PHYSICS

BOOKS - TARGET PHYSICS (MARATHI ENGLISH)

MEASUREMENTS

Classical Thinking Introduction

1. The atomic, molecular and nuclear phenomenon are the part of _____ domain.

A. macroscopic

B. microsopic

C. megascopic

D. electroscopic

Answer: b

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2. Nano size of gold has _____colour .

A. yellow

B. red

C. pink

D. orange

Answer: c

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3. Maxwell's equal relate to_____

A. law of gravition

B. basic laws of electromagenetism

C. laws of electrostatics

D. nuclear model of an atom

Answer: b

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Classical Thinking Need Of Measurements

1. _____is needed for the experimental veritfication of various theories .

A. unit

B. Symbol

C. Instrument

D. Measurement

Answer: d

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Classical Thinking Units Of Measurments

1. The reference standard used for the measurement of a physical quantity is called

A. standard quantity

B. dimension

C. constant

D. unit

Answer: d

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2. Which of the following in NOT a characteristic of a good unit ?

A. It is invariable

B. It is reproducible

C. It is perishable

D. It is easily available

Answer: c

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Classical Thinking System Of Units

1. Unit are classified into_____group.

A. 2

B. 4

C. 5

D. 6

Answer: a

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2. A set of fundamental and derived units is known as _____ .

A. supplementary units

B. system of units

C. complementary units

D. metric units

Answer: b

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3. The physical quantity having the same unit in all the systems of unit is _____ .

A. length

B. time

C. mass

D. foot

Answer: b

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Classical Thinking S I Units

1. S.I system of unit contains_____supplementary unit.

A. 7

B. 2

C. 4

D. many

Answer: b

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2. In which of following system, scientific data can be exchanged between different parts of the world?

A. M.K.S

B. C.G.S

C. F.P.S

D. S.I

Answer: d

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Classical Thinking Fundamental And Derived Units

1. Out of the following units, which is NOT a fundamental unit?

A. newton

B. second

C. punod

D. kg

Answer: a

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2. Temperature can be expressed as a derived quantity in terms of any of the following

A. