

94. **Electron-volt is the unit of-**
(a) Charge (b) Potential
(c) Momentum (d) Energy
CG PET-22.05.2022, 2006

Ans. (d) : Electron-Volt is the unit of 'energy.

95. **The S. I. unit of thermal conductivity is**
(a) $J\, S\, m^{-1}\, K^{-1}$ (b) $W^{-1}\, m^{-1}\, K^{-1}$
(c) $W\, m^{-1}\, K^{-1}$ (d) $W\, m^{-2}\, K^{-1}$
J&K CET- 2011
NEET (National) 2019

Ans. (c) : The unit of thermal conductivity $(k) = \frac{QL}{A\Delta T}$

$$\text{Unit of } k = \frac{M}{M^2 \times K} \times \text{watt}$$

$$k = Wm^{-1}K^{-1}$$

(c) Dimensions of Physical Quantity and Its Applications

96. **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 then (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 $[T^{-1}]$.
(a) $A = [LT]$, $B = [L^{-1}T^{-1}]$
(b) $A = [L^{-1}T]$, $B = [LT^{-1}]$
(c) $A = [L^{-1}T^{-1}]$, $B = [LT]$
(d) $A = [L^{-1}T^{-1}]$, $B = [LT^{-1}]$
JEE Main-29.01.2023, Shift-II

Ans. (a) : According to principle of dimensional homogeneity

$x - At = 0$
$[x] = [A]\, [t]$
$[L] = [A]\, [T^{-1}]$
$[A] = [LT]$

$$y - \frac{t}{B} = 0 \qquad [y] = \frac{[t]}{[B]},$$

$$[B] = \frac{[t]}{[y]} = \lfloor L^{-1}T^{-1} \rfloor$$

97. $\left(P+\frac{a}{V^2}\right)(V-b)=RT$ **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**

(a) Bulk modulus (b) Compressibility
(c) Modulus of rigidity (d) Energy density

JEE Main-01.02.2023, Shift-I

Ans. (b) : $\left(P+\frac{a}{V^2}\right)(V-b)=RT$

According to principle of dimensional homogeneity, the dimension of each terms of dimensional equation on both side are same.

So, dimension of a is given as,

$[P] = \frac{[a]}{[V]^2}$

$[a] = [P]\,[V]^2$

$= [ML^{-1}T^{-2}]\,[L^3]^2$

$= [ML^5T^{-2}]$

The dimension of b is given as,

$[b] = [V]$

$= [L^3]$

So, the $\frac{[b]^2}{[a]} = \frac{[L^3]^2}{ML^5T^{-2}}$

$= \frac{L^6}{ML^5T^{-2}}$

$= M^{-1}LT^2$

$\beta = \frac{1}{K}$

($\because$ K = Bulk modulus, β = Compressibility)

$[\beta] = \frac{1}{ML^{-1}T^{-2}}$

$[\beta] = M^{-1}LT^2$

It is the dimension of compressibility.

98. Match List I with List II

	List-I		List-II
A.	Young's Modulus (Y)	1.	$[ML^{-1}T^{-1}]$
B.	Co-efficient of Viscosity (η)	2.	$[ML^2T^{-1}]$
C.	Planck's Constant (h)	3.	$[ML^{-1}T^{-2}]$
D.	Work Function (φ)	4.	$[ML^2T^{-2}]$

Choose the correct answer from the options given below :

(a) A-I, B-III, C-IV, D-II
(b) A-I, B-II, C-III, D-IV
(c) A-II, B-III, C-IV, D-I
(d) A-III, B-I, C-II, D-IV

JEE Main-25.01.2023, Shift-II

Ans. (d) : (A) $Y = \frac{FL}{A\Delta L} = \frac{[MLT^{-2}][L]}{[L]^3} = [ML^{-1}T^{-2}]$

(B) $\eta = \frac{Fd}{Av} = \frac{[MLT^{-2}][L]}{[L]^2[LT^{-1}]} = [ML^{-1}T^{-1}]$

(C) $h = \frac{E\lambda}{C} = \frac{[ML^2T^{-2}][L]}{[LT^{-1}]} = [ML^2T^{-1}]$

(D) $\phi = h\nu - eV_0 = [ML^2T^{-2}]$

99. Match List I with List II

List I	List II
(A) Plank's constant (h)	I. $[M^1L^2T^{-2}]$
(B) Stopping potential (Vs)	II. $[M^1L^1T^{-1}]$
(C) Work function (ϕ)	III. $[M^1L^2T^{-1}]$
(D) Momentum (p)	IV. $[M^1L^2T^{-3}A^{-1}]$

Choose the correct answer from the options given below:

(a) A-II, B-IV, C-III, D-I
(b) A-III, B-IV, C-I, D-II
(c) A-I, B-III, C-IV, D-II
(d) A-III, B-I, C-II, D-IV

JEE Main-24.01.2023, Shift-I

Ans. (b) : $E = h\upsilon$

(A) $h = \frac{E}{\upsilon} = \frac{[ML^2T^{-2}]}{[T^{-1}]} = [ML^2T^{-1}]$

(B) $V_s = \frac{W}{q} = \frac{[ML^2T^{-2}]}{[AT]} = [ML^2A^{-1}T^{-3}]$

(C) $\phi = w = [ML^2T^{-2}]$

(D) $P = mv = [MLT^{-1}]$

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

(a) $\left(-\frac{3}{2},\frac{1}{2},\frac{1}{2}\right)$ (b) $\left(-\frac{3}{2},-\frac{1}{2},\frac{1}{2}\right)$

(c) $\left(\frac{3}{2},\frac{1}{2},-\frac{1}{2}\right)$ (d) $\left(\frac{3}{2},-\frac{1}{2},\frac{1}{2}\right)$

JEE Main-24.01.2023, Shift-II

Ans. (b) : Density $(\rho) = \frac{\text{Mass}(M)}{\text{Volume}(V)}$

$[\rho] = \frac{[M]}{[V]} = \frac{[M]}{[L^3]} = [ML^{-3}]$

Surface tension $(s) = \frac{\text{Force}(F)}{\text{Length}(L)}$

$[s] = \frac{[F]}{[L]} = \frac{[MLT^{-2}]}{[L]} = [MT^{-2}]$

Dimension of radius

$[r] = [L]$

Frequency $(v) = \frac{1}{T}$

$$[v] = \frac{1}{[T]} = [T^{-1}]$$

According to question,

$v = r^a \rho^b s^c$

$T^{-1} = [L^a] [ML^{-3}]^b [MT^{-2}]^c$

$M^0L^0T^{-1} = M^{b+c} L^{a-3b} T^{-2c}$

By comparing both side, we get–

$b + c = 0$ .....(i)

$a - 3b = 0$ .....(ii)

$-2c = -1$ .....(iii)

$$c = \frac{1}{2}$$

Putting value of c in equation (i), we get–

$$b + \frac{1}{2} = 0$$

$$b = -\frac{1}{2}$$

Putting value of b in equation (ii), we get–

$$a - 3\left(-\frac{1}{2}\right) = 0$$

$$a = -\frac{3}{2}$$

So, the value of a, b and c are $\left(-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$.

101. Match List-I with List-II

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

Chose the correct answer from the options given below:

(a) A-IV, B-II, C-I, D-III
(b) A-II, B-III, C-IV, D-I
(c) A-III, B-I, C-IV, D-II
(d) A-I, B-IV, C-III, D-II

JEE Main-31.01.2023, Shift-II

Ans. (c) : (A) Angular momentum (L) = mvr

$[L] = [m][v][r]$
$= [M][LT^{-1}][L]$
$= [ML^2T^{-1}]$

(B) Torque $(\tau) = F \times r$

$[\tau] = [F] [r]$
$= [MLT^{-2}] [L]$
$= [ML^2T^{-2}]$

(C) Stress $(\sigma) = \frac{F}{A}$

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

(D) Pressure gradient $= \frac{dp}{dx} = \frac{[ML^{-1}T^{-2}]}{[L]}$

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

102. Match list I with List II :

List-I		List-II	
(A)	Torque	I	kg m^{-1} s^{-2}
(B)	Energy density	II.	kg ms^{-1}
(C)	Pressure gradient	III.	kg m^{-2} s^{-2}
(D)	Impulse	IV.	kg m^2 s^{-2}

Choose the correct answer from the options given below :

(a) A-IV, B-I, C-III, D-II
(b) A-I, B-IV, C-III, D-I
(c) A-IV, B-III, C-I, D-II
(d) A-IV, B-I, C-II, D-III

JEE Main-30.01.2023, Shift-II

Ans. (a) :

(A) Torque = F × r = kgm^2 sec^{-2}

(B) Energy density $= \frac{\text{Energy}}{\text{Volume}} = kgm^{-1} sec^{-2}$

(C) Pressure gradient $= \frac{dp}{dx} = kgm^{-2} sec^{-2}$

(D) Impulse $= F \times t = kgms^{-1}$

103. 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:

(a) Nm^2C^{-1}; Nm^3C^{-1}
(b) Nm^3C; Nm^2C
(c) Nm^2C; Nm^3C
(d) Nm^3C^{-1}; Nm^2C^{-1}

JEE Main-30.01.2023, Shift-I

Ans. (a) :

$$E = \frac{A}{x^2}$$

$$NC^{-1} = \frac{A}{m^2}$$ ($\because$ SI unit of electric field is N/C)

$A = Nm^2C^{-1}$

$$E = \frac{B}{y^3}$$

$$NC^{-1} = \frac{B}{m^3}$$

$B = Nm^3C^{-1}$

104. Match list - I with List - II

List-I (Physical Quantity)	List - II (Dimensional Formula)
A. Pressure gradient	I. $[M^0L^2T^{-2}]$
B. Energy density	II. $[M^1L^{-1}T^{-2}]$
C. Electric Field	III. $[M^1L^{-2}T^{-2}]$
D. Latent heat	IV. $[M^1L^1T^{-2}A^{-1}]$

Choose the correct answer from the options given below:

(a) A-II, B-III, C-I, D-IV
(b) A-III, B-II, C-IV, D-I
(c) A-II, B-III, C-IV, D-I
(d) A-III, B-II, C-I, D-IV

JEE Main-29.01.2023, Shift-I

Ans. (b) :

(A) Pressure gradient $= \frac{dp}{dx} = \frac{F}{A.L}$

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

(B) Energy density $= \frac{\text{Energy}}{\text{Volume}} = \frac{[ML^2T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$

(C) Electric field $= \frac{F}{q} = \frac{[MLT^{-2}]}{[AT]} = [M^1L^1T^{-3}A^{-1}]$

(D) Latent heat $= \frac{\text{Heat}}{\text{mass}} = \frac{\text{energy}}{\text{mass}} = \frac{[ML^2T^{-2}]}{[M]} = [L^2T^{-2}]$

105. 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 :

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

JEE Main-01.02.2023, Shift-II

Ans. (c) :

$[M] = [G]^a [h]^b [C]^c$

$[G] = [M^{-1}L^3T^{-2}]$; $[h] = [ML^2T^{-1}]$

$[C] = [LT^{-1}]$

$[M] = [M^{-1}L^3T^{-2}]^a [ML^2T^{-1}]^b [LT^{-1}]^c$

$M^1L^0T^0 = M^{-a+b} L^{3a+2b+c} T^{-2a-b-c}$

On comparing both side, we get–

$-a + b = 1$ .....(i)

$3a + 2b + c = 0$ .....(ii)

$-2a - b - c = 0$ .....(iii)

On solving equation (i), (ii) and (iii), we get–

$a = \frac{-1}{2}$

$b = 1/2$

$c = 1/2$

$[M] = [h^{1/2}c^{1/2}G^{-1/2}]$

106. The physical quantity having the dimensions $[M^{-1}L^{-3}T^3A^2]$ is

(a) resistance (b) resistivity
(c) electrical conductivity (d) electromotive force

J&K-CET-2012, JCECE-2009
Karnataka CET-2006

Ans. (c) : Resistivity $(\rho) = \frac{RA}{l}$

$$R = \frac{V}{I} \text{ and } V = \frac{W}{Q}$$

So, $\rho = \frac{W}{QI} \cdot \frac{A}{l}$

dimension of $(\rho) = \frac{[ML^2T^{-2}][L^2]}{[AT][A][L]} = [ML^3A^{-2}T^{-3}]$

Electrical conductivity $\sigma = \frac{1}{\rho} = [M^{-1}L^{-3}T^3A^2]$

Resistance $= \frac{\text{resistivity} \times \text{length}}{\text{area}}$

$$= [ML^3T^{-3}A^{-2}]\frac{[L]}{[L^2]} = [ML^2T^{-3}A^{-2}]$$

Electromotive force = resistance × current

$$= [ML^2T^{-3}A^{-2}][A]$$
$$= [ML^2T^{-3}A^{-1}]$$

107. The dimension of $\frac{a}{b}$ in the equation $p = \frac{a - t^2}{bx}$, where p is pressure, x is distance and t is time is

(a) $[LT^{-3}]$ (b) $[ML^3T^{-1}]$
(c) $[M^2LT^{-3}]$ (d) $[MT^{-2}]$

JCECE-2011, CG-PET-2014
Karnataka CET-2003
UPSEE - 2013

Ans. (d) :

Dimension of pressure $[P] = \frac{[F]}{[A]} = \frac{[MLT^{-2}]}{[L^2]}$

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

Dimension of Distance $(x) = [L]$

Dimension of Time (t) $= [T^1]$

$P = \frac{a - t^2}{bx} = \frac{a}{bx} - \frac{t^2}{bx}$

Dimension of P = Dimension of $\frac{a}{bx}$

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

$$[ML^{-1}T^{-2}] = \left[\frac{a}{b}\right]\frac{1}{[L]}$$

The dimension of $\left[\frac{a}{b}\right] = [MT^{-2}]$

108. $[ML^{-1}T^{-1}]$ stand for dimension of

(a) work
(b) torque
(c) linear momentum
(d) coefficient of viscosity

UPSEE - 2013, 2011, J&K CET- 2010, 1998
AIIMS-2010, AIEEE 2004, UP CPMT-2001

Ans. (d) :
(i) Dimension of work
W = f.d
$W = [MLT^{-2}][L] = [ML^2T^{-2}]$
(ii) Dimension of torque
$T = f \times r$
$= [MLT^{-2}][L]$
$T = [ML^2T^{-2}]$
(iii) Linear momentum
P = m.v.
$= [M][LT^{-1}] = [MLT^{-1}]$
(iv) Dimension of coefficient of viscosity
$F = 6\pi\eta rv$

$$\eta = \frac{F}{6\pi r.v}$$

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

109. If p represents radiation pressure, c represents speed of light and S represents radiation energy striking unit area per sec. The non-zero integers x, y, z such that $p^x S^y c^z$ is dimensionless are

(a) x = 1, y = 1, z = 1
(b) x = –1, y = 1, z = 1
(c) x = 1, y = –1, z = 1
(d) x = 1, y = 1, z = –1

[AIPMT 1992], UPCPMT-1992, 1981
AFMC-1991, MP PMT-1992

Ans. (c) : Given,
P = radiation pressure
C = speed of light
S = radiation energy
x,y and z are non zero intezers.
$[P^x S^y C^z] = [M^0L^0T^0]$ …(i)
The dimension of $P = [ML^{-1}T^{-2}]$
The dimension of $S = [MT^{-3}]$
The dimension of $C = [LT^{-1}]$
Putting the dimension in equation (i)
$[ML^{-1}T^{-2}]^x [MT^{-3}]^y . [LT^{-1}]^z = [M^0L^0T^0]$
$[M^{x+y}.L^{-x+z}.T^{-2x-3y-z}] = [M^0L^0T^0]$
$x + y = 0$ …(ii)
$z - x = 0$ …(iii)
$-2x - 3y - z = 0$ …(iv)
From equation (iii)
x = z
From equation (ii)
∴ z = –y
By solving, we get,
x = 1, y = –1, z = 1
Hence, option (c) is correct.

110. The dimensional formula for permeability of free space, μ_0 is

(a) $[MLT^{-2}A^{-2}]$
(b) $[ML–1T^{-2}A^2]$
(c) $[ML^{-1}T^{-2}A^2]$
(d) $[MLT^{-2}A^{-1}]$

UPCPMT-2007, AIIMS-2003
AFMC-2002, AIPMT-1993, 1991
MP PET-1997

Ans. (a) : The dimensional formula for permeability of free space,

$$\mu_0 = \frac{2\pi \times \text{force} \times \text{distance}}{\text{current} \times \text{current} \times \text{length}}$$

Dimension of force = $[MLT^{-2}]$
Dimension of current = [A]
Dimension of length and distance = [L]

$$\therefore \mu_0 = \frac{[MLT^{-2}][L]}{[A][A][L]}$$

$$\mu_0 = [MLT^{-2}A^{-2}]$$

111. The frequency of vibration f of a mass m suspended from a spring of spring constant k is given by a relation of the type $f = Cm^x k^y$, where C is a dimensionless constant. The values of x and y are

(a) $x = \frac{1}{2}, y = \frac{1}{2}$
(b) $x = -\frac{1}{2}, y = -\frac{1}{2}$
(c) $x = \frac{1}{2}, y = -\frac{1}{2}$
(d) $x = -\frac{1}{2}, y = \frac{1}{2}$

[AIPMT 1990], RPMT-1998, MP PET-2013

Ans. (d) : Given,
$f = Cm^x.K^y$
where, C = dimensionless constant
m = mass
K = spring constant
The dimension of frequency, $f = [T^{-1}]$
The dimension of mass, m = [M]
The dimension of spring constant, $k = [MT^{-2}]$
$F = Cm^x.K^y$
$[M^0L^0T^{-1}] = [M]^x [MT^{-2}]^y$
$[M^0L^0T^{-1}] = [M^{x+y}. T^{-2y}]$
$x + y = 0$ and $-2y = -1$
$x = -y$ and $y = \frac{1}{2}$
$\Rightarrow x = -\frac{1}{2}, y = \frac{1}{2}$

112. If C and R denote capacitance and resistance respectively, then the dimensional formula of CR is

(a) $[M^0L^0T]$
(b) $[M^0L^0T^0]$
(c) $[M^0L^0T^{-1}]$
(d) Not expressible in terms of [MLT]

[AIPMT-1995, 1992, 1988]
UPCPMT-2005, 1985, 1981
Punjab PMT-1999, MP PMT-2006

Ans. (a) :

Capacitance $(C) = \frac{q}{v} = \frac{q}{\frac{w}{q}} = \frac{q^2}{w} = \frac{(it)^2}{F.d}$

Where q = charge
C = Capacitance
v = voltage

$= \frac{(it)^2}{Fx} = \frac{[AT]^2}{[ML^2T^{-2}]}$

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

and $R = \frac{V}{i} = \frac{w}{qi} = \frac{F.d}{i^2.t} = \frac{[MLT^{-2}][L]}{[A]^2[T]}$

$[ML^2T^{-3}A^{-2}]$

Dimensional formula of CR

$= [M^{-1}L^{-2}T^4A^2][ML^2T^{-3}A^{-2}]$

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

113. The dimensions of impulse is :
(a) $[MLT^{-2}]$ (b) $[M^2LT^{-1}]$
(c) $[MLT^{-1}]$ (d) $[ML^2T^{-1}]$

AP EAMCET(Medical)-1998
J&K CET- 2011, CPMT-1978
EAMCET-1981, AIPMT-1991
AFMC-1998, BCECE-2003, KCET-2007

Ans. (c) : Impulse (I) = Force × Time
Force = $[M^1L^1T^{-2}]$
Time = [T]
Hence, $I = [M^1L^1T^{-2}][T]$
$I = [M^1L^1T^{-1}]$

114. If power (P), surface, tension (T) and Planck's constant (h) are arranged, so that the dimensions of time in their dimensional formulae are in ascending order, then which of the following is correct?
(a) P, T, h (b) P, h, T
(c) T, P, h (d) T, h, p

AP EMCET(Medical)-2008
CPMT-1974, EAMCET-1981
SCRA-1989, MP PMT-2001, 1996
MP PET-2007

Ans. (a) :

Power $\boxed{P = \frac{w}{T}}$

$[P] = \frac{[ML^2T^{-2}]}{[T]} = [ML^2T^{-3}]$

Surface Tension, $\boxed{T = \frac{F}{L}}$

$[T] = \frac{[MLT^{-2}]}{[L]} = [ML^0T^{-2}]$

Photon energy, $E = h\nu$

$h = \frac{E}{\nu}$

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

$\therefore$ The ascending order of dimensions of time in the dimensional formula P, T, h

115. The dimensional formula for latent heat is
(a) $[MLT^{-2}]$ (b) $[ML^2T^{-2}]$
(c) $[M^0L^2T^{-2}]$ (d) $[MlT^{-1}]$

EAMCET-1999, UPCPMT-1986, 1978
IIT-1989, 1983, MNR-1987
Karnataka CET-2001, RPET-2002

Ans. (c) : Formula of latent heat given by $L = \frac{Q}{m}$

Where, L= latent heat
Q= amount of heat
M = mass of substance

Dimension of heat or work = force × displacement
$= [M L T^{-2}] [L]$
$= [M L^2 T^{-2}]$

Dimension of mass = [M]

Dimension of Latent heat $L = \frac{\text{dim.of } Q}{\text{dim.of } m}$

$= [M L^2T^{-2}]. [M]^{-1}$
$= [M^0L^2T^{-2}]$

116. Dimensions of resistance in an electrical circuit, in terms of dimension of mass M, of length L, of time T and of current I, would be
(a) $[ML^2T^{-3}I^{-1}]$ (b) $[ML^2T^{-2}]$
(c) $[ML^2T^{-1}I^{-1}]$ (d) $[ML^2T^{-3}I^{-2}]$

JIPMER-2009, JCECE-2018
AIIMS-2005, UPCPMT-2008, [AIPMT 2007]

Ans. (d) : From the relation of ohm's law-
V = IR

Where – V = Voltage
I = current of the circuit
R = Resistance of the wire

or

$R = \frac{V}{I}$ $\left(\because V = \frac{W}{q}\right)$

$\therefore$ $R = \frac{W}{q.I}$ $(\because q = I.t)$

or

$R = \frac{W}{I.t.I} = \frac{[ML^2T^{-2}]}{[IT][I]}$

or

$R = [ML^2T^{-3}I^{-2}]$

117. If M, L, T, and I stand for mass, length, time and electric current respectively, the dimensional formula for capacitance is

(a) $[M^{-1}L^2T^{-4}I^2]$ (b) $[M^{-1}L^{-2}T^4I^2]$
(c) $[ML^2T^4I^2]$ (d) $[ML^2T^{-4}I^{-2}]$

AIIMS-25.05.2019 (E)-Shift-II
UPSEE - 2012, AMU (Medical)-2002
EAMCET-1998, IIT-1983
AP EAMCET(Medical)-1997

Ans. (b) : Capacitance = $\dfrac{\text{charge}}{\text{voltage}}$

Capacitance = charge × voltage^{-1} …….. (i)
Dim. of charge = [IT]
Voltage = Electric field × displacement
Electric field = force × charge^{-1}
$= [M L T^{-2}] \times [IT]^{-1}$
Dim. (Electric field) = $[ML^1T^{-3}I^{-1}]$
Now, dimension of voltage = $[MLI^{-1}T^{-3}]$ [L]
$= [M L^2 I^{-1} T^{-3}]$
Put in the equation (i),
Dim. (Capacitance) = $[IT] \times [M L^2 I^{-1} T^{-3}]^{-1}$
$= [M^{-1} L^{-2} T^4 I^2]$

118. The dimensional formula for Young's modulus is
OR
The dimensional formula of modulus of rigidity is
OR
The dimensional formula of pressure is
OR
The dimensional formula for volume elasticity is
OR
The dimensional formula of modulus of elasticity is
OR
Dimension of Bulk modulus is
OR
What is the dimension of stress?

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

NEET (Sep.) 2020, SRMJEEE-2017
Kerala CEE-2019, UPSEE-2010
CG PET- 2012, 2009, DCE-2007
JIPMER-2005, MP PET-2000, 1991
UP CPMT-2004, 1991
AP EAMCET (Med.)-1995
Manipal-1995, Punjab PMT-2001
AIPMT-1990, IIT-1982
MNREC-1986, 1984

Ans. (a) : Young's modulus = $\dfrac{\text{stress}}{\text{strain}}$

$$\text{Stress} = \frac{\text{Force}}{\text{Area}} = \frac{[MLT^{-2}]}{[L^2]} = [ML^{-1}T^{-2}]$$

$$\text{Strain} = \frac{\Delta l}{l} \Rightarrow \frac{[L]}{[L]} = [M^0L^0T^0]$$

Dimension of Young's modulus = $\dfrac{[ML^{-1}T^{-2}]}{[M^0L^0T^0]}$

Dimensional formula of Young's modulus = $[ML^{-1}T^{-2}]$

119. The dimension of light year

(a) $[LT^{-1}]$ (b) [T]
(c) $[ML^2T^{-2}]$ (d) [L]

TS EAMCET 28.09.2020, Shift-I
MP PMT-1989, UPCPMT-1991
AFMC-2005, 1991

Ans. (d) : Light year is a distance that light can travel in one year since its unit is in meter.
∴ Dimension of light year is [L]

120. Dimensional formula for ε_0 is

(a) $[M^{-1}L^{-2}A^2T^2]$ (b) $[ML^2A^{-2}T^4]$
(c) $[M^{-1}L^{-3}A^2T^4]$ (d) $[ML^3A^{-2}T^4]$

AP EAMCET (17.09.2020) Shift-II
Kerala CEE -2018, JCECE-2017
BCECE-2010, CG PET- 2007, 2006
UPSEE - 2005, AIIMS-2004, AMU-2003

Ans. (c) : From Coulomb's law,

$$F = \frac{1}{4\pi\varepsilon_0}\cdot\frac{q_1q_2}{r^2}$$

$$\therefore \quad \varepsilon_0 = \frac{1}{4\pi F}\cdot\frac{q_1q_2}{r^2}$$

$$\therefore \text{ Dimensions of } \varepsilon_0 = \frac{1}{[MLT^{-2}]}\times\frac{[AT]^2}{[L^2]}$$

$$= [M^{-1}L^{-3}A^2T^4]$$

121. Dimensions of $1/\mu_0\varepsilon_0$, where symbols have their usual meaning, are

(a) $[L^{-1}T]$ (b) $[L^2T^2]$
(c) $[L^2T^{-2}]$ (d) $[LT^{-1}]$

MP PMT-1991, 1989, 1987
J&K CET-2010, DPMT-2004
AIEEE 2003, Bihar PET-1984
AFMC-1986, AIIMS-1993
AIPMT-1992, UPCPMT-1997, 1992
Karnataka CET-1994, DCE-1999

Ans. (c) : We know,

$$c = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$$

$$c^2 = \frac{1}{\mu_0\varepsilon_0}$$

Then, dimensional formula of $\dfrac{1}{\mu_0\varepsilon_0}$ is given as –

$$\frac{1}{\mu_0\varepsilon_0} = c^2 = [LT^{-1}]^2 = [L^2T^{-2}]$$

122. **Planck's constant has the dimensions of**
(a) linear momentum (b) angular momentum
(c) energy (d) power

TS EAMCET 31.07.2022, Shift-II
AP EAMCET-06.09.2021, Shift-I
Kerala CEE 2007, Karnataka CET-2004
AIPMT-2001

Ans. (b) : We know that, E = hν
Where, E = Energy, h = Planck's constant,
ν = Frequency
Dimension of Plank's constant

$$h = \frac{E}{\nu}$$
$$h = \frac{[ML^2T^{-2}]}{[M^0L^0T^{-1}]}$$
$$h = [ML^2T^{-1}]$$

Dimension of Angular momentum
= MVr
= $[M][LT^{-1}]$ [L]
= $[ML^2T^{-1}]$
Hence, option (b) is correct.

123. **Dimensions of Planck's constant is :**
(a) $[ML^2T^{-1}]$ (b) $[MLT^{-2}]$
(c) $[ML^{-2}T]$ (d) $[ML^{-1}T^2]$

J&K CET- 2015, 2003, 1999
DCE-2007, BCECE-2004
AFMC-2003, Kerala PMT-2002
AIIMS-1997, MP PMT-1996, 1983
IIT-1985, DPMT-1987, MP PET-1995
RPMT-1999, UPCPMT-1999

Ans. (a) : Formula, E = h*ν*

$$\text{Planck's Constant } (h) = \frac{\text{Energy in each Photon}}{\text{Frequency of radiation}}$$
$$= \frac{E}{\nu} = \frac{[ML^2T^{-2}]}{[T^{-1}]}$$
$$= [ML^2T^{-1}]$$

124. **The dimension of magnetic flux is**
(a) $[MLT^{-1}A^{-1}]$ (b) $[ML^{-1}TA^{-2}]$
(c) $[ML^{-2}T^2A^{-2}]$ (d) $[ML^2T^{-2}A^{-1}]$

J&K-CET-2015, GUJCET-2014
Odisha-JEE-2012, Kerala PMT-2005
Kerala CEE 2005, DPMT-2001
AP EAMCET (Medical)-2003
AIPMT-1999, 89, AIIMS-1998
MP PMT-1994, DCE-1993, IIT-1982

Ans. (d) : Magnetic flux (ϕ_B) = B × A × cosθ
Where, B = Magnetic Field
A = Surface Area
θ = Angle between the magnetic field and normal to the surface.

Therefore, dim. (ϕ_B) = $[M^1T^{-2}A^{-1}][M^0L^2T^0]$
$$\phi_B = [M^1L^2T^{-2}A^{-1}]$$
Since, θ is a dimensionless quantity.

125. **The equation of state of some gases can be expressed as**
$$\left(p + \frac{a}{V^2}\right)(V - b) = RT$$
where, p is the pressure, V the volume, T the absolute temperature and a and b are constants. The dimensional formula of a is
(a) $[ML^5T^{-2}]$ (b) $[M^{-1}L^5T^{-2}]$
(c) $[ML^{-1}T^{-2}]$ (d) $[ML^{-5}T^{-2}]$

WB JEE-2013, JCECE-2010
CG-PET-2009, Odisha PMT-2004
UPSEE-2002, UPCPMT-1997
AIMPMT-1996, MNR-1995
AFMC-1995, MP PMT-1994, MPPET-1992

Ans. (a) : According to the principle of dimensional homogeneity the dimensions of each the terms of a dimensional equation on both sides are the same.
So, dimension of p and $\frac{a}{V^2}$ will be same

$$p = \left[\frac{a}{V^2}\right]$$
$$a = [p][V^2]$$
$$a = [ML^{-1}T^{-2}][L^6]$$
$$a = [ML^5T^{-2}]$$

126. **The dimensions of universal gravitational constant are–**
(a) $[M^{-2}L^{-3}T^{-2}]$ (b) $[M^{-2}L^2T^{-1}]$
(c) $[M^{-1}L^3T^{-2}]$ (d) $[ML^2T^{-2}]$

AP EAMCET-23.09.2020, Shift-II
WB JEE 2017, COMEDK 2014
BCECE-2013, 2005, Kerala PMT-2012
Odisha JEE-2010, Karnataka CET- 2008
CG PET- 2004, JIPMER-2004
Punjab PMT-2003, AIIMS-2000
MP PMT-2000, AFMC-1999
UPCPMT-1996, DPMT-1984
EAMCET-1992, AIPMT-2004, 1992

Ans. (c) : Gravitational force acting between two body is–
$$F = \frac{Gm_1m_2}{r^2}$$
$$\therefore \quad G = \frac{F.r^2}{m_1.m_2}$$
Where, G = Universal gravitational constant
F = Gravitational force
m_1 = mass of first body
m_2 = mass of second body

r = Distance between two body.

$\therefore$ Unit of Universal gravitational constant–

$\Rightarrow$ Unit of $G = \frac{\text{Newton. m}^2}{\text{kg . kg}} = \frac{\text{N.m}^2}{(\text{Kg})^2}$

$\Rightarrow$ Dimension of G = Dimension of $\frac{\text{N.m}^2}{(\text{Kg})^2}$

$\Rightarrow$ Dimension of $G = \frac{[MLT^{-2}][L^2]}{[M^2]}$

$\Rightarrow$ Dimension of $G = [M^{-1} L^3 T^{-2}]$

127. The dimensions of self inductance *L* are

(a) $[ML^2T^{-2}A^{-2}]$ (b) $[ML^2T^{-1}A^{-2}]$
(c) $[ML^2T^{-1}A^{-1}]$ (d) $[ML^{-2}T^{-2}A^{-2}]$

MP PET-2009, UPSEE –2008, 2014
J&K CET-2005, Karnataka CET-2004
KCET-2004, DPMT-1999
CPMT-1992, IIT-1983, AIPMT-1992, 1989

Ans. (a) : We know that,

$E = L\frac{di}{dt}$

where is 'i' is the current of circuit and L is the self inductance.

$L = \frac{|E|}{\frac{di}{dt}} = \frac{[ML^2T^{-3}A^{-1}]}{[AT^{-1}]}$

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

128. Dimensional formula of Stefan's constant is

(a) $[MT^{-3}K^{-4}]$ (b) $[ML^0T^{-2}K^{-4}]$
(c) $[ML^2T^{-2}]$ (d) $[MT^{-2}L^0]$
(e) $[MT^{-4}L^0]$

Manipal UGET -2020, Kerala CEE - 2009
KCET-2006, AIPMT-2002, MP PET-1992
MP PMT-1992, 1989, AFMC-1986

Ans. (a) : Stefan's constant $(\sigma) = \frac{E}{AtT^4}$

$[\sigma] = \frac{[ML^2T^{-2}]}{[L^2][K^4][T]}$

$[\sigma] = \frac{[ML^0T^{-3}]}{[K]^4}$

Dimension of $(\sigma) = [ML^0T^{-3}K^{-4}]$

129. If the force is given by $F = at + bt^2$ with t as time. The dimensions of a and b are

(a) $[MLT^{-4}]$ and $[MLT^{-2}]$
(b) $[MLT^{-3}]$ and $[MLT^{-4}]$
(c) $[ML^2T^{-3}]$ and $[ML^2T^{-2}]$
(d) $[ML^2T^{-3}]$ and $[ML^3T^{-4}]$

JIPMER-2013, 2005, BITSAT-2012
Kerala PET-2011, Kerala CEE - 2011
AP EAMCET -2010, BCECE-2003
BHU-2005, 1998, AFMC-2001

Ans. (b) : Given, $F = at + bt^2$

Dimension of F = Dimension of at

$[MLT^{-2}] = a[T]$

$a = \frac{[MLT^{-2}]}{[T]}$

$a = [MLT^{-3}]$

Dimension of F = Dimension of bt^2

$F = bt^2$

$[MLT^{-2}] = b[T]^2$

$b = \frac{[MLT^{-2}]}{[T^2]}$

$b = [MLT^{-4}]$

130. The correct dimensional formula for impulse is given by

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

WB JEE 2019, AIPMT-1991
AFMC-1998, BCECE-2003
Karnataka CET-2007, UPCPMT-1978
AP EAMCET-1981

Ans. (b) : Impulse (I) = Force × time

$[M^1L^1T^{-2}] \times [T]$

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

131. The dimension of angular momentum is

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

UPCPMT-1999, 1989, 1986, 1982, 1973
WB JEE-2012, AIPMT-1988
BCECE-2004, Punjab PET-2000
DPMT-1987, IIT-1983, VIT-1982
MP PMT-1987, AIPMT-1992, 1988, BHU-1995

Ans. (c) : We know

Angular momentum (L) = mvr.

where = m = mass (kg)
V = velocity (m/s)
r = radius (m)

$L = [M][LT^{-1}][L]$

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

132. The speed of light (c), gravitation 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) $[G^{1/2} h^{1/2} c^{1/2}]$

CG PET-22.05.2022
AIIMS-2008, AMU-1999

Ans. (a) : dimension

$$[C] = LT^{-1}$$
$$[G] = M^{-1}L^3T^{-2}$$
$$[h] = M^1L^2T^{-1}$$

Let $t \propto c^x\ G^y h^z$

$$T = (LT^{-1})^x (M^{-1}L^3T^{-2})^y (ML^2T^{-1})^z$$
$$= [M]^{-y+z}\ [L]^{x+3y+2z}\ [T]^{-x-2y-z}$$

By equating

$-y + z = 0$ ___(i)

$x + 3y + 2z = 0$ ___(ii)

$-x - 2y - z = 1$ ___(iii)

By Solving eq^n (i), (ii) & (iii)

We get, $x = \frac{-5}{2},\ y = \frac{1}{2},\ z = \frac{1}{2}$

$$[t] = [C^{-5/2}G^{1/2}h^{1/2}]$$

133. The dimensions of Boltzmann constant are

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

(c) $[M^2LT^{-2}\theta^{-1}]$ (d) $[ML^0T^{-2}\theta^{-1}]$

AP EAMCET-08.07.2022, Shift-I
CG PET- 22.05.2022
AIIMS-26.05.2019(E) Shift-2
CG PET-2010, MP PET-2013, 2002
Punjab PET-2001

Ans. (a) : Dimensional formula of Boltzmann constant

$(K_b) = \frac{\text{Dimensional formula of energy}}{\text{Dimensional formula of temperature}}$

$= \frac{[ML^2T^{-2}]}{[\theta]}$

$= [ML^2T^{-2}\theta^{-1}]$

134. If velocity (V), acceleration (A) and force (F) are considered as fundamental units then the dimension of Young's modulus will be

(a) $[FA^2V^{-5}]$ (b) $[FA^2V^{-4}]$

(c) $[FA^2V^{-3}]$ (d) $[FA^2V^2]$

Tripura-27.04.2022
JEE Main-11.01.2019, Shift-II
JEE Main-02.09.2020, Shift-1

Ans. (b) : Velocity = ν
Acceleration = A
Force = F

We know that,
The dimension of young's

Modulus, $Y = \frac{\text{stress}}{\text{strain}} = [ML^{-1}T^{-2}]$

Then according to the dimension rule

$[Y] = [F]^a\ [A]^b\ [V]^c$ ……….(i)

$[ML^{-1}T^{-2}] = [MLT^{-2}]^a\ [LT^{-2}]^b\ [LT^{-1}]^c$

$[ML^{-1}T^{-2}] = [M^a\ L^{a+b+c}\ T^{-2a-2b-c}]$

comparing both side, we get

$a = 1$

$a + b + c = -1$

$-2a - 2b - c = -2$

On solving the equation we get

$a = 1,\ b = 2,\ c = -4$

Putting the value of a, b, and c in equation (1)

$[Y] = [FA^2\ V^{-4}]$.

135. Dimensional formula of electric flux________

(a) $[M^1\ L^{-3}\ T^{-3}\ A^{-1}]$ (b) $[M^1\ L^3\ T^3\ A^{-1}]$

(c) $[M^1\ L^{-3}\ T^{-3}\ A^{-1}]$ (d) $[M^{-1}\ L^3\ T^{-3}\ A^{-1}]$

GUJCET 18.04.2022

Ans. (c) : Electric flux

$\phi = B.A$

$= \frac{F}{q}.A$

Unit of $\phi = Nm^2c^{-1}$ or $kg\ m^3s^{-2}\ c^{-1}$

Dimensions = $\frac{F}{q}.A$

$\frac{[MLT^{-2}][L^2]}{[AT]}$

$\phi = [ML^3T^{-3}A^{-1}]$

136. The dimensional formula for the power of a lens is

(a) $[L^{-1}M^0T^0]$ (b) $[L^0M^{-1}T^0]$

(c) $[L^0M^0T^{-1}]$ (d) $[L^0M^0T^0]$

(e) $[L^{-1}M^0T^{-1}]$

Kerala CEE 04.07.2022

Ans. (a) : We know, $P = \frac{1}{f(m)}$

F = Focal length

The dimension of focal length is $[M^0L^1T^0]$

Then the dimensional formula for the power of a lens

$P = [L^{-1}M^0T^0]$

137. If E and E_0 denote energies at time t and t_0 respectively, and L and L_0 distance from some point at t and t_0 respectively, then which of the following equations can be declared to be incorrect on dimensional grounds.

(A) $E = \frac{2E_0L}{L_0}$ **(B)** $E = E_0e^{-2L/L_0}$

(C) $E = 2Le^{-L/E_0}$ **(D)** $E = 2(E_0/L_0) \times e^{-L/L_0}$

(a) A, B only (b) A, C only

(c) A, C, D only (d) C, D only

TS EAMCET 18.07.2022, Shift-I

Ans. (d) : In C, the dimension of E and L are different.

Similarly in D, E and $\frac{E_0}{L_0}$ also have different dimension.

So, C and D is incorrect on dimensional ground.

$[E] \neq [L]$

$[E] \neq \left[\frac{E_0}{L}\right]$

138. If the velocity of light C, the gravitational constant G and Planck's constant h are chosen as the fundamental units, the dimension of density in the new system is

(a) $[C^3G^{-2}h^1]$ (b) $[C^5G^{-2}h^{-1}]$

(c) $[C^{-3/2}G^{-1/2}h^{1/2}]$ (d) $[C^{9/2}G^{-1/2}h^{-1/2}]$

TS EAMCET 20.07.2022, Shift-I

Ans. (b) : Given,

Speed of Light (C) = $[LT^{-1}]$

Gravitational constant (G) = $[M^{-1}L^3T^{-2}]$

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

Let $[ML^{-3}] = [C^xG^yh^z]$

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

$= [M^{-y+z}.L^{x+3y+2z}.T^{-x-2y-z}]$

Where,

$-y + z = 1, \quad x + 3y + 2z = -3, \quad -x - 2y - z = 0$

$x = 5, \quad y = -2, \quad z = -1$

So, the dimension of $[ML^{-3}] = [C^5 G^{-2} h^{-1}]$

139. 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 ρ and radius of the drop is r, then $T = K\sqrt{\rho r^3 / S^{\frac{3}{2}}}$ 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.

(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 but (R) is true

JEE Main-29.07.2022, Shift-I

Ans. (d) :

$$T = \sqrt{\rho r^3 / (S)^{3/2}} \;\; \text{.........} \; (i)$$

Dimensional formula of the given parameters T, r,ρ and S –

$$T = [T], \; r = [L], \; \rho = [ML^{-3}], \; S = [MT^{-2}]$$

$$\text{R.H.S} \Rightarrow \sqrt{\rho r^3 / (S)^{3/2}} = \sqrt{\frac{(ML^{-3})(L)^3}{(MT^{-2})^{3/2}}}$$

$$= \left[\frac{(M)}{M^{3/2}T^{-3}}\right]^{1/2}$$

$$= \left[\frac{M^{\frac{1}{2}}}{M^{\frac{3}{4}}T^{\frac{-3}{2}}}\right] = \left[M^{\frac{-1}{4}}T^{\frac{3}{2}}\right]$$

∴ Dimensional formula of R.H.S = $\left[M^{\frac{-1}{4}}T^{3/2}\right]$

And dimensional formula of L.H.S = [T]

∴ L.H.S ≠ R.H.S

So, Left hand side and right hand side is not dimensionally correct and their dimension is not same.

140. The dimensions of $\left(\frac{B^2}{\mu_0}\right)$ will be :

(if μ_0 : permeability of free space and B : magnetic field)

(a) $[ML^2T^{-2}]$ (b) $[MLT^{-2}]$

(c) $[ML^{-1}T^{-2}]$ (d) $[ML^2 T^{-2} A^{-1}]$

JEE Main-28.07.2022, Shift-I

Ans. (c) : $\frac{B^2}{2\mu_0}$ = Magnetic Energy density

$$\left[\frac{B^2}{\mu_0}\right] = \frac{[\text{Energy}]}{[\text{Volume}]} = \left[\frac{M^1L^2T^{-2}}{L^3}\right] = [M^{+1}L^{-1}T^{-2}]$$

141. Given below are two statements : One is labeled as Assertion A and the other is labeled as Reason R.

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

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

Choose the correct answer from the options given below.

(a) Both A and R true and R is 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 but R is true.

JEE Main-28.06.2022, Shift-I

Ans. (c) The dimension of product of pressure and time $= [ML^{-1}T^{-2}]\,[T^1] = [ML^{-1}T^{-1}]$

∵ Coefficient of viscosity $\eta = \frac{F}{6\pi rv}$

$$\text{Dimension of } \eta = \frac{[MLT^{-2}]}{[L][LT^{-1}]} = [ML^{-1}T^{-1}]$$

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

$$\frac{[MLT^{-2}]}{[LT^{-1}][L^{-1}]} = [MLT^{-1}]$$

So, assertion is true but reason is falls.

142. The dimension of mutual inductance is:

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

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

JEE Main-26.06.2022, Shift-II

Ans. (c) : We know that, mutual inductance $L = \frac{\phi}{I}$

Dimension of $\phi = [ML^2T^{-2}A^{-1}]$

Dimension of $L = \frac{[ML^2T^{-2}A^{-1}]}{[A]}$

Dimension of $L = [ML^2T^{-2}A^{-2}]$

143. Identify the pair of physical quantities which have different dimensions

(a) Wave number and Rydberg's constant
(b) Stress and Coefficient of elasticity
(c) Coercivity and Magnetisation
(d) Specific heat capacity and Latent heat

JEE Main-24.06.2022, Shift-I

Ans. (d) Dimensional formula of specific heat capacity,

$C = [L^2T^{-2}\theta^{-1}]$

Dimensional formula of latent heat,

$L = [L^2T^{-2}]$

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

(a) Velocity gradient and decay constant
(b) wien's constant and Stefan constant
(c) angular frequency and angular momentum
(d) wave number and Avogadro number

JEE Main-24.06.2022, Shift-II

Ans. (a) : Dimensional formula of velocity gradient and decay constant is same and it is given as $[M^0L^0T^{-1}]$.

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

(a) $[P\,A^{-1}\,T^{0}]$ (b) $[P\,A\,T^{-1}]$

(c) $[P\,A^{-1}\,T]$ (d) $[P\,A^{-1}\,T^{-1}]$

JEE Main-25.07.2022, Shift-I

Ans. (a) : $[PA^{-1}T^0]$

We know,

Coefficient of viscosity = Pascal × second

$P^xA^yT^z = [M^1L^{-1}T^{-1}]$

$[M^1L^1T^{-1}]^x\,[L^2]^y\,[T^1]^z = [M^1L^{-1}T^{-1}]$

$m^x \quad L^{x+2y}\;\; T^{-x+z} = M^1L^{-1}\,T^{-1}$

Comparing the above equation,

$x = 1,$

$x + 2y = -1$

$y = -1$

$z = 0$

Coefficient of viscosity = $[P^1A^{-1}T^0]$

146. Which of the following physical quantities have the same dimensions?

(a) Electric displacement $(\vec{D})$ and surface charge density
(b) Displacement current and electric field
(c) Current density and surface charge density
(d) Electric Potential and energy

JEE Main-25.07.2022, Shift-I

Ans. (a) : We know,

Electric displacement $(\vec{D}) = q_0\,\vec{E}$

$$[D] = \left[q_0 \frac{\sigma}{q_0}\right]$$

$$[D] = [\sigma]$$

From above, we can say Electric displacement $(\vec{D})$ is equal to surface charge density (σ).

147. The dimensional formula of emissivity of a body is

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

(c) $[M^0L^0T^0]$ (d) $[M^1L^2T^{-2}]$

AP EAPCET-12.07.2022, Shift-II

Ans. (c) : Emissivity can be defined as the ratio of the emissive power of body temperature and emissive power of the black body at same temperature. So, it is dimensionless formula which dimension is $\left[M^0L^0T^0\right]$

148. The energy E of a system is function of time t and is given by $E(t) = \alpha t - \beta t^3$ where α and β are constants. The dimensions of α and β are

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

(b) $\left[LT^{-1}\right]$and$\left[LT\right]$

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

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

AP EAMCET-05.07.2022, Shift-I

Ans. (c) : $E(t) = \alpha t - \beta t^3$

By the principle of dimensional homogeneity.

Dimension of Energy = dimension of αt = dimension of βt^3

So, $[E] = [\alpha t]$

$ML^2T^{-2} = [\alpha]\,[T]$

$$[\alpha] = \frac{M^1L^2T^{-2}}{[T]}$$

$$[\alpha] = \left[ML^2T^{-3}\right]$$

and $[E] = [\beta t^3]$

$\left[ML^2T^{-2}\right] = \beta[T^3]$

$$[\beta] = \frac{\left[ML^2T^{-2}\right]}{\left[T^3\right]}$$

$$[\beta] = \left[ML^2T^{-5}\right]$$

So, the dimension of $[\alpha]$ and $[\beta]$ are $\left[ML^2T^{-3}\right]$and $\left[ML^2T^{-5}\right]$

149. If the dimension of (Angle × Force × Length) is M^{n_1} L^{n_2} T^{n_3} then the value of (n_1, n_2, n_3) is

(a) (1, 1, –1) (b) (1. 2, –2)
(c) (1, 1, 1) (d) (1, 2, 2)

AP EAMCET-12.07.2022, Shift-I

Ans. (b) : [Angle] × [Force] × [Length] = $M^{n_1} \times L^{n_2} \times T^{n_3}$

the dimension of

Angle = [M°L°T°]

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

Length = $[L^1]$

$[M°L°T°] \times [M^1L^1T^{-2}] \times [L^1] = M^{n_1} \times L^{n_2} \times T^{n_3}$

$[M^1L^2T^{-2}] = [M^{n_1}\ L^{n_2}\ T^{n_3}]$

Comparing on both side, we get

$n_1 = 1, n_2 = 2, n_3 = -2$

150. If the dimensional formula of '(Energy × speed)' is $[M^aL^bT^C]$ then a, b and c are.

(a) (1,3,–3) (b) (1,2,3)
(c) (1,2,3) (d) (1,3,–2)

AP EAMCET-05.07.2022, Shift-II

Ans. (a) : Given that,

Dimensional formula of (Energy × Speed) = $[M^aL^bT^C]$

Dimension (Energy) = $M^1L^2T^{-2}$

Dimension (Speed) = L^1T^{-1}

∴ $[M^1L^2T^{-2}] \times [L^1T^{-1}] = [M^aL^bT^C]$

$[M^1L^3T^{-3}] = [M^aL^bT^C]$

On comparing both side we get,

a = 1

b = 3

c = –3

Thus (a, b, c) = (1, 3, –3)

151. 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, α and β are constants. Then, the dimensions of β will be

(a) $[M^2LT^2]$ (b) $[M^0LT^0]$
(c) $[MLT^{-2}]$ (d) $[ML^2T^{-2}]$

JEE Main-24.02.2021, Shift-I

Ans. (c) : Given,

$$W = \alpha\beta^2 e^{\frac{-x^2}{\alpha kT}}$$

As we know, exponential terms are always dimensionless

So, dimension of $\left(\frac{-x^2}{\alpha kT}\right) = [M^0L^0T^0]$

Here, dimension of kT is equal to the dimension of energy = $M^1L^2T^{-2}$

$$\frac{[L^2]}{[\alpha][ML^2T^{-2}]} = [M^0L^0T^0]$$

$$[\alpha] = [M^{-1}L^0T^2]$$

Now, From the given equation, we have dimension of W = dimension of α × dimension of β^2

$$\text{Dimension of } \beta = \sqrt{\frac{\text{dimension of w}}{\text{dimension of } \alpha}}$$

$$= \sqrt{\frac{[ML^2T^{-2}]}{M^{-1}L^0T^2}}$$

$$= \sqrt{M^2L^2T^{-4}}$$

Dimension of β = $[MLT^{-2}]$

152. In a typical combustion engine, the work done by a gas molecule is given $W = \alpha^2\beta e^{\frac{-\beta x^2}{kT}}$, where x is the displacement, k is the Boltzmann constant and T is the temperature. If α and β are constants, dimensions of α will be

(a) $[MLT^{-2}]$ (b) $[M^0LT^0]$
(c) $[M^2LT^{-2}]$ (d) $[MLT^{-1}]$

JEE Main-26.02.2021, Shift-I

Ans. (b) : kT has dimension of energy.

Exponential terms are always dimensionless.

So, $\frac{\beta x^2}{kT}$ is dimensionless

i.e. $\left[\frac{\beta x^2}{kT}\right] = [M^0L^0T^0]$

$$\frac{[\beta][L]^2}{[ML^2T^{-2}]} = [M^0L^0T^0]$$

$$[\beta][L^2] = [ML^2T^{-2}]$$

$$[\beta] = [MT^{-2}]$$

$\alpha^2\beta$ has dimension of work

$$[\alpha^2][MT^{-2}] = [ML^2T^{-2}]$$

$$[\alpha^2] = \frac{[ML^2T^{-2}]}{[MT^{-2}]}$$

$$\alpha = \sqrt{M^0L^2T^0}$$

$$\alpha = [M^0LT^0]$$

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

(a) $[FL^{-4}T^2]$ (b) $[FL^{-3}T^2]$
(c) $[FL^{-5}T^2]$ (d) $[FL^{-3}T^3]$

JEE Main-27.08.2021, Shift-II

Ans. (a) : As we know that,
Force = mass × acceleration

$$\text{mass} = \frac{\text{Force}}{\text{acceleration}}$$

$$\text{dimension of mass} = \frac{[F]}{[LT^{-2}]}$$

dimension of mass (m) = $[FL^{-1}T^2]$
Now,

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Dimension of density} = \frac{[FL^{-1}T^2]}{[L^3]}$$

$$= [FL^{-4}T^2]$$

154. Which of the following is not a dimensionless quantity ?
(a) Relative magnetic permeability (μ_r)
(b) Power factor
(c) Permeability of free space (μ_0)
(d) Quality factor

JEE Main-27.08.2021, Shift-I

Ans. (c) : (a) Relative magnetic permeability (μ_r) = –1 as $\mu_r = \frac{\mu}{\mu_m}$ (Where, μ_r is constant and it is dimensionless)
(b) Power factor is an indication of the relative phase of the power line voltage and power line current. It ranges from 0 to 1. As it is a ratio. So, it has no dimension.
(c) Permeability of free space (μ_0) = $\frac{2\pi \times \text{force} \times \text{distance}}{\text{current} \times \text{current} \times \text{length}}$

$$= \frac{[MLT^{-2}][L]}{[A][A][L]} = [MLT^{-2}A^{-2}]$$

(d) Quality factor (Q) = $\frac{\text{Energy stored}}{\text{Energy dissipated per cycle}}$
So, Q is unit less and dimensionless.

155. Match List-I with List-II.

	List-I		List-II
A.	Magnetic induction	**1.**	$[ML^2T^{-2}A^{-1}]$
B.	Magnetic flux	**2.**	$[ML^{-1}A]$
C.	Magnetic permeability	**3.**	$[MT^{-2}A^{-1}]$
D.	Magnetisation	**4.**	$[MLT^{-2}A^{-2}]$

Choose the most appropriate answer from the options given below.

	A	B	C	D
(a)	2	4	1	3
(b)	2	1	4	3
(c)	3	2	4	1
(d)	3	1	4	2

JEE Main-26.08.2021, Shift-II

Ans. (d) : Magnetic induction → $[MT^{-2}A^{-1}]$
Magnetic flux → $[ML^2T^{-2}A^{-1}]$
Magnetic permeability → $[MLT^{-2}A^{-2}]$
Magnetisation → $[M^0L^{-1}A]$
Hence, correct option is (d)

156. If E,L,M and G denote the quantities as energy, angular momentum, mass and constant of gravitation respectively, then the dimension of P in the formula P =$EL^2M^{-5}G^{-2}$ is
(a) $[M^0L^1T^0]$
(b) $[M^{-1}L^{-1}T^2]$
(c) $[M^1L^1T^{-2}]$
(d) $[M^0L^0T^0]$

JEE Main-26.08.2021, Shift-I

Ans. (d) : Given,

$$P = \frac{EL^2}{M^5G^2} \qquad \ldots(i)$$

where, E → energy
L → angular momentum
M → mass
G → Gravitational constant
So, dimension of
Energy [E] = $[ML^2T^{-2}]$
Angular momentum [L] = $[ML^2T^{-1}]$
Gravitational constant [G] = $[M^{-1}L^3T^{-2}]$
Mass [M] = [M]
Substituting dimension of each quantity in equation (i)

$$[P] = \frac{[ML^2T^{-2}][ML^2T^{-1}]^2}{[M]^5[M^{-1}L^3T^{-2}]^2}$$

$$[P] = \frac{M^3L^6T^{-4}}{M^3L^6T^{-4}} \Rightarrow [P] = [M^0L^0T^0]$$

157. Which of the following equations is dimensionally incorrect ?
Where, t = time, h = height,
s = surface tension, θ= angle,
ρ= density, r = radius,
g = acceleration due to gravity,
V = volume , p= pressure, W = work done, τ = torque, ε = permittivity,
E = electric field, J = current density,
L = length.
(a) $V = \frac{\pi \rho a^4}{8\eta L}$
(b) $h = \frac{2s\cos\theta}{\rho rg}$
(c) $J = \varepsilon \frac{\partial E}{\partial t}$
(d) $W = \tau\theta$

JEE Main-31.08.2021, Shift-I

Ans. (a) : dimension of volume [V] = $[L^3]$
dimension of [η] = $[ML^{-1}T^{-1}]$

$$\therefore \frac{\pi\rho a^4}{8\eta L} = \frac{[ML^{-3}].[L^4]}{[ML^{-1}T^{-1}].[L]}$$

$$[LT] \neq V = [L^3]$$

Hence, this expression is dimensionally incorrect

158. A large number of water drops, each of radius r, combine to have a drop of radius R. If the surface tension is T and mechanical equivalent of heat is J, the rise in heat energy per unit volume will be

(a) $\frac{2T}{J}\left(\frac{1}{r}-\frac{1}{R}\right)$ (b) $\frac{2T}{rJ}$

(c) $\frac{3T}{rJ}$ (d) $\frac{3T}{J}\left(\frac{1}{r}-\frac{1}{R}\right)$

JEE Main-26.02.2021, Shift-I

Ans. (d) : Let, R is the radius of bigger drop and r is the radius of smaller drop.

Water drops are combined to form a bigger drop.

So, volume of n smaller drops = volume of a bigger drop

$$n\times\frac{4}{3}\pi r^3=\frac{4}{3}\pi R^3$$

$$n=\left(\frac{R}{r}\right)^3$$

Δu = T × change in surface area

$\Delta u = T\,(n\times 4\pi r^2-4\pi R^2)$

$$\Delta u=4\pi T\left[\left(\frac{R}{r}\right)^3 r^2-R^2\right]$$

$$=4\pi T\left(\frac{R^3}{r}-R^2\right)$$

$$\text{Heat energy (H)}=\frac{\Delta u}{J}=\frac{4\pi T\left(\frac{R^3}{r}-R^2\right)}{J}$$

Now,

$$\text{Heat energy per unit volume }\left(\frac{H}{V}\right)=\frac{4\pi T\left(\frac{R^3}{r}-R^2\right)}{J\times\frac{4}{3}\pi R^3}$$

$$=\frac{3T}{J}\left(\frac{1}{r}-\frac{1}{R}\right)$$

159. The dimensions of stopping potential is

(a) $[ML^{-1}T^{-2}A^3]$ (b) $[M^{-1}L^{-2}T^3A^2]$

(c) $[M^{-2}LT^{-3}A^{-1}]$ (d) $[ML^2T^{-3}A^{-1}]$

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Ans. (d) : $\text{Electrical Potential}=\frac{\text{Potential Energy}}{\text{Charge}}$

$$[V]=\frac{[E_p]}{[Q]}$$

$$=\frac{[ML^2T^{-2}]}{[AT]}$$

$$=[ML^2T^{-3}A^{-1}]$$

160. In the expression $P=\frac{a-t^2}{bx}$, P is pressure, t is time and x is the distance. The dimension of $\frac{a}{b}$ will be.

(a) $[LT^2]$ (b) $[MT^{-2}]$

(c) $[ML^2T^{-4}]$ (d) $[M^2LT^{-2}]$

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Ans. (b) : Given expression $P=\frac{a-t^2}{bx}$

Where,

t = Time [T]

x = Distance [L]

P = Pressure $[ML^{-1}T^{-2}]$

$$P=\frac{a-t^2}{bx}$$

$$Pbx=a-t^2$$

$$Pbx+t^2=a$$

Both side dividing by "b"

$$\frac{Pbx}{b}+\frac{t^2}{b}=\frac{a}{b}$$

$$Px+\frac{t^2}{b}=\frac{a}{b}$$

So, dimension of $\left[\frac{a}{b}\right]=Px=[ML^{-1}T^{-2}]\,[L]=[MT^{-2}]$

161. 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

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

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

JEE Main-25.07.2021, Shift-II

Ans. (b) : Given that,

F = A Cos Bx + C Sin Dt

$Bx=M^0L^0T^0$

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

$[B]=[L^{-1}]$ ...(1)

And, $Dt=M^0L^0T^0$

$[D]=[T^{-1}]$ ...(2)

And, $[A]=[C]=[MLT^{-2}]$ ...(3)

From equation (1), (2), (3)

$$\text{So, }\frac{AD}{B}=\frac{[MLT^{-2}][T^{-1}]}{[L^{-1}]}$$

$$\boxed{\frac{AD}{B}=[ML^2T^{-3}]}$$

162. Which of the following pairs of physical quantities possess same dimension?

(a) Force and surface tension
(b) Frequency and velocity gradient
(c) Angular speed and solid angle
(d) Stefan's constant and Plank's constant

AP EAMCET-24.08.2021, Shift-I

Ans. (b) : Velocity gradient is variation in velocity among the adjacent layers of the fluid

$\therefore$ Velocity gradient $= \frac{\Delta V}{\Delta x} = \frac{\text{meter}}{\text{second}} \times \frac{1}{\text{meter}}$

$\frac{\Delta V}{\Delta x} = \frac{1}{\text{second}}$

$\therefore$ Dimension of velocity gradient is $[M^0L^0T^{-1}]$, which is same as that of Frequency.
So option 'b' is correct.

163. Match List-I with List-II

List-I	List-II
A. h(Planck's constant)	1. $[MLT^{-1}]$
B. E (kinetic energy)	2. $[ML^2T^{-1}]$
C. V (electric potential)	3. $[ML^2T^{-2}]$
D. P (linear momentum)	4. $[ML^2I^{-1}T^{-3}]$

Choose the correct answer from the options given below.

	A	B	C	D		A	B	C	D
(a)	3	4	2	1	(b)	2	3	4	1
(c)	1	2	4	3	(d)	3	2	4	1

JEE Main-25.02.2021, Shift-I

Ans. (b) :

List-I	List-II
A. (Planck's constant)h	2. $[ML^2T^{-1}]$
B. (Kinetic energy)E	3. $[ML^2T^{-2}]$
C. (electric potential)v	4. $[ML^2T^{-3}I^{-1}]$
D. (linear momentum)p	1. $[MLT^{-1}]$

164. The time dependence of a physical quantity p is given by $P = P_0\, e^{-\alpha t^2}$, where a is a constant and t is the time. The constant "a"

(a) is dimensionless
(b) has dimensions $[T^{-2}]$
(c) has dimensions $[T^2]$
(d) has dimensions of p

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Ans. (b) : $p = p_0\, e^{-\alpha t^2}$

$[at^2] = [M^0L^0T^0]$

$[a] = \frac{1}{[t^2]}$

$[a] = [t^{-2}] = [T^{-2}]$

165. Consider an expression $QV = KPTL^\alpha$ where V,P,T,L are volume, pressure, time and length respectively. The quantity [Q] has dimension $[ML^{-1}T^{-1}]$. K is dimensionless constant. The value of integer α is:

(a) 2 (b) –2
(c) 3 (d) –1

TS EAMCET 05.08.2021, Shift-I

Ans. (c) :
Consider an expression, $QV = KPTL^\alpha$ ...(i)
Where V = volume, P = Pressure, T = Time, L = Length
Given, the dimension of
$[Q] = [ML^{-1}T^{-1}]$
K = dimensionless constant
Find value of integer α.

By eq. (i), $Q = \frac{KPTL^\alpha}{V}$

$\because P = \frac{F}{A}$, then dimension of $[P] = \frac{[MLT^{-2}]}{[L^2]}$
$= [ML^{-1}T^{-2}]$

$[Q] = K\frac{[P][T][L^\alpha]}{[V]}$

$= \frac{[ML^{-1}T^{-2}][T][L^\alpha]}{[L^3]}$ Given that $\{\because [Q] = [ML^{-1}T^{-1}]\}$

$ML^{-1}T^{-1} = ML^{-1-3+\alpha}\,T^{-2+1}$
$ML^{-1}T^{-1} = ML^{-4+\alpha}\,T^{-1}$
So, $L^{-1} = L^{-4+\alpha}$
then, $-1 = -4 + \alpha$ $\{\therefore \text{base same, power same}\}$
$\alpha = -1 + 4$
$\alpha = 3$

166. If ε_0 and μ_0 represent of permittivity and permeability of free space respectively. Then the dimension of the product $\varepsilon_0\,\mu_0$ is:

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

TS EAMCET 05.08.2021, Shift-II

Ans. (a) : Dimension of $\varepsilon_0 = [M^{-1}L^{-3}T^4A^2]$

Dimension of $\mu_0 = [MLT^{-2}A^{-2}]$

Then, dimension of $\varepsilon_0\mu_0$ = dimension of ε_0 × dimension of μ_0

$= [M^{-1}L^{-3}T^4A^2] \times [MLT^{-2}A^{-2}]$

$= [M^{-1+1}L^{-3+1}T^{4-2}A^{2-2}] = [M^0L^{-2}T^2]$

Dimension of $\varepsilon_0\mu_0 = [M^0L^{-2}T^2]$

167. The dimensions of σb^4 where 'σ' is Stefan's constant and 'b' is Wien's constant are

(a) $[M^0L^0T^0]$ (b) $[ML^4T^{-3}]$
(c) $[ML^{-2}T]$ (d) $[ML^6T^{-3}]$

TS EAMCET 04.08.2021, Shift-I

Ans. (b) : $\lambda_m T = b$

$\therefore \quad b^4 = \lambda_m^4 T^4$

$\frac{\text{Energy}}{\text{Area} \times \text{Time}} = \sigma T^4$

$\Rightarrow \quad \sigma = \frac{\text{Energy}}{(\text{Area} \times \text{Time})T^4}$

$\therefore \quad \sigma b^4 = \left[\frac{\text{Energy}}{(\text{Area} \times \text{Time})T^4}\right]\lambda_m^4 T^4$

$= \frac{[ML^2T^{-2}]}{[L^2]\times[T]} \times [L^4] = \frac{[ML^{(2+4)}T^{-2-1}]}{[L^2]}$

$= [ML^{6-2}T^{-3}]$

$\sigma b^4 = [ML^4T^{-3}]$

168. If momentum (P), area (A) and time (T) are taken to be the fundamental quantities then the dimensional formula for power is

(a) $\left[P^{\frac{1}{2}}AT^{-1}\right]$ (b) $\left[P^2AT^{-2}\right]$

(c) $\left[PA^{\frac{1}{2}}T^{-2}\right]$ (d) $\left[PA^{-1}T^{-2}\right]$

TS EAMCET (Medical) 09.08.2021, Shift-I

Ans. (c) : From the dimensional relations:

Power = $k P^a A^b T^c$

Substituting the dimensions of the quantities,

$[ML^2T^{-3}] = [ML^1T^{-1}]^a[L^2]^b[T]^c$

$= [M^aL^{a+2b}T^{-a+c}]$

Comparing the dimensions:-

$a = 1, \quad a + 2b = 2, -a + c = -3$

On solving the equations,

$a = 1, \quad b = \frac{1}{2}, \quad c = -2$

So, Power can be represented as:–

Power $= \left[PA^{1/2}T^{-2}\right]$

169. Which quantity among the following has neither units nor dimensions?

(a) Relative velocity (b) Relative density

(c) Angle (d) Energy

AP EAMCET-25.08.2021, Shift-II

Ans. (b) : Relative density is the ratio of two like quantities. Therefore, it has neither unit nor dimensions.

170. Dimensions of $\epsilon_0 \frac{d\phi_\epsilon}{dt}$ are same as that of (symbols have their usual meanings) ______

(a) Potential (b) Current

(c) Charge (d) Capacitance

AP EAMCET-03.09.2021, Shift-I

Ans. (b) : Dimensions of $\epsilon_o \frac{d\phi_E}{dt}$ are same as that of current,

$i = \epsilon_o \frac{d\phi_E}{dt} \quad \left[\because \phi = \frac{q}{\epsilon_o}\right]$

$= \frac{\epsilon_o \frac{q}{\epsilon_o}}{[T]}$

$= \frac{[AT]}{[T]}$

$= [A]$

Hence, A is unit of current.

171. If the energy $E = G^p h^q c^r$, where 'G' is the universal gravitational constant, 'c' is the velocity of light in vacuum and 'h' is Planck's constant. The values of p,q & r are respectively ______

(a) $\frac{-1}{2}, \frac{1}{2} \& \frac{5}{2}$ (b) $\frac{1}{2}, \frac{-1}{2} \& \frac{-5}{2}$

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

AP EAMCET-06.09.2021, Shift-I

Ans. (a) : The given energy formula,

$E = G^p h^q c^r$

Writing the dimensions of every quantity,

$[ML^2T^{-2}] = [M^{-1}L^3T^{-2}]^p [ML^2T^{-1}]^q [LT^{-1}]^r$

$[ML^2T^{-2}] = [M^{-p+q} L^{3p+2q+r} T^{-2p-q-r}]$

Applying the principle of homogeneity, we get

$-p + q = 1$ ...(i)

$3p + 2q + r = 2$ ...(ii)

$-2p - q - r = -2$ ...(iii)

Adding (ii) and (iii)

$p + q = 0$ ...(iv)

solving (i) and (iv)

$q = 1/2$

from (i), $p = -1/2$

put the value of p and q in equation (ii)

$r = 5/2$

172. If E and G respectively denote energy and gravitational constant. Then $\frac{E}{G}$ has the dimensions of

(a) $[M^2] [L^{-1}] [T^0]$ (b) $[M] [L^{-1}] [T^{-1}]$

(c) $[M] [L^0] [T^0]$ (d) $[M^2] [L^{-2}] [T^{-1}]$

[NEET 2021]

Ans. (a)

Energy (E) = $\frac{1}{2}mv^2$

Dimension of E = $[ML^2T^{-2}]$

and gravitational constant (G) = $\frac{Fr^2}{m_1m_2}$

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

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

Now,

Dimension of $\frac{E}{G} = \frac{[ML^2T^{-2}]}{[M^{-1}L^3T^{-2}]}$

$$\frac{E}{G} = [M^2L^{-1}T^0]$$

173. If E and E_0 represent the energies, t and t_0 represent the times, then which of the following is dimensionally correct relation?

(a) $E = E_0e^{-t}$ (b) $E = E_0t_0 e^{-t/t_0}$

(c) $E = E_0t_0e^{-t^2}$ (d) $E = E_0e^{-t/t_0}$

TS-EAMCET-09.09.2020, Shift-1

Ans. (d): If E and E_0 represent the energies, t and t_0 represent the times, then the relation is

$$E = E_0e^{-t/t_0}$$

174. The dimension of angular momentum in mass (M), length (L) and time (T) is

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

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

TS-EAMCET.11.09.2020, Shift-2

Ans. (c) : We know that,

Angular momentum = Angular velocity × Moment of Inertia

Dimension of angular momentum $= [T^{-1}][ML^2]$

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

175. The dimension of $\frac{E^2}{\mu_0}$ in mass (M), length (L) and time (T) is (E = electric field, μ_0 = permeability of free space)

(a) $[M^2L^3T^{-2}A^2]$ (b) $[MLT^{-4}]$

(c) $[ML^3T^{-2}]$ (d) $[ML^4T^{-4}]$

TS-EAMCET-14.09.2020, Shift-1

Ans. (b) : Dimension of electric field (E) = $[MLT^{-3}I^{-1}]$

Dimension of Permeability (μ_0) = $[MLT^{-2}I^{-2}]$

So,

Dimension of $\frac{E^2}{\mu_0} = \frac{[MLT^{-3}I^{-1}]^2}{[MLT^{-2}I^{-2}]} = \frac{[M^2L^2T^{-6}I^{-2}]}{[MLT^{-2}I^{-2}]}$

$= [MLT^{-4}]$

176. Due to an explosion underneath water, a bubble started oscillating. If this oscillation has time period T, which is proportional to $P^\alpha S^\beta E^\gamma$, where P is static pressure, S is density of water and E is total energy of explosion. Determine α, β and γ.

(a) $\alpha = -\frac{3}{2}, \beta = \frac{1}{3}, \gamma = -\frac{5}{6}$

(b) $\alpha = -\frac{5}{6}, \beta = \frac{1}{2}, \gamma = \frac{1}{3}$

(c) $\alpha = \frac{1}{2}, \beta = -\frac{5}{6}, \gamma = \frac{7}{4}$

(d) $\alpha = \frac{1}{3}, \beta = \frac{3}{2}, \gamma = \frac{4}{3}$

TS-EAMCET-10.09.2020, Shift-1

Ans. (b) : Given,

$T \propto P^\alpha S^\beta E^\gamma$

$T = k P^\alpha S^\beta E^\gamma$ ($\because k = \text{Constant}$)

Using dimensional balance method.

$[M^0L^0T^1] = [M^1L^{-1}T^{-2}]^\alpha [ML^{-3}T^0]^\beta [M^1L^2T^{-2}]^\gamma$

$[M^0L^0T^1] = [M^{\alpha+\beta+\gamma}L^{-\alpha-3\beta+2\gamma}T^{-2\alpha-2\gamma}]$

Comparison of power in both side

$\alpha + \beta + \gamma = 0$ ... (i)

$-\alpha - 3\beta + 2\gamma = 0$ …(ii)

$-2\alpha - 2\gamma = 1, \alpha + \gamma = \frac{-1}{2}$ …(iii)

From equation (i), (ii) and (iii) we get,

$\alpha = \frac{-5}{6}, \beta = \frac{1}{2}, \gamma = \frac{1}{3}$

177. A quantity f is given by $f = \sqrt{hc^5/G}$, where c is speed of light, G universal gravitational constant and h is the Planck's constant. Dimension of f is that of

(a) area (b) volume

(c) momentum (d) energy

JEE Main-09.01.2020, Shift-I

Ans. (d) : Given,

Speed of light (c) = $[LT^{-1}]$

Gravitational constant (G) = $[M^{-1}L^3T^{-2}]$

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

$$[F] = \sqrt{\frac{hc^5}{G}}$$

$$[F] = \sqrt{\frac{[ML^2T^{-1}][L^1T^{-1}]^5}{[M^{-1}L^3T^{-2}]}} \Rightarrow [F] = \sqrt{\frac{[ML^2T^{-1}][L^5T^{-5}]}{[M^{-1}L^3T^{-2}]}}$$

$$[F] = \sqrt{[M^2L^4T^{-4}]} \Rightarrow [F] = [ML^2T^{-2}]$$

178. Dimensional formula for thermal conductivity is (Here, K denotes the temperature)

(a) $[MLT^{-2}K]$ (b) $[MLT^{-2}K^{-2}]$

(c) $[MLT^{-3}K^{-1}]$ (d) $[MLT^{-3}K]$

JEE Main-04.09.2020, Shift-I

Ans. (c) : Thermal conductivity, we can find the dimension formula using the equation.

$$\frac{\Delta Q}{\Delta t} = -KA\frac{\Delta T}{\Delta x}$$

Therefore, the dimension of thermal conductivity

$$K = \frac{-\Delta Q.\Delta x}{\Delta t.\Delta T} \times \frac{1}{A}$$

$$= \frac{\text{energy}}{\text{time}} \cdot \frac{\text{length}}{\text{temperature}} \times \frac{1}{\text{Area}}$$

$$= \frac{[ML^2T^{-2}]}{[T]} \times \frac{[L]}{[K]} \times \frac{1}{[L^2]} = \frac{[ML^3T^{-2}]}{[TK.L^2]}$$

$$= [MLT^{-3}K^{-1}]$$

179. The physical quantities that have the same dimension are

(a) Couple of force and work
(b) Force and power
(c) Latent heat and specific
(d) Work and power

AP EAMCET-07.10.2020, Shift-I

Ans. (a) : The dimension of couple of force is $[ML^2T^{-2}]$.
The dimension of Work is $[ML^2T^{-2}]$.
The dimension of Force is $[M^1L^1T^{-2}]$.
The dimension of Power is $[M^1L^2T^3]$.
The dimension of Latent heat is $[M^0L^2T^{-2}]$.
The dimension of specific heat is $[M^0L^2T^{-2}K^{-1}]$.
So, the physical quantities that have the same dimension are 'couple of force and work'.

180. A quantity x is given by $x = \frac{IFv^2}{WL^4}$ where, I is moment of inertia, F is force, v is velocity, w is work and L is length. The dimensional formula for x is same as that of

(a) Planck's constant
(b) force constant
(c) coefficient of viscosity
(d) energy density

JEE Main-04.09.2020, Shift-II

Ans. (d) : Given,

$$x = \frac{IFv^2}{WL^4}$$

$$[x] = \frac{[ML^2] \times [MLT^{-2}] \times [L^2T^{-2}]}{[ML^2T^{-2}][L^4]}$$

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

$$\text{Energy density} = \frac{\text{Energy}}{\text{Volume}} = \frac{[ML^2T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$$

So, dimensional formula of x is same as energy density.

181. The quantities $x = \frac{1}{\sqrt{\mu_o \varepsilon_o}}, y = \frac{E}{B}$ and $z = \frac{L}{CR}$ are defined, where C is capacitance, R is resistance, L is length, E is electric field, B is magnetic field, ε_0 is free space permittivity and μ_0 is permeability, respectively. Then,

(a) x, y and z have the same dimension
(b) Only x and z have the same dimension
(c) Only x and y have the same dimension
(d) Only y and z have the same dimension

JEE Main-05.09.2020, Shift-II

Ans. (a) : x, y and z have same dimension.
We know,

$$x = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = [LT^{-1}]$$

$$y = \frac{E}{B} = [LT^{-1}]$$

$$z = \frac{L}{CR} = [LT^{-1}]$$

So, x, y, z have same dimension.

182. The dimension of $\frac{B^2}{2\mu_o}$, where B is magnetic field and μ_0 is the magnetic permeability of vacuum, is

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

JEE Main-07.01.2020, Shift-II

Ans. (a) : We know,

$$\text{Energy density} = \frac{B^2}{2\mu_0}$$

$$\text{Energy density} = \frac{\text{Energy}}{\text{Volume}}$$

$$E = \frac{\text{Force} \times \text{Displacement}}{(\text{Dimension})^3}$$

Dimensional formula of energy density,

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

183. 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

(a) $[h^{-2/3}c^{-1/3}G^{4/3}A^{-1}]$
(b) $[h^0G^{-1}c^5A^{-1}]$
(c) $[h^2G^{3/2}c^{1/3}A^{-1}]$
(d) $[h^{2/3}c^{5/3}G^{1/3}A^{-1}]$

JEE Main-08.01.2020, Shift-I

Ans. (b) : We know,

$V_0 = [ML^2 T^{-3} A^{-1}]$, $h = [ML^2 T^{-1}]$,
$c = [L T^{-1}]$, $G = [M^{-1}L^3 T^{-2}]$, $I = [A]$

Then, dimensional formula of stopping potential is given as –

$V_0 = [h]^a [A]^b [G]^c [c]^d$ …….. (i)

$[ML^2 T^{-3} A^{-1}] = [ML^2 T^{-1}]^a [A]^b [M^{-1} L^3 T^{-2}]^c [LT^{-1}]^d$

$[ML^2 T^{-3} A^{-1}] = [M^{a-c} L^{2a+3c+d} T^{-a-2c-d} A^b]$

On comparing both side –

$a - c = 1$, $2a + 3c + d = 2$, $-a - 2c - d = -3$, $b = -1$

Solving the above equations, we get –

$a = 0$, $b = -1$, $c = -1$, $d = 5$

Putting the value of a, b, c, d in equation (i)–

Hence, $[V_0] = [K h^0 c^5 G^{-1} A^{-1}]$; K = 1

184. If momentum P, area A and time T are taken to be the fundamental quantities, then the dimensional formula for energy is

(a) $\left[P^2AT^{-2}\right]$ (b) $\left[PA^{-1}T^{-2}\right]$

(c) $\left[PA^{1/2}T^{-1}\right]$ (d) $\left[P^{1/2}AT^{-1}\right]$

JEE Main-02.09.2020, Shift-II

Ans. (c) : According the question energy is represented as –

$$E=[P]^a[A]^b[T]^c \text{ ...... (i)}$$

Dimensional formula of parameters given in the equation (i)

$$P=\left[MLT^{-1}\right], A=\left[L^2\right], T=[T], E=\left[ML^2T^{-2}\right]$$

Putting the above value in equation (i)

$$\left[ML^2T^{-2}\right]=\left[MLT^{-1}\right]^a\left[L^2\right]^b[T]^c$$

$$\left[ML^2T^{-2}\right]=\left[M^aL^{a+2b}T^{c-a}\right]$$

On comparing both side –

a = 1, a + 2b = 2, c – a = –2

Solving the above equation we get –

a = 1, b = ½, c = –1

Putting the value of a, b, c in equation (i)

$$[E]=[P]^1[A]^{1/2}[T]^{-1}$$

$$[E]=\left[P^1A^{1/2}T^{-1}\right]$$

185. Amount of solar energy received on the earth's surface per unit area per unit time is defined as solar constant. Dimensional formula of solar constant is

(a) $\left[MLT^{-2}\right]$ (b) $\left[ML^0T^{-3}\right]$

(c) $\left[M^2L^0T^{-1}\right]$ (d) $\left[ML^2T^{-2}\right]$

JEE Main-03.09.2020, Shift-II

Ans. (b) : According to question solar constant (K) is defined as amount of solar energy received on earth surface per unit area per unit time.

So,

$$\text{Solar constant (K)} = \frac{\text{Energy}}{\text{Area}\times\text{time}}$$

Dimensional formula of energy = $[ML^2T^{-2}]$

Dimensional formula of area = $[L^2]$

Dimensional formula of time = $[T]$

$$\text{Dimension of solar constant, } K=\frac{\left[ML^2T^{-2}\right]}{\left[L^2\right][T]}$$

$$K=[MT^{-3}]$$

$\therefore$ Dimensional formula of solar constant = $[ML^0T^{-3}]$

186. Which among the following has dimension of charge?

(a) $\varepsilon_0\, E/ds$ (b) $\varepsilon_0\, E.ds$

(c) $\frac{\mu_0}{\varepsilon_0}E.ds$ (d) $\frac{\varepsilon_0}{\mu_0}E.ds$

AP EAMCET (23.09.2020) Shift-I

Ans. (b) :

Gauss's Law $\phi_E=\frac{Q}{\varepsilon_o}$

Where, Q = Total charge

ε_0 = Electric constant

ϕ_ε = Electric flux

$$Eds=\frac{Q}{\varepsilon_o}$$

$$[Q]=[\varepsilon_oE.ds]$$

187. The dimensional formula of Polarization P is _____.

(a) $[L^{-2}A^{-1}T^1]$ (b) $[M^1L^{-2}T^1]$

(c) $[L^2A^{-1}T^1]$ (d) $[L^{-2}A^1T^1]$

GUJCET 2020

Ans. (d) : Polarization= $\frac{\text{Dipole moment}}{\text{Volume}}$

Dimension of polarization

$$=\left[\frac{qd}{L^3}\right](\text{dipole moment}=qd)$$

$$=\left[L^{-2}T^1A^1\right]$$

188. Suppose refractive index μ is given as $\mu = A + \frac{B}{\lambda^2}$ where A and B are constants and λ is wavelength, then dimension of B are same as that of

(a) Wavelength (b) volume

(c) Pressure (d) area

COMEDK 2020

Ans. (d) : As refractive index,

$$(\mu)=\frac{\text{velocity of light in vaccum}(c)}{\text{velocity of light in medium}}$$

Since, refractive index is ratio of velocity so it is dimension less quantity.

$$\mu=A+\frac{B}{\lambda^2}$$

So, dimensionally μ, A , and $\frac{B}{\lambda^2}$ are same,

$$[\mu]=[A]=\frac{[B]}{\left[\lambda^2\right]}$$

$$\frac{[B]}{\left[\lambda^2\right]}=\left[M^0L^0T^0\right]$$

$$[B]=\left[\lambda^2\right]=\left[L^2\right] \quad (\because \lambda = \text{wavelength in meter})$$

Dimension of [B] is equal to $[\lambda^2]$ i.e. $[L^2]$ which represent the dimension of area.

189. Let 'σ' and 'b' be Stefan's constant and Wien's constant respectively, then dimensions of 'σb' are

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

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

MHT-CET 2020

Ans. (d) : Here, σ = Stefan constant
b = Wien's constant
Dimensions of [σ × b]
We know that,

$$\sigma = \frac{E}{T^4} = \frac{Q}{AtT^4} = \frac{ML^2T^{-2}}{L^2TK^4} = [MT^{-3}K^{-4}]$$

E = Heat energy per unit area per unit time.
From Wien's law–

$$\lambda = \frac{b}{T}$$

b = λ.T = [L.K]
Dimensions of [σ × b]
$= [MT^{-3}K^{-4} \times LK]$
$= [MLT^{-3}K^{-3}]$

190. Which of the following expression has a dimensional formula different from others?

(a) $\frac{1}{2}\epsilon_0 E^2$ f(ϵ_0 permitivity of free space, E: electric field)
(b) hv (h: Plancks constant, v: frequency)
(c) ρgh (ρ: density, g: acceleration due to gravity, h: height)
(d) $\frac{1}{2}\rho v^2$ (ρ: density, v: velocity)

UPSEE 2020

Ans. (b) :
(a) $\frac{1}{2}\epsilon_0 E^2 = \frac{\text{Energy}}{\text{Volume}}$
Dimension of $\frac{1}{2}\epsilon_0 E^2 = \frac{[ML^2T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$
(b) h*v* = Energy of photon
Dimension of h*v* = ML^2T^{-2}
(c) Dimension of ρgh = $[ML^{-3}]$ $[LT^{-2}]$ [L] = $ML^{-1}T^{-2}$
(d) Dimension of $\frac{1}{2}\rho v^2 = [ML^{-3}][LT^{-1}]^2$
$= [ML^{-1}T^{-2}]$
So, dimension of $\frac{1}{2}\epsilon_0 E$, ρgh and $\frac{1}{2}\rho v^2$ same
But h*v* has different dimensional formula.

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

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

JEE Main-11.01.2019, Shift-I

Ans. (c) : $[M^2LT^{-4}]$
We know,

$$F = \alpha\beta \exp\left(\frac{-x^2}{\alpha KT}\right)$$

In expression, there will be dimensionless.

$$\frac{[L^2]}{\alpha \times [ML^2T^{-2}\theta^{-1}] \times [\theta]} = [M^0L^0T^0]$$

$$= \frac{[L^2]}{\alpha \times [ML^2T^{-2}]} = [M^0L^0T^0]$$

$$\alpha = [M^{-1}T^{+2}]$$

Now,
F = αβ
$[MLT^{-2}] = [M^{-1}T^2] \times [\beta]$
$\beta = [M^2LT^{-4}]$

192. Which of the following combinations has the dimension of electrical resistance (ε_o is the permittivity of vacuum and μ_0 is the permeability of vacuum) ?

(a) $\sqrt{\frac{\mu_o}{\varepsilon_o}}$
(b) $\frac{\mu_o}{\varepsilon_o}$
(c) $\sqrt{\frac{\varepsilon_o}{\mu_o}}$
(d) $\frac{\varepsilon_o}{\mu_o}$

JEE Main-12.04.2019, Shift-I

Ans. (a) : We know that,

$$V = IR \Rightarrow R = \frac{V}{I} = \frac{W/q}{I} = \frac{W}{qI}$$

Where, V = Voltage, I = current, R = resistance
W = workdone, q = charge

$$R = \frac{[ML^2T^{-2}]}{[A^2][T]} = [ML^2T^{-3}A^{-2}]$$

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2} = \varepsilon_0 = \frac{q_1q_2}{4\pi r^2F}$$

$$= \frac{I^2t^2}{[L^2][MLT^{-2}]} = \frac{[A^2][T^{-2}]}{[L^2][MLT^{-2}]}$$

$$\varepsilon_0 = [M^{-1}L^{-3}T^4A^2] \quad ...(1)$$

$$c^2 = \frac{1}{\mu_0\varepsilon_0} \Rightarrow \mu_0 = \frac{1}{c^2\varepsilon_0}$$

$$\mu_0 = \frac{1}{[L^2T^{-2}][M^{-1}L^{-3}T^4A^2]}$$

$$\mu_0 = [M^1L^1T^{-2}A^{-2}] \quad ...(2)$$

From eq^n (i) & eq^n (ii)

$$\frac{\varepsilon_0}{\mu_0} = \frac{[M^{-1}L^{-3}T^4A^2]}{[M^1L^1T^{-2}A^{-2}]} = [M^{-2}L^{-4}T^6A^4]$$

$$\frac{\varepsilon_0}{\mu_0} = [M^2L^4T^{-6}A^{-4}] \Rightarrow \sqrt{\frac{\mu_0}{\varepsilon_0}} = [ML^2T^{-3}A^{-2}]$$

So, option (a) is correct.

193. In SI units, the dimensions of $\sqrt{\frac{\varepsilon_o}{\mu_o}}$ is

(a) $\left[A^{-1}TML^3\right]$ (b) $\left[AT^2M^{-1}L^{-1}\right]$

(c) $\left[AT^{-3}ML^{3/2}\right]$ (d) $\left[A^2T^3M^{-1}L^{-2}\right]$

JEE Main-08.04.2019, Shift-I

Ans. (d) : We know that,

$$\varepsilon_0 = \frac{q^2}{Fr^2} = \frac{I^2t^2}{Fr^2} = \frac{[A^2.T^2]}{[MLT^{-2}L^2]}$$
$$= [M^{-1}L^{-3}T^4A^2]$$
$$\mu_0 = \frac{1}{c^2\varepsilon_0} = \frac{1}{[L^2T^{-2}][M^{-1}L^{-3}T^4A^2]}$$
$$\mu_0 = [MLT^{-2}A^{-2}]$$
$$\text{The dimension of} = \sqrt{\frac{\varepsilon_0}{\mu_0}} = \sqrt{\frac{[M^{-1}L^{-3}T^4A^2]}{[MLT^{-2}A^{-2}]}}$$
$$= \sqrt{[M^{-2}L^{-4}T^6A^4]}$$
$$= [M^{-1}L^{-2}T^3A^2]$$

194. The expression for the force is given by $b + \frac{c}{t^3}$ where 'b' and 'c' are some physical quantities and 't' is the time. Then the dimensions of 'c' are

(a) $[M^0LT]$ (b) $[MLT^{-1}]$

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

TS EAMCET 08.05.2019, Shift-I

Ans. (d) :

Force = mass × acceleration

Or F = ma

$$F = b + \frac{c}{t^3}$$

$\because$ $F = [MLT^{-2}]$

The dimension of c are

$$F = \frac{c}{t^3}$$
$$c = F \times t^3$$
$$c = [MLT^{-2}] \times \left[T^3\right]$$
$$c = \left[MLT^1\right]$$
$$c = [MLT]$$

195. In form of G (universal gravitational constant), h (Planck constant) and c (speed of light), the time period will be proportional to

(a) $\sqrt{\frac{Gh}{c^5}}$ (b) $\sqrt{\frac{hc^5}{G}}$

(c) $\sqrt{\frac{c^3}{Gh}}$ (d) $\sqrt{\frac{Gh}{c^3}}$

JEE Main-09.01.2019, Shift-II

Ans. (a) : We know,

$$G = \frac{Fr^2}{m^2}, G = \left[M^{-1}L^3T^{-2}\right]$$
$$h = \left[ML^2T^{-1}\right], c = \left[LT^{-1}\right]$$

Now, time period is expressed as –

$$T = K\, G^x\, h^y\, c^z$$
$$[T] = [M^{-1}L^3T^{-2}]^x\, [ML^2T^{-1}]^y [LT^{-1}]^z$$
$$[M^0L^0T^1] = [M^{-x+y}L^{3x+2y+z}T^{-2x-y-z}]$$

Comparing the power in above equation,

$$-x + y = 0 \Rightarrow x = y$$
$$3x + 2y + z = 0 \Rightarrow 5x + z = 0$$
$$-2x - y - z = 1 \Rightarrow 3x + z = -1$$

On solving the above equation, we get–

$$x = \frac{1}{2}, y = \frac{1}{2}, z = \frac{-5}{2}$$
$$T = K\sqrt{\frac{Gh}{c^5}}$$

196. 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

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

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

JEE Main-08.04.2019, Shift-II

Ans. (c) : Dimensional formula of linear momentum is expressed as –

$$P = KS^a I^b h^c \quad \ldots\ldots\text{(i)}$$

Where, K = dimensionless constant

Putting the dimensional formula of given parameters in equation (i)–

$$[MLT^{-1}] = [MT^{-2}]^a [ML^2]^b [ML^2T^{-1}]^c$$
$$[MLT^{-1}] = [M^{a+b+c}\, L^{2b+2c}\, T^{-2a-c}]$$

On comparing both side –

$$a + b + c = 1,\ 2b + 2c = 1,\ -2a - c = -1$$

Solving the above equation we get,

$$a = \frac{1}{2}, b = \frac{1}{2}, c = 0$$

Putting the value of a, b, c in equation (i)–

$$P = K\, S^{1/2}\, I^{1/2}\, h^0$$

197. 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?

(a) $\left[M^{-1}L^{-2}T^4A^2\right]$

(b) $\left[M^{-2}L^0T^{-4}A^{-2}\right]$

(c) $\left[M^{-3}L^{-2}T^8A^4\right]$

(d) $\left[M^{-2}L^{-2}T^6A^3\right]$

JEE Main-10.04.2019, Shift-II

Ans. (c) : Given,

$X = 5YZ^2$

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

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

Now,

$$Y = \frac{X}{5Z^2}$$

$$Y = \frac{[M^{-1}L^{-2}T^4A^2]}{5[M^1T^{-2}A^{-1}]^2}$$

$$Y = [M^{-3}L^{-2}T^8A^4]$$

198. P, Q, R and S denote energy, mass, angular momentum and gravitational constant respectively, the quantity $\left[\frac{Q^5S^2}{PR^2}\right]$ has the dimensions of

(a) Mass (b) Length

(c) Time (d) Angle

AP EAMCET (Medical)-24.04.2019, Shift-I

Ans. (d) : Given,

Let quantity is x

So, $x = \left[\frac{Q^5S^2}{PR^2}\right]$ ....(i)

Where, $P \rightarrow$ energy

$Q \rightarrow$ mass

$R \rightarrow$ angular momentum

$S \rightarrow$ Gravitational constant

Dimension of ,

Energy $[P] = [ML^2T^{-2}]$

Mass $[Q] = [M]$

Angular momentum $[R] = [ML^2T^{-1}]$

Gravitational constant $[S] = [M^{-1}L^3T^{-2}]$

Substituting dimension of each quantity in equation (1)

$$[x] = \frac{[M]^5[M^{-1}L^3T^{-2}]^2}{[ML^2T^{-2}][ML^2T^{-1}]^2}$$

$$= \frac{M^3L^6T^{-4}}{M^3L^6T^{-4}} = [M^0L^0T^0]$$

Angle is dimension less quantity

So, dimension formula of angle = $[M^0L^0T^0]$

199. If R, L, C, F, v, q, I and t represent resistance, inductance, capacitance, force, velocity. electric charge, electric current and time respectively, then which of the following will have same dimensions?

(A) $[I^2 R]$ (B) $\left[\frac{L}{Rt}\right]$

(C) $\left[\frac{q^2}{RC^2}\right]$ (D) $\left[\frac{Fv}{t}\right]$

(a) A & B (b) A & C

(c) B & D (d) A & D

AP EAMCET-23.04.2019, Shift-II

Ans. (b) :

(A) $I^2R = I^2 \times \frac{V}{I}$ $\left(\because R = \frac{V}{I}\right)$

$= V \times I$

$[I^2R] = [ML^2T^{-3}A^{-1}][A] = [ML^2T^{-3}]$

(B) $\frac{L}{Rt}$

We have formula for inductance is

$$L = \frac{V}{\frac{dI}{dt}}$$

$$[L] = \frac{[ML^2T^{-3}A^{-1}]}{[AT^{-1}]} = [ML^2T^{-2}A^{-2}]$$

$$\left[\frac{L}{Rt}\right] = \frac{[ML^2T^{-2}A^{-2}]}{[ML^2A^{-2}T^{-3}][T]}$$

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

(C) $\frac{q^2}{RC^2}$

$$\left[\frac{q^2}{RC^2}\right] = \frac{[T^2A^2]}{[ML^2A^{-2}T^{-3}][M^{-1}L^{-2}T^4A^2]^2}$$

$= [ML^2T^{-3}]$

(D) $\frac{Fv}{t}$

$$\left[\frac{Fv}{t}\right] = \frac{[M^1L^1T^{-2}][LT^{-1}]}{[T]} = [ML^2T^{-4}]$$

So, A & C have same dimension.

200. If the velocity of light (C), gravitational constant (G) and Plank's constant (h) are chosen as fundamental units, the dimensions of time will be

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

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

Assam CEE-2019

Ans. (d) : $T \propto C^xG^y h^z$ ……(i)

Dimension of

time [t] = [T]

light $[C] = [LT^{-1}]$

Gravitational constant $[G] = [M^{-1}L^3T^2]$

Plack constant $[h] = [ML^2T^{-1}]$

Putting value of each dimension in equation (i)

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

$[M^0L^0T^1] \propto [M^{-y+z} L^{x+3y+2z} T^{-x-2y-z}]$

On comparing both side we get

$-y + z = 0$ ….. (ii)

$x+3y+2z = 0$ ….. (iii)

$-x-2y-z = 1$ ….. (iv)

On solving equation (ii), (iii), (iv), we get

$$x = \frac{-3}{2},\ y = \frac{1}{2},\ z = \frac{1}{2}$$

Putting the value of x, y and z in equation (i), we get

$T \propto C^{-3/2}\, G^{1/2}\, h^{1/2}$

201. The dimensional formula of modulus of elasticity and its unit are

(a) $[ML^{-1}T^{-2}]$ and Pascal
(b) $[ML^{-2}T^{-1}]$ and Pascal
(c) $[ML^{-1}T^{-2}]$ and Poise
(d) $[ML^{-2}T^{-1}]$ and Poise

Assam CEE-2019

Ans. (a) :

Modulus of elasticity = $\dfrac{\text{stress}}{\text{strain}}$

Stress $= \dfrac{F}{A} = [ML^{-1}T^{-2}]$

Strain is dimensionless

∴ Modulus of elasticity= $[ML^{-1}T^{-2}]$

Unit = $\dfrac{F}{A}$ = Pascal

202. The dimensional formula for pressure gradient of a liquid flowing in a tube is

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

AMU-2019

Ans. (d) : Since we know that pressure gradient is given as-

Pressure gradient $= \dfrac{\Delta P}{\Delta h}$

unit of presser gradient $= \dfrac{N}{m^2} \times \dfrac{1}{m} = \dfrac{N}{m^3}$

Dimensional formula of pressure gradient $= \dfrac{[MLT^{-2}]}{[L^3]}$

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

Hence, option (d) is correct.

203. Consider a spongy block of mass m floating on a flowing river. The maximum mass of the block is related to the speed of the river flow v, acceleration due to gravity g and the density of the block ρ such that $m_{max} = kv^xg^y\rho^z$ (k is constant). The values of *x,* y and z should then respectively be (Mass of the spongy block is assumed to vary due to absorption of water by it)

(a) 6, 3, 2
(b) 6, –3, 1
(c) 3, 6, 1
(d) 6, 1, 3

TS-EAMCET-06.05.2019, Shift-1

Ans. (b) : The maximum mass of the block floating on river depends, speed of flow of the river (v) acceleration due to gravity (g) and density of the block (ρ)

So,

$m_{max} = kv^x g^y \rho^z$

Write the dimensional formula in both sides.

$[M^1L^0T^0] = [LT^{-1}]^x [LT^{-2}]^y [ML^{-3}]^z$

$[M^1L^0T^0] = M^zL^{x+y-3z}T^{-x-2y}$

Comparing the power we get,

$z = 1$ ...(i)

$x + y - 3z = 0$

$x + y - 3 \times 1 = 0$

$x + y = 3$ ...(ii)

$-x - 2y = 0$

$x = -2y$ ...(iii)

from equation (ii) and (iii) we get–

$y = -3, x = 6$

Then, the value of x, y and z will be

(6, –3, 1)

204. Match the physical quantities given in List-1 with dimensions in List-II.

List I	List II
(a) Gravitational potential	(i) $[M^0L^2T^{-2}K^{-1}]$
(b) Stefan's constant	(ii) $[M^{-1}L^3T^{-2}]$
(c) Permittivity	(iii) $[ML^0T^{-3}K^{-4}]$
(d) Specific heat capacity	(iv) $[M^{-1}L^{-3}T^4I^2]$

(The dimension of mass, length, time, temperature and current are M, L, T, K and I, respectively). The correct match is

	A	B	C	D
(a)	IV	I	III	II
(b)	I	IV	II	III
(c)	III	II	I	IV
(d)	II	III	IV	I

TS-EAMCET-03.05.2019, Shift-2

Ans. (d) : Dimensions of the given physical quantities are as follows :

(A) Gravitational potential,

$= [m^3/kg.s^{-2}]$

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

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

(B) Stefan's constant $= (W/m^2K^4)$

$= [ML^2T^{-3}/L^2K^4]$

$= [ML^0T^{-3}K^{-4}]$

(C) Permittivity $= \dfrac{C^2}{N - m^2}$ (C^2s^2/m^3kg)

$= [M^{-1}L^{-3}T^4I^2]$

(D) Specific heat capacity $= (\text{Joule}/\text{kg.K})$

$= [ML^2T^{-2}/MK]$

$= [M^0L^2T^{-2}K^{-1}]$

So, the correct sequence of match is

A → II, B → III, C → IV and D → I.

205. If A represents density, B represents velocity, C represents specific heat capacity and D represents wavelength, then the quantity having the dimensions of product of A, B, C and D is

(a) Stefan's constant
(b) Boltzmann's constant
(c) Thermal conductivity
(d) Universal gas constant

AP EAMCET (22.04.2019) Shift-II

Ans. (c) : Given that,

$$A = \text{Density} = \left[ML^{-3}T^{0}\right]$$

$$B = \text{Velocity} = \left[M^{0}LT^{-1}\right]$$

$$C = \text{Specific heat capacity} = \left[M^{o}L^{2}T^{-2}K^{-1}\right]$$

$$D = \text{Wavelength} = \left[M^{o}LT^{o}\right]$$

According to question dimension of ABCD is

$$[k] = [A][B][C][D]$$

$$[k] = \left[ML^{-3}\right]\left[LT^{-1}\right]\left[L^{2}T^{-2}K^{-1}\right][L]$$

$$[k] = \left[ML^{-3+1+2+1}T^{-1-2}K^{-1}\right]$$

$$[k] = \left[MLT^{-3}K^{-1}\right]$$

Dimensional formula of each option are -

Thermal conductivity = $\left[MLT^{-3}K^{-1}\right]$

Universal gas constant $= \left[ML^{2}T^{-2}K^{-1}\right]$

Stefan's constant $= \left[ML^{o}T^{-3}K^{-4}\right]$

Boltzmann's Constant $= \left[ML^{2}T^{-2}K^{-1}\right]$

Hence, dimension formula of ABCD is same as dimension formula of thermal conductivity.

206. A physical quantity obtained from the ratio of the coefficient of thermal conductivity to the universal gravitational constant has a dimensional formula [M^{2a} L^{4b} T^{2c} K^{d}], then the value of $\frac{a+b}{c+b}$ - d is

(a) $+\frac{3}{2}$ (b) $-\frac{1}{2}$

(c) $-\frac{3}{2}$ (d) $+\frac{1}{2}$

AP EAMCET (20.04.2019) Shift-II

Ans. (d) : Given that,

$$\frac{\text{Dimension formula of}[K]}{\text{Dimension formula of}[G]} = \left[M^{2a}L^{4b}T^{2c}K^{d}\right]$$

$$\frac{\left[M^{1}L^{1}T^{-3}K^{-1}\right]}{\left[M^{-1}L^{3}T^{-2}\right]} = \left[M^{2a}L^{4b}T^{2c}K^{d}\right]$$

$$M^{2a}L^{4b}T^{2c}K^{d} = \left[M^{2}L^{-2}T^{-1}K^{-1}\right]$$

Comparing both side, we get –

$$2a = 2,\ 4b = -2,\ 2c = -1,\ d = -1$$

$$a = 1 \quad b = \frac{-1}{2} \quad c = \frac{-1}{2}, d = -1$$

According to the question the value of

$$\frac{a+b}{c+b} - d = \frac{1-\frac{1}{2}}{-\frac{1}{2}-\frac{1}{2}} - (-1) = \frac{1}{2}$$

207. If the charge of electron e, mass of electron m, speed of light in vacuum c and Planck's constant h are taken as fundamental quantities, then the permeability of vacuum μ_0 can be expressed as

(a) $\frac{h}{mc^2}$ (b) $\frac{hc}{me^2}$

(c) $\frac{h}{ce^2}$ (d) $\frac{mc^2}{he^2}$

AP EAMCET (20.04.2019) Shift-1

Ans. (c) : Dimension of permeability of vacuum μ_o

$$[\mu_o] = \left[MLT^{-2}A^{-2}\right]$$

Dimension charge (e) = [AT]

Dimension of mass of electron (m) = [M]

Dimension of speed of light (c) = $[LT^{-1}]$

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

According to question

$$\mu_o \propto e^{a}m^{b}c^{c}h^{d}$$

$$\mu_o = ke^{a}m^{b}c^{c}h^{d} \quad .....(i)$$

$$\mu_o = k[AT]^{a}[M]^{b}\left[LT^{-1}\right]^{c}\left[ML^{2}T^{-1}\right]^{d}$$

$$\mu_o = k[M]^{b+d}[L]^{c+2d}[T]^{a-c-d}[A]^{a}$$

$$\left[MLT^{-2}A^{-2}\right] = K[M]^{b+d}[L]^{c+2d}[T]^{a-c-d}[A]^{a}$$

Comparing both side, we get –

$c + 2d = 1$ ......(ii)

$b + d = 1$ .....(iii)

$a - c - d = -2$ .....(iv)

$a = -2$ ......(v)

Solving the equation a = –2, b = 0, c = –1, d = 1,

Putting value of a, b, c, d in equation (i)

$$\mu_o = ke^{a}m^{b}c^{c}h^{d}$$

$$\mu_o = ke^{-2}m^{0}c^{-1}h^{1}$$

$$\mu_o = \frac{kh}{ce^2}$$

$$\mu_o = \frac{h}{ce^2}$$

Hence option (c) is correct answer.

208. If A represents Boltzmann constant, B represents Planck's constant and C represents speed of light in vacuum, then the quantity having the dimensions of $A^4B^{-3}C^{-2}$ is

(a) Universal gas constant

(b) Specific heat capacity

(c) Stefan's constant

(d) Heat energy

AP EAMCET (20.04.2019) Shift-1

Ans. (c) : Dimension of Boltzmann's constant (A)

$$=\left[ML^2T^{-2}K^{-1}\right]$$

Dimension of Planck constant $(B)=\left[ML^2T^{-1}\right]$

Dimension of speed of light $(C)=\left[LT^{-1}\right]$

The dimension of $A^4B^{-3}C^{-2}$ is –

$$=\left[ML^2T^{-2}K^{-1}\right]^4\left[ML^2T^{-1}\right]^{-3}\left[LT^{-1}\right]^{-2}$$

$$=\left[M^4L^8T^{-8}K^{-4}\right]\left[M^{-3}L^{-6}T^{+3}\right]\left[L^{-2}T^{+2}\right]$$

$$=\left[M^{4-3}L^{8-6-2}T^{-8+3+2}K^{-4}\right]=\left[M^1L^0T^{-3}K^{-4}\right]$$

We know $\left[M^1L^0T^{-3}K^{-4}\right]$ is dimension formula of Stefan's constant.

209. The dimensional formula of $\sqrt{\mu_r \in_r}$ is ______.

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

GUJCET 2019

Ans. (c) : We know that,

$$v=\frac{c}{\sqrt{\mu_r\varepsilon_r}}$$

$$\sqrt{\mu_r\varepsilon_r}=\frac{c}{v}$$

$\frac{c}{v}$ is the ratio of velocity so it is dimensionless

So, the dimension of $\sqrt{\mu_r\varepsilon_r}$ is $M^oL^0T^0A^0$

210. The dimensional formula of jωL is ______. Take Q as the dimension of charge.

(a) $[M^{-1}L^2T^{-1}Q^{-2}]$ (b) $[M^1L^{-2}T^{-1}Q^{-2}]$
(c) $[M^1L^2T^{-1}Q^{-2}]$ (d) $[M^1L^2T^1Q^{-2}]$

GUJCET 2019

Ans. (c) : [jωL]
Where, j = Complex number
ω = angular frequency
L = inductance
$j\omega L = [M^0L^0T^0]\,[M^0L^0T^{-1}]\,[M^1L^2T^0Q^{-2}]$
Dimension of $j\omega L = [M^1L^2T^{-1}Q^{-2}]$

211. The dimensional formula of effective torsional constant of spring is ______.

(a) $[M^1L^2T^{-3}]$ (b) $[M^1L^2T^{-2}A^{-2}]$
(c) $[M^1L^2T^{-2}]$ (d) $[M^0L^0T^0]$

GUJCET 2019

Ans. (c) : $\tau = C\theta$
where,
C = torsional constant of spring
τ = restoring torque
θ = angle
Dimension of $\theta = [M^0L^0T^0]$

$$\tau = M^1L^2T^{-2}$$

$$C=\left[\frac{\tau}{\theta}\right]=\frac{[M^1L^2T^{-2}]}{[M^0L^0T^0]}$$

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

212. What is the dimension of Luminous flux?

(a) $[cd^1]$ (b) $[cd^1T^{-1}]$
(c) $[cd^1L^{-2}]$ (d) $[cd^1L^1T^{-1}]$

AIIMS-26.05.2019(M) Shift-1

Ans. (a) : The unit of luminous intensity is Candela and denoted as cd.
So, the unit of luminous flux = [cd]

213. Which of the following is the dimensional formula for electric polarization

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

MHT-CET 2019

Ans. (b) : Dimensional formula for electric polarization is $[M^0L^{-2}T^1I^1]$.
Electric polarization $(P) = \varepsilon_0\,\chi\,E$
Where, E = electric field
χ = electric susceptibility (dimensionless)

$$[P]=[\varepsilon_0][E] \quad :\chi \text{ is dimensionless}$$

$$[P]=\left[M^{-1}L^{-3}T^4I^2\right]\left[MLT^{-3}I^{-1}\right]$$

$$[P]=\left[M^0L^{-2}T^1I^1\right]$$

214. The dimensional formula of coefficient of viscosity can be expressed as $M^a\,L^b\,T^c$. What are the values of a, b and c.

(a) a = b = c = 1 (b) a = b = 1 , c = –1
(c) a = 1, b = c = –1 (d) a = c = –1, b = 1

J&K-CET-2019

Ans. (c) : Coefficient of viscosity $(\eta)=\frac{F\times r}{A\times v}$

Where, F = Tangential force
r = Distance between layers
A = Area
v = Velocity

$$\text{Dim. }(\eta)=\frac{F\times r}{A\times v}$$

$$=\frac{\left[MLT^{-2}\right]\times[L]}{\left[L^2\right]\times\left[L^1T^{-1}\right]}$$

$$=\frac{\left[ML^2T^{-2}\right]}{\left[L^3T^{-1}\right]}=\left[ML^{-1}T^{-1}\right]$$

Hence, an comparing with $[M^aL^bT^c]$
We get, a = 1, b = –1, c = –1.

215. Which of the following is a dimensionless quantity?

(a) Thermal conductivity
(b) Specific gravity
(c) Coefficient of linear expansion
(d) Surface tension

J&K-CET-2019

Ans. (b) : Density $= \frac{\text{Mass}}{\text{Volume}} = \left[ML^{-3}\right]$

Specific gravity $= \frac{\text{Density of substance}}{\text{Density of water at } 4^{o}C}$

Dim. of specific gravity $= \frac{\left[ML^{-3}\right]}{\left[ML^{-3}\right]}$

$= \left[M^0L^0\right]$

Hence, specific gravity is a dimensionless quantity.

216. The dimensions of torque are same as that of

(a) Pressure
(b) impulse
(c) moment of force
(d) acceleration

MHT-CET 2019

Ans. (c) : Torque = Force × Distance

$= \left[ML^1T^{-2}\right] \times \left[M^0L^1T^0\right]$

$= \left[ML^2T^{-2}\right]$

Moment of force = force × Distance

$= \left[ML^1T^{-2}\right] \times \left[M^0L^1T^0\right]$

$= \left[ML^2T^{-2}\right]$

217. If force is proportional to square of velocity, then the dimension of proportionality constant is

(a) $[ML^{-1}T]$
(b) $[ML^{-1}T^0]$
(c) $[MLT^0]$
(d) $[M^0LT^{-1}]$

Manipal UGET-2019, 2010

Ans. (b) : According to question–

$F \propto V^2$

$F = kV^2$ (k = proportionality const.)

Write dimension on both side

$[MLT^{-2}] = k[LT^{-1}]^2$

$= k[L^2T^{-2}]$

$k = \frac{\left[MLT^{-2}\right]}{\left[L^2T^{-2}\right]}$

$k = \left[ML^{-1}T^0\right]$

218. Which of the following physical quantities set has different dimensional formulae :

(a) Angular Impulse. Planks constant. Stefan's constant
(b) Energy density. Wave Intensity. Stress
(c) Radius of gyration. Angular displacement. Rydberg constant
(d) Velocity gradient. Acceleration. Gravitational Potential

TS EAMCET 02.05.2018, Shift-II

Ans. (d) : Angular impulse = Torque × time

= (force × distance) × (time)

$= [MLT^{-2}] [L] [T]$

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

Dimension of plank's constant $[h] = [ML^2T^{-1}]$

Stefan's constant $(\sigma) = [ML^0T^{-3}K^{-4}]$

Energy density $= [ML^{-1}T^{-2}]$

Wave intensity $= [ML^0T^{-3}]$

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

Radius of gyration $= [M^0L^0T^0]$

Angular displacement $= [M^0L^0T^0]$

Rydberg constant $= [M^0L^{-1}T^0]$

Velocity gradient $= [M^0L^0T^{-1}]$

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

Gravitational potential $= [M^0L^2T^{-2}]$

219. If L represents inductance, R represents resistance and Q represents electric charge, then match the following.

List-I (Quantity)	List-II (Dimensions)
(A) $\frac{Q^2R^2}{L}$	I) $M^2 L^4 T^{-5} A^{-2}$
(B) $\frac{Q^2R^3}{L}$	II) $M^0 L^0 T^0 A^1$
(C) $\frac{QR^2}{L}$	III) $M^1 L^2 T^{-2} A^0$
(D) $\frac{QR}{L}$	IV) $M^1 L^2 T^{-3} A^{-1}$

The correct is

	A	B	C	D
(a)	IV	III	II	I
(b)	III	I	IV	II
(c)	IV	III	I	II
(d)	III	IV	I	II

AP EAMCET-25.04.2018, Shift-II

Ans. (b) : $Q = It$

$\left[Q\right] = \left[AT\right]$

$R = \frac{W}{QI}$

$\left[R\right] = \frac{\left[ML^2T^{-2}\right]}{\left[AT\right]\left[A\right]} = \left[ML^2T^{-3}A^{-2}\right]$

$L = V \times \frac{dt}{di}$

$= \frac{W}{Q} \cdot \frac{dt}{di}$

$\left[L\right] = \frac{\left[ML^2T^{-2}\right]}{\left[AT\right]} \cdot \frac{\left[T\right]}{\left[A\right]}$

$= \left[ML^2T^{-2}A^{-2}\right]$

$\frac{Q^2R^2}{L}$

(A) $\left[\frac{Q^2R^2}{L}\right] = \frac{\left[A^2T^2\right]\left[ML^2T^{-3}A^{-2}\right]^2}{\left[ML^2T^{-2}A^{-2}\right]}$

$= \left[ML^2T^{-2}A^0\right]$

(B) $\left[\frac{Q^2R^3}{L}\right] = \frac{\left[A^2T^2\right]\left[ML^2T^{-3}A^{-2}\right]^3}{\left[ML^2T^{-2}A^{-2}\right]}$

$= \left[M^2L^4T^{-5}A^{-2}\right]$

(C) $\left[\frac{QR^2}{L}\right] = \frac{\left[AT\right]\left[ML^2T^{-3}A^{-2}\right]^2}{\left[ML^2T^{-2}A^{-2}\right]}$

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

(D) $\left[\frac{QR}{L}\right] = \frac{\left[AT\right]\left[ML^2T^{-3}A^{-2}\right]}{\left[ML^2T^{-2}A^{-2}\right]}$

$= \left[M^0L^0T^0A^1\right]$

220. If L represents inductance, R represents resistance and Q represents electric charge, then match the following.

List-I (Quantity)	**List-II (Dimensions)**
(A) $\frac{Q^2R^2}{L}$	I) $M^2 L^4 T^{-5} A^{-2}$
(B) $\frac{Q^2R^3}{L}$	II) $M^0 L^0 T^0 A^1$
(C) $\frac{QR^2}{L}$	III) $M^1 L^2 T^{-2} A^0$
(D) $\frac{QR}{L}$	IV) $M^1 L^2 T^{-3} A^{-1}$

The correct is

	A	B	C	D
(a)	IV	III	II	I
	A	B	C	D
(b)	III	I	IV	II
	A	B	C	D
(c)	IV	III	I	II
	A	B	C	D
(d)	III	IV	I	II

AP EAMCET-25.04.2018, Shift-II

Ans. (b) : $Q = It$

$[Q] = [AT]$

$R = \frac{W}{QI}$

$[R] = \frac{\left[ML^2T^{-2}\right]}{[AT][A]} = \left[ML^2T^{-3}A^{-2}\right]$

$L = V \times \frac{dt}{di}$

$= \frac{W}{Q}\cdot\frac{dt}{di}$

$[L] = \frac{\left[ML^2T^{-2}\right]}{[AT]}\cdot\frac{[T]}{[A]}$

$= \left[ML^2T^{-2}A^{-2}\right]$

$\frac{Q^2R^2}{L}$

(A) $\left[\frac{Q^2R^2}{L}\right] = \frac{\left[A^2T^2\right]\left[ML^2T^{-3}A^{-2}\right]^2}{\left[ML^2T^{-2}A^{-2}\right]}$

$= \left[ML^2T^{-2}A^0\right]$

(B) $\left[\frac{Q^2R^3}{L}\right] = \frac{\left[A^2T^2\right]\left[ML^2T^{-3}A^{-2}\right]^3}{\left[ML^2T^{-2}A^{-2}\right]}$

$= \left[M^2L^4T^{-5}A^{-2}\right]$

(C) $\left[\frac{QR^2}{L}\right] = \frac{\left[AT\right]\left[ML^2T^{-3}A^{-2}\right]^2}{\left[ML^2T^{-2}A^{-2}\right]}$

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

(D) $\left[\frac{QR}{L}\right] = \frac{\left[AT\right]\left[ML^2T^{-3}A^{-2}\right]}{\left[ML^2T^{-2}A^{-2}\right]}$

$= \left[M^0L^0T^0A^1\right]$

221. The dimensions in M, L and T of the term a/V^2 in Vander Waals equation are

(a) 1, –1, –2 (b) 1, 1, –2
(c) 2, 1, –1 (d) 1, 1, 1

Assam CEE-2018

Ans. (a) The Vanderwaal's equation is given as –

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

Therefore, a/V^2 should have same dimension as P (pressure).

So, dimension of $\left(\frac{a}{V^2}\right) = M^1L^{-1}T^{-2}$

222. The radius of nucleus is $R = R_0A^{1/3}$, where A is mass number. The dimension of R_0 is

(a) $[MLT^{-2}]$ (b) $[M^0LT^0]$
(c) $[M^0LT^{-1}]$ (d) None of these

HP CET-2018

Ans. (b) : Given, that:-
The radius of nucleus $R = R_0A^{1/3}$

$$\text{or } R_0 = \frac{R}{(A)^{1/3}}$$

A is mass number so, it is dimensionless
So, dimension of R_0 = dimension of R
$= [L] = [M^0LT^0]$

223. If energy of photon is $E \alpha\, h^a c^b \lambda^d$ where, h is Planck's constant, c = speed of light and λ = wavelength of photon. Then the value of a, b and d are

(a) 1, 1, 1 (b) 1, –1, 1
(c) 1, 1, –1 (d) None of these

HP CET-2018

Ans. (c) : We have :-

$E \propto h^a c^b \lambda^d$

We know that :-

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

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

$[c] = [L^1T^{-1}]$

$[\lambda] = [L^1]$

So, $[E] = [h]^a[c]^b[\lambda]^d$

$[M^1L^2T^{-2}] = [M^1L^2T^{-1}]^a[L^1T^{-1}]^b[L^1]^d$

$[M^1L^2T^{-2}] = [M^aL^{2a+b+d}T^{-a-b}]$

On comparing coff. of M, L and T both sides:-

$a = 1$

$2a + b + d = 2$

$-a - b = -2$

$-1 - b = -2 \quad (\because a = 1)$

$-b = -2 + 1$

$b = 1$

Put a = 1, b = 1 in 2a + b + d = 2

$2 + 1 + d = 2 \Rightarrow d = -1$

So, the value of a, b, d are :-

a, b, d = 1, 1, –1

224. If V_0 is the volume of a standard unit cell of germanium crystal containing N_0 atoms, then the expression for the mass m of a volume V in terms of V_0, N_0, M_{mol} and N_A is [here, M is the molar mass of germanium and N_A is the Avogadro's constant]

(a) $M\frac{V}{V_0}\frac{N_A}{N_0}$ (b) $\frac{N_A}{N_0}\frac{V_0}{V}M$

(c) $M\frac{V}{V_0}\frac{N_0}{N_A}$ (d) $M\frac{V_0}{V}\frac{N_0}{N_A}$

TS-EAMCET-05.05.2018, Shift-1

Ans. (c) : Number of unit cells in volume

$$= \frac{\text{Total volume}}{\text{Volume of a unit cell}} = \frac{V}{V_0}$$

Number of atoms in volume (V)

=Number of unit cells × Number of atoms in (N_0)

1 unit cell = $\frac{V}{V_0} \times N_0$

Number of moles in volume (V)

$$= \frac{\text{Number of atoms}}{\text{Avagadro number}} = \frac{V}{V_0} \times \frac{N_0}{N_A}$$

Mass m of given sample volume

= Number of moles × Molar mass

$$\therefore \quad m = \frac{V}{V_0} \times \frac{N_0}{N_A} \times M$$

225. A gas satisfies the relation $PV^{5/3} = k$, where P is pressure, V is volume and k is constant. The dimension of constant k are

(a) $[ML^4T^{-2}]$ (b) $[ML^2T^{-2}]$

(c) $[ML^6T^{-2}]$ (d) $[MLT^{-2}]$

TS-EAMCET-04.05.2018, Shift-1

Ans. (a) : Given, $PV^{5/3} = k$, $\begin{Bmatrix} P = \text{pressure} \\ V = \text{volume} \end{Bmatrix}$

Using dimensional balance method

$k = [P]\,[V]^{5/3} = [ML^{-1}T^{-2}] \times [L^3]^{5/3}$

$= [ML^{-1}T^{-2}] \times [L^5]$

$= [ML^4T^{-2}]$

226. Dimensions of the quantity $\frac{P}{\varepsilon_0\mu_0}$, where p is the pressure, ε_0 is electric permittivity of free space and μ_0 is permeability of free space, will be

(a) $[MLT^{-4}]$ (b) $[ML^2T^{-2}]$

(c) $[ML^3T^{-3}]$ (d) $[ML^2T^{-4}]$

TS-EAMCET-07.05.2018, Shift-1

Ans. (a) : Given,

$$\text{Quantity} = \frac{P}{\varepsilon_0\mu_0}$$

Where, P = Pressure, ε_0 = permittivity of free space and μ_0 = Permeability of free space.

So,

$$\text{Dimension of } \frac{P}{\varepsilon_0\mu_0} = \left[ML^{-1}T^{-2}\right] \times \left[L^2T^{-2}\right] = [MLT^{-4}]$$

227. If C, the velocity of light, g the acceleration due to gravity and P the atmospheric pressure be the fundamental quantities in MKS system, then the dimensions of length will be same as that of

(a) $\frac{C}{g}$ (b) $\frac{C}{P}$

(c) PCg (d) $\frac{C^2}{g}$

BITSAT-2018

Ans. (d) : C = velocity

g = acceleration due to gravity

P = Atmospheric Pressure

$$\text{Dimension of } \left(\frac{C^2}{g}\right) = \frac{\left[LT^{-1}\right]^2}{\left[LT^{-2}\right]} = \frac{\left[L^2T^{-2}\right]}{\left[LT^{-2}\right]} = [L]$$

$$\text{Dimension of } \frac{C}{P} = \frac{\left[LT^{-1}\right]}{[ML^{-1}T^{-2}]} = \left[M^{-1}L^2T\right]$$

Dimension of

$$PCg = \left[ML^{-1}T^{-2}\right]\left[LT^{-1}\right]\left[LT^{-2}\right] = \left[MLT^{-5}\right]$$

$$\text{Dimension of } \frac{C}{g} = \frac{\left[LT^{-1}\right]}{\left[LT^{-2}\right]} = [T]$$

Hence, only option (d) is correct dimension of length.

228. Assertion (A) : Energy per unit volume and angular momentum can be added dimensionally.

Reason (R): Physical quantities having same dimensions can be added or subtracted.

(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 but (R) is true

AP EAMCET (23.04.2018) Shift-1

Ans. (d) : Due to dimensionally not equal, angular momentum can not be added dimensionally to energy per unit volume. Hence, Assertion (A) is false. Physical quantities have same dimensions can be added or subtracted. Hence Reason (R) is correct.

229. The magnetic induction field has the dimensions of

(a) force
(b) force constant
(c) surface tension
(d) $\frac{\text{surface tension}}{\text{current}}$
(e) force constant λ current

Kerala CEE -2018

Ans. (d) : Magnetic Induction force (F) = qvB

Or $B = \frac{F}{qv} = \frac{F}{q\left(\frac{L}{t}\right)}$

Or $B = \frac{F}{Li} \quad \left(\because\ v = \frac{L}{t}, i = \frac{q}{t}\right)$

Or $B = \frac{F}{L} \times \frac{1}{i}$

We know that, surface tension = $\frac{\text{force}}{\text{length}}$

Dimension of $B = \frac{\text{surface tension}}{\text{current}}$

230. The dimensional formula of mobility is ______.

(a) $[M^{-1}L^{1}T^{2}A^{1}]$
(b) $[M^{1}L^{0}T^{2}A^{-1}]$
(c) $[M^{1}L^{-1}T^{-2}A^{-1}]$
(d) $[M^{-1}L^{0}T^{2}A^{1}]$

GUJCET 2018

Ans. (d) : Mobility $(\mu) = \frac{\text{Drift velocity}(V_d)}{\text{Electric field}(E)}$

Drift velocity is a type of velocity and it can have the same dimensional formula as that of velocity.

$[V_d] = [M^0L^1T^{-1}]$

Electric field is a force per unit charged.

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

$$\mu = \frac{[V_d]}{[E]} = \frac{[M^0L^1T^{-1}]}{[M^1L^1T^{-3}A^{-1}]} = [M^{-1}L^0T^2A^1]$$

231. The dimensional formula of $\mu_0\varepsilon_0$ is ______.

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

GUJCET 2018

Ans. (a) : Speed of light $(C) = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$

Squaring both side,

$$C^2 = \frac{1}{\mu_0\varepsilon_0}$$

$$\mu_0\varepsilon_0 = \frac{1}{C^2}$$

Dimensional formula of speed (C) = $[LT^{-1}]$

So, $\mu_0\varepsilon_0 = \frac{1}{[L^1T^{-1}]^2} = \frac{1}{[L^2T^{-2}]}$

$\mu_0\varepsilon_0 = [M^0L^{-2}T^2]$

232. Gravitational constant (G), Planck's constant (h) and Velocity of light (c) are

(a) Dimensional variables
(b) Dimensionless variables
(c) Non-dimensional constants
(d) Dimensional constants

J&K-CET-2018

Ans. (d) : The physical quantities which have dimensions and a fixed value are known as dimensional constant.

Gravitational constant G has a fixed value of 6.67×10^{-11} Nm^2/Kg^2.

Planck's constant (h) has a fixed value of 6.626×10^{-34}Js

Velocity of light (c) has a fixed value of 3×10^8 m/s

233. The velocity of water waves (v) may depend on their wavelength λ, the density of water ρ and the acceleration due to gravity g. The method of dimensions gives the relation between these quantities is

(a) v
(b) $v^2 \propto g\lambda$
(c) $v^2 \propto g\lambda^2$
(d) $v^2 \propto g^{-1}\lambda^2$

AIIMS-26.05.2018(E)

Ans. (b) : Let, $v \propto \lambda^a\rho^bg^c$

The dimensional formula for all quantities we get,

$$[LT^{-1}] \propto [L]^a[ML^{-3}]^b[LT^{-2}]^c$$

$$[M^0L^1T^{-1}] \propto [M^b L^{a-3b+c} T^{-2c}]$$

Comparing power of M,L and T

b = 0, a – 3b + c = 1, and –2c = –1

$a - 3 \times 0 + \frac{1}{2} = 1$ $\quad c = \frac{1}{2}$

$a = 1 - \frac{1}{2} = \frac{1}{2}$

$a = \frac{1}{2}$

$\therefore$ $v \propto \lambda^{1/2}\rho^0g^{1/2}$

$v = \sqrt{\lambda g}$

So, $v^2 \propto \lambda g$

234. A physical quantity 'P' is given by $P = \in_0 L\frac{\Delta V}{\Delta t}$, where $\in_0$ is electric permittivity, L is length, ΔV is potential difference and Δt is time interval. The dimensional formula of P is same as that of

(a) resistance (b) electric charge
(c) voltage (d) electric current

AP EAMCET-24.04.2017, Shift-II

Ans. (d) :

$P = \varepsilon_0 L\frac{\Delta v}{\Delta t}$ …(i)

where ε_0 = electric permittivity
$= [M^{-1}L^{-3}T^4A^2]$
L = length = [L]
$\Delta t = [T]$

Keep these values in eq. (i)

$[P] = [\varepsilon_0][L]\frac{[\Delta v]}{[\Delta t]}$

$[P] = [M^{-1}L^{-3}T^4A^2][L]\frac{[ML^2T^{-3}A^{-1}]}{[T]}$

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

Electric current unit is Ampere
It mean P has same dimensions as of current

235. A rectangular beam which is supported at its two ends and loaded in the middle with weight W sags by an amount δ Such that $\delta = \left[\frac{wl^3}{4Yd^3?}\right]$, where *l*, *d* and Y represent length, depth and elasticity respectively. Guess the unknown factor using dimensional considerations.

(a) breadth (b) $(\text{breadth})^2$
(c) $(\text{breadth})^3$ (d) mass

COMEDK 2017

Ans. (a): Let unknown factor be x

$\delta = \left[\frac{wl^3}{4Yd^3x}\right]$

$x = \left[\frac{wl^3}{4Yd^3\delta}\right]$

where, w = weight
l = length
d = depth
Y = elastic property
δ = Saging So,

$x = \frac{[MLT^{-2}][L^3]}{\left[\frac{MLT^{-2}}{L^2}\right][L^3][L]}$

$x = \frac{[L^2]}{[L]} = [L]$

Thus unknown factor x represent breadth.

236. P, Q and R are physical quantities having different dimensions, then the following combination never be a meaningful quantity

(a) $\frac{PQ}{R}$ (b) $\frac{R}{PQ}$
(c) $\frac{Q^2}{PR}$ (d) $\frac{PQ}{R+Q}$

AP EAMCET-28.04.2017, Shift-I

Ans. (d) :
$\frac{PQ}{R+Q} \rightarrow$. This combination can never be a combination because physical quantity having different dimension cannot be added or subtracted.

237. What is the dimension of $\frac{1}{\mu_0\varepsilon_0}$?

(μ_o= magnetic permeability and
(ε_o= permittivity of free space)

(a) $[L^2T^{-2}]$ (b) $[LT^{-1}]$
(c) $[L^2T^2]$ (d) $[LT^2]$

TS-EAMCET-11.09.2020, Shift-1
CGPET-2018

Ans. (a) : ∵ The speed of the light in vacuum is

$C = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$

$C^2 = \frac{1}{\mu_0\varepsilon_0}$

$\frac{1}{\mu_0\varepsilon_0} = [LT^{-1}]^2 = [L^2T^{-2}]$

238. Out of the following pairs, which one does not have identical dimensions?

(a) Angular momentum and Planck's constant
(b) Impulse and momentum
(c) Moment of inertia and moment of a force
(d) Work and torque

AIEEE 2005

Ans. (c) : Moment of inertia and moment of force
Moment of Inertia (I) = Mr^2
$I = [M^1L^2T^0]$ and
Moment of a force (τ) = F.d
$= [M^1L^1T^{-2}][L]$
$= [M^1L^2T^{-2}]$
So, Moment of inertia and moment of a force does not have identical dimension.

239. The dimensions of magnetic field in M, L, T and C (coulomb) is given as

(a) $[MLT^{-1}C^{-1}]$ (b) $[MT^2C^{-2}]$
(c) $[MT^{-1}C^{-1}]$ (d) $[MT^2C^{-1}]$

AIEEE 2008

Ans. (c) : We know that,

Lorentz Force (F) = q v × B

$$[B] = \frac{[F]}{[q][v]}$$

$$= \frac{[MLT^{-2}]}{[C][LT^{-1}]}$$

$[B] = [MT^{-1}C^{-1}]$

240. Let [ε_0] denotes the dimensional formula of the permittivity of vacuum. If M = mass, L = length, T = time and A = electric current, then

(a) $[\varepsilon_o] = [M^{-1}L^{-3}T^2A]$

(b) $[\varepsilon_o] = [M^{-1}L^{-3}T^4A^2]$

(c) $[\varepsilon_o] = [M^{-2}L^2T^{-1}A^{-2}]$

(d) $[\varepsilon_o] = [M^{-1}L^2T^{-1}A^2]$

JEE Main 2013

Ans. (b) : We know that,

$$F = \frac{1}{4\pi\varepsilon_o}\frac{q_1q_2}{r^2}$$

$$[\varepsilon_o] = \frac{[q_1][q_2]}{[F][r^2]} = \frac{[it][it]}{[F][r^2]}$$

$$[\varepsilon_o] = \frac{[IT][IT]}{[MLT^{-2}][L^2]}$$

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

241. The dimensional formula of coefficient of kinematic viscosity is:

(a) $[M^0L^{-1}T^{-1}]$ (b) $[M^0L^2T^{-1}]$

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

AP EAMCET(Medical)-2002

Ans. (b) : The dimensional formula of kinematic viscosty is $[M^0L^2T^{-1}]$.

242. The dimensional formula of magnetic induction is:

(a) $[MT^{-1}A^{-1}]$ (b) $[MT^{-2}A^{-1}]$

(c) $[MTA^{-2}]$ (d) $[MTA^{-2}]$

AP EAMCET(Medical)-2000

Ans. (b) : The dimensional formula of magnetic induction is $[MT^{-2}A^{-1}]$.

243. Which of the following physical quantities represent the dimensions of $\frac{b}{a}$ in the relation $P = \frac{x^2 - b}{at}$, where P is power, x is distance and t is time

(a) Power (b) Surface tension

(c) Torsional constant (d) Force

AP EAMCET(Medical)-2016

Ans. (c) : Given,

$$P = \frac{x^2 - b}{at}$$

The dimension of b = The dimension of x^2

$\therefore$ $[b] = [L^2]$------------(1)

Also,

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

$[t] = [T^1]$

$$[a] = \frac{[b]}{[P][t]} = \frac{[L^2]}{[ML^2T^{-3}][T]}$$

$[a] = [M^{-1}T^2]$---------------(2)

$$\therefore \quad \frac{[b]}{[a]} = \frac{[L^2]}{[M^{-1}T^2]} = [ML^2T^{-2}]\text{---------(3)}$$

Torsional constant $k = \frac{\tau}{\theta}$

$\therefore$ $[k] = [\tau]$

$[k] = [ML^2T^{-2}]$-------------(4)

From 3 and 4,

$$\frac{[b]}{[a]} = k$$

244. If energy (E), force (F) and linear momentum (P) are fundamental quantities, then match the following and give the correct answer.

(A) Physical quantity	(B) Dimensional formula
(a) Mass	(d) $[E^0 F^{-1} P^1]$
(b) Length	(e) $[E^{-1} F^0 P^2]$
(c) Time	(f) $[E^1 F^{-1} P^0]$

(a) a-d, b-e, c-f (b) a-f, b-e, c-d

(c) a-e, b-f, c-d (d) a-e, b-d, c-f

AP EAMCET(Medical)-2015

Ans. (c) :

(A) Physics quantity	(B) Dimensional formula
(A) Mass	(E) $E^{-1} F^0 p^2$
(B) Length	(F) $E^1 F^{-1} p^0$
(C) Time	(D) $E^0 F^{-1} p^1$

245. In the equation $\left(\frac{1}{p\beta}\right) = \frac{y}{K_BT}$, where p is the pressure, y is the distance, K_B is Boltzmann constant and T is the temperature Dimensions of β are

(a) $[M^{-1}L^1T^2]$ (b) $[M^0L^2T^0]$

(c) $[M^1L^{-1}T^{-2}]$ (d) $[M^0L^0T^0]$

AP EAMCET(Medical)-2013

Ans. (b) : From the equation $= \frac{1}{p.\beta} = \frac{y}{K_BT}$

$$\beta = \frac{K_BT}{p.y} = \frac{[ML^2T^{-3}][T]}{[ML^{-1}T^{-2}][L]}$$

$$= \frac{[ML^2T^{-2}]}{[ML^0T^{-2}]} = [M^0L^2T^0]$$

Hence, the dimension of β is $[L^2]$

246. The van der Waal's equation for n moles of a real gas is

$$\left(p+\frac{a}{V^2}\right)(V-b)=nRT$$

Where p is pressure, V is volume, T is absolute temperature, R is molar gas constant a, b and c are van der Waal's constants. The dimensional formula for ab is

(a) $[ML^8L^{-2}]$ (b) $[ML^6L^{-2}]$
(c) $[ML^4L^{-2}]$ (d) $[ML^2L^{-2}]$

AP EAMCET(Medical)-2012

Ans. (a) : P must be same as $\frac{a}{V^2}$

Hence, $\frac{[a]}{L^6}=\left[ML^{-1}T^{-2}\right]$

$[a]=\left[ML^5T^{-2}\right]$

The dimension of b must be same as that of V

Hence, $[b]=L^3$

$[ab]=\left[ML^8T^{-2}\right]$

247. If force (F), work (W) and velocity (v) are taken as fundamental quantities, then the dimensional formula of time (T) is:

(a) $[WFv]$ (b) $[WFv^{-1}]$
(c) $[W^{-1}F^{-1}v]$ (d) $[WF^{-1}v^{-1}]$

AP EAMCET(Medical)-2007

Ans. (d) : Force = F
Work = W
Velocity = v
Let the distance be 'd' and the time be t Distance can be expressed as d = v ×t
Work done by an object is given by.

$W = F \times d$
$= F \times v \times t$

$t=\frac{W}{Fv}$

$t=\left[W^1F^{-1}v^{-1}\right]$

Hence, the dimensional formula of the time will be $[WF^{-1}v^{-1}]$

248. Some physical constants are given in List 1 and their dimensional formulae are given in List 2. Match the correct pairs in the lists:

	List 1		List 2
(A)	Planck's constant	(1)	$[ML^{-1}T^{-2}]$
(B)	gravitational constant	(2)	$[ML^{-1}T^{-2}]$
(C)	bulk modulus	(3)	$[ML^2T^{-1}]$
(D)	coefficient of viscosity	(4)	$[M^{-1}L^3T^{-2}]$

(a) (1) D, (2) C, (3) B, (4) A
(b) (1) B, (2) A, (3) C, (4) D
(c) (1) C, (2) B, (3) A, (4) D
(d) (1) C, (2) D, (3) A, (4) B

EAMCET-2007
AP EAMCET(Medical)-2006

Ans. (d) :

$h=\frac{E}{\nu}=\frac{\left[ML^2T^{-2}\right]}{\left[T^{-1}\right]}$

$h=\left[ML^2T^{-1}\right]$

• Gravitational constant (G)

$g=\frac{GM}{R^2}$

$G=\frac{gR^2}{M}$

$G=\frac{\left[LT^{-2}\right]\left[L^2\right]}{[M]}$

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

• Bulk modulus (K)= $K=-V\frac{dP}{dV}$

Where, P = Pressure
V = Volume
P = F/A

$$K=\frac{F/A}{\left\{\frac{\Delta V}{V}\right\}}$$

$$K=\frac{F}{A}=\frac{\left[MLT^{-2}\right]}{\left[L^2\right]}$$

$$K=\left[M^1L^{-1}T^{-2}\right]$$

• Coefficient of viscosity $(\eta)=\frac{F}{A.\left\{\frac{dv}{dx}\right\}}$

$$(\eta)=\frac{\left[MLT^{-2}\right]}{\left[L^2\right]\left[T^{-1}\right]}$$

$$=\left[ML^{-1}T^{-1}\right]$$

249. According to Bernoulli's theorem $\frac{P}{d}+\frac{V^2}{2}+gh=\text{constant}$. The dimensional formula of the constant is: (P = pressure, d = density, h = height, V = velocity and g = acceleration due to gravity)

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

AP EAMCET(Medical)-2005

Ans. (c) : Bernoulli's theorem $\frac{P}{d}+\frac{V^2}{2}+gh=\text{constant}$

Dimensional formula of the constant is same as dimensional formula of $\frac{P}{d},\frac{V^2}{2}$, gh.

So, dimensional formula of gh = $[LT^{-2}][L]$
$= [L^2T^{-2}]$
$= [M^0L^2T^{-2}]$

250. The dimensional formula of the product of two physical quantities P and Q is $[ML^2T^{-2}]$. The dimensional formula of $\frac{P}{Q}$ is $[MT^{-2}]$ P and Q respectively are:

(a) force, velocity
(b) momentum, displacement
(c) force, displacement
(d) work, velocity

AP EAMCET(Medical)-2001

Ans. (c) : Given, $PQ = [ML^2T^{-2}]$

$$\frac{P}{Q} = [MT^{-2}]$$

$$PQ \times \frac{P}{Q} = ML^2T^{-2} \times MT^{-2}$$

$$P^2 = M^2L^2T^{-4}$$

$$P = MLT^{-2} = \text{Force}$$

Now,

$$\frac{PQ}{\left(\frac{P}{Q}\right)} = \frac{PQ}{P} \times Q = \frac{ML^2T^{-2}}{MT^{-2}}$$

$$Q^2 = L^2$$

$$Q = L \quad = \text{Displacement}$$

251. If m is mass $\underset{\sim}{Q}$ is charge and B is magnetic induction, then $\frac{m}{B\underset{\sim}{Q}}$ has the same dimensions as:

(a) frequency
(b) $\frac{1}{\text{frequency}}$
(c) velocity
(d) acceleration

AP EAMCET(Medical)-1999

Ans. (b) : Magnetic induction (B) = $ML^0T^{-2}A^{-1}$

Charge (Q) = TA

Mass (m) = M

Hence,

$$\frac{m}{BQ} = \frac{[M]}{[ML^0T^{-2}A^{-1}][TA]}$$

$$\frac{m}{BQ} = \frac{1}{[L^0T^{-1}A^0]}$$

$$\frac{m}{BQ} = [T]$$

$$\text{Time} = \frac{1}{\text{frequency}}$$

252. The velocity of light 'c', the constant of gravitation 'G' and Planck's constant 'h' be chosen as fundamental units, the dimensions of mass in terms of c, G and h is

(a) $\left[h^{1/2}c^{-3/2}G^{1/2}\right]$
(b) $\left[h^{1/2}c^{1/2}G^{-1/2}\right]$
(c) $\left[h^{1/2}c^{-5/2}G^{1/2}\right]$
(d) $\left[h^{1/2}c^{-1/2}G^{1/2}\right]$

TS EAMCET 09.05.2019, Shift-I
AP EAMCET -2014

Ans. (b) : We know that, dimensional formula of

Speed of light $[c] = [LT^{-1}]$

Gravitational constant $[G] = [M^{-1}L^3T^{-2}]$

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

Let formula of mass in term of c, G and h be

$$M = c^x G^y h^z$$

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

$$[M] = [M^{-y+z} L^{x+3y+2z} T^{-x-2y-z}]$$

where,

$-y + z = 1$, $x + 3y + 2z = 0$, $-x - 2y - z = 0$

On solving, we get

$$x=\frac{1}{2}, y=-\frac{1}{2}, z=\frac{1}{2}$$

So, dimension of $[M] = [h^{1/2} c^{1/2} G^{-1/2}]$

253. The pair with same dimension is _______

(a) Pressure and density
(b) Impulse and momentum
(c) Stress and strain
(d) Momentum and inertia

AP EAMCET-24.09.2020, Shift-I
DCE-2009

Ans. (b) : The dimension of Pressure is $[M^1L^{-1}T^{-2}]$.
The dimension of Density is $[M^1L^{-3}T^0]$.
The dimension of Impulse is $[M^1L^1T^{-1}]$.
The dimension of Momentum is $[M^1L^1T^{-1}]$.
The dimension of Stress is $[M^1L^{-1}T^{-2}]$.
The dimension of Strain is $[M^0L^0T^0]$.
The dimension of Inertia is $[M^1L^2T^0]$.
So, the pair with same dimension is 'Impulse and Momentum'.

254. The pair of physical quantities having the same dimensional formula is

(a) energy and torque
(b) torque and entropy
(c) entropy and power
(d) power and angular momentum

EAMCET-1991

Ans. (a) : Dim. of Torque = $[M L^2T^{-2}]$
Dim. Angular moment = $[M L^2T^{-1}]$
Dim. of Power = $[M L^2T^{-3}]$
Dim. of Entropy = $[M L^2 T^{-2} K^{-1}]$
Dim. of energy = $[M L^2T^{-2}]$
Hence, from above dimensional formula we can see that dim. of Torque and energy are same.

255. The ratio L/R, where L and R stand for inductance and resistance, has the same dimensions as those of

(a) velocity
(b) acceleration
(c) time
(d) force

EAMCET-1994

Ans. (c) :

Dimensions of $\frac{[L]}{[R]} = \frac{[ML^2T^{-2}A^{-2}]}{[ML^2T^{-3}A^{-2}]}$

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

$= [T]$

So, The ratio of L/R has the same dimensions of time.

256. The pair of physical quantities not having the same dimensional formula is

(a) acceleration, gravitational field strength
(b) torque, angular momentum
(c) pressure, modulus of elasticity
(d) All of the above

EAMCET-1993

Ans. (b) : (a) Dimension of acceleration = Dim. of gravitational field strength = $[LT^{-2}]$

(b) Dim. of torque = $[ML^2T^{-2}]$
Dim of angular momentum = $[M L^2T^{-1}]$

(c) Dim. of pressure = dim. of modulus of elasticity = $[M L^{-1}T^{-2}]$

257. If time period t of a drop of liquid of density d vibrating under surface tension s is given by the formula $t = \sqrt{d^a r^b s^c}$ where r is radius of drop a = 1 and c = –1, the value of b is

(a) 3 (b) –3
(c) –4 (d) 4

EAMCET-1993

Ans. (a) : Given that,

$t = \sqrt{d^a r^b s^c}$,

When a = 1, c = –1

Or $t = (d^a r^b s^c)^{1/2} = d^{1/2} r^{b/2} s^{-1/2}$ ……. (i)

dim of d = ML^{-3}
dim of r = L
dim of s = MT^{-2}

Putting the values in equation (i),

$[T] = [ML^{-3}]^{1/2}[L]^{b/2}[MT^{-2}]^{-1/2}$

$[T] = [M^0L^{-3/2+b/2}T^1]$

$[M^0L^0T^1] = [M^0L^{-3/2+b/2}T^1]$

On comparing we have,

$-\frac{3}{2} + \frac{b}{2} = 0$

$\frac{b}{2} = \frac{3}{2}$

b = 3

258. Dimensions of ohm are same as (h = Planck's constant, e = charge)

(a) $\frac{h}{e}$ (b) $\frac{h^2}{e}$
(c) $\frac{h}{e^2}$ (d) $\frac{h^2}{e^2}$

EAMCET-1998

Ans. (c) : Ohm $[\Omega] = [M L^2A^{-2} T^{-3}]$

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

e = [AT]

Dimension of given option are-

(a) $\frac{h}{e} = \frac{[ML^2T^{-1}]}{[AT]} = [ML^2A^{-1}T^{-2}]$

(b) $\frac{h^2}{e} = \frac{[ML^2T^{-1}]^2}{[AT]} = [M^2L^4A^{-1}T^{-3}]$

(c) $\frac{h}{e^2} = \frac{[ML^2T^{-1}]}{[A^2T^2]} = [ML^2A^{-2}T^{-3}]$

(d) $\frac{h^2}{e^2} = \frac{[ML^2T^{-1}]^2}{[A^2T^2]} = [M^2L^4A^{-2}T^{-4}]$

Hence, dimension of ohm is as same as dimension of $\frac{h}{e^2}$.

259. Which of the following has no dimensions?

(a) Angular velocity
(b) Momentum
(c) Angular momentum
(d) Strain

EAMCET-1995

Ans. (d) : Strain is defined as

$\text{Strain} = \frac{\text{change in dimension}}{\text{original dimension}}$

$= \frac{[M^0L^1T^0]}{[M^0L^1T^0]}$

Dim. [strain] = $[M^0 L^0 T^0]$

So, strain is dimensionless quantity.

260. The dimension of resistance × capacitance are same as for

(a) frequency (b) energy
(c) time period (d) current

EAMCET-1995

Ans. (c) : Dimension of resistance × capacitance

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

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

= dim. of time period

261. The velocity of a body falling freely under gravitational field varies as $g^p h^q$, where g is gravitational acceleration and h is height from which the body is released. p and q are given by

(a) p = 2 : q = 1/2
(b) p = 1/2 : q = 1/2
(c) p = 1/2 : q = 1
(d) p = q = 1

EAMCET-1994

Ans. (b) : According to the question,

$v = g^p h^q$

or $[L T^{-1}] = [LT^{-2}]^p [L]^q$

$[L T^{-1}] = [L^{p+q} T^{-2p}]$

Comparing both side,

$-2p = -1 \Rightarrow p = \frac{1}{2}$

$p + q = 1 \Rightarrow q = \frac{1}{2}$

So, p and q are $\frac{1}{2}$ and $\frac{1}{2}$.

262. The fundamental physical quantities that have same dimensions in the dimensional formula of torque and angular momentum are

(a) mass, time (b) time, length
(c) mass, length (d) time, mole

EAMCET-2000

Ans. (c) : Angular momentum = mvr

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

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

Torque $= F \times d$

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

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

So, from the dimension of torque and angular momentum the dimension of mass and length are same.

263. If pressure p, velocity v and time T are taken as fundamental physical quantities the dimensional formula of the force is

(a) $[pv^2T^2]$ (b) $[p^{-1}v^2T^{-2}]$
(c) $[pvT^2]$ (d) $[p^{-1}vT^2]$

EAMCET-2000

Ans. (a) : If pressure p, velocity v and time T are taken as fundamental physical quantity then dimension of

$F = p^{\alpha} v^{\beta} T^{\gamma}$ ....(i)

Or $[M L T^{-2}] = [M L^{-1} T^{-2}]^{\alpha} [LT^{-1}]^{\beta} [T]^{\gamma}$

$[M L T^{-2}] = [M^{\alpha} L^{-\alpha+\beta} T^{-2\alpha+\gamma-\beta}]$

On comparing we have,

$\alpha = 1$

$-\alpha + \beta = 1 \Rightarrow \beta = 2$

$-\beta - 2\alpha + \gamma = -2 \Rightarrow \gamma = 2$

Hence, $\alpha = 1, \beta = 2, \gamma = 2$

Putting the value of a, b, γ in equation (i),

$F = [p^1 v^2 T^2]$

$F = [p v^2 T^2]$

264. If C, R, L and I denote capacity, resistance, inductance and electric current respectively, the quantities having the same dimensions of time are

(1) [CR] (2) $\left[\frac{L}{R}\right]$

(3) $\left[\sqrt{LC}\right]$ (4) $[LI^2]$

(a) (1) and (2) only (b) (1) and (3) only
(c) (1) and (4) only (d) (1), (2) and (3) only

EAMCET-2006

Ans. (d) :

$\because$ Electrical Capacity (C) = $\frac{\text{Charge}}{\text{Potential difference}}$

Dimensional formula of charge,

$Q = [AT]$

Dimensional formula of electric potential,

$\Delta V = [ML^2T^{-3}A^{-1}]$

$\therefore$ Electric capacity = $\frac{[AT]}{[ML^2T^{-3}A^{-1}]}$

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

Similarly, Voltage (V) = RI

$R = \frac{V}{I} = \frac{(W/Q)}{I} = \frac{W}{Q.I} = \frac{[ML^2L^{-2}]}{[AT][A]} = [ML^2T^{-3}A^{-2}]$

$R = [ML^2T^{-3}A^{-2}]$ ...(ii)

Similarly, Inductance (I) = $[ML^2T^{-2}A^{-2}]$ ...(iii)

and current (I) = $[M^0L^0T^0A^{-1}]$ ... (iv)

- for, $[CR] = [M^{-1}L^{-2}T^4A^2][ML^2T^{-3}A^{-2}] = [T^1]$

= dimension of time ....(1)

- $\frac{L}{R} = \frac{[ML^2T^{-2}A^{-2}]}{[ML^2T^{-3}A^{-2}]} = [T^1]$

= dimension of time ....(2)

- $\sqrt{LC} = \sqrt{[ML^2T^{-2}A^{-2}][M^{-1}L^{-2}T^4A^2]} = \sqrt{[T^2]} = [T]$

= dimension of time ....(3)

- $[LI^2] = [ML^2T^{-2}A^{-2}] [A^2]$

$= [ML^2T^{-2}A^{\circ}]$ ....(4)

So, equation (1), (2) and (3) gives the dimension of time.

265. Name of units of some physical quantities are given in Column I and their dimensional formulae are given in Column II. Match the following Columns and choose the correct answer.

	Column I		Column II
(A)	Pa-s	(1)	$[L^2T^{-2}K^{-1}]$
(B)	$Nm\text{-}K^{-1}$	(2)	$[MLT^{-3}K^{-1}]$
(C)	$J\ kg^{-1}\ K^{-1}$	(3)	$[ML^{-1}T^{-1}]$
(D)	$Wm^{-1}\ K^{-1}$	(4)	$[ML^2T^{-2}K^{-1}]$

Codes:

	(A)	(B)	(C)	(D)		(A)	(B)	(C)	(D)
(a)	(4)	(3)	(1)	(2)	(b)	(3)	(2)	(4)	(1)
(c)	(3)	(1)	(4)	(2)	(d)	(3)	(4)	(1)	(2)

EAMCET-2005

Ans. (d) :

(A) $Pa - s = \frac{N}{m^2} \cdot s = [ML^{-1}T^{-2}][T^1] = [ML^{-1}T^{-1}]$

(B) $NmK^{-1} = [MLT^{-2}][L][K^{-1}] = [ML^2T^{-2}K^{-1}]$

(C) $JKg^{-1}K^{-1} = [ML^2T^{-2}][M^{-1}][K^{-1}] = [M^0L^2T^{-2}K^{-1}]$

(D) $Wm^{-1}K^{-1} = [M^1L^2T^{-3}] [L^{-1}][K^{-1}] = [MLT^{-3}K^{-1}]$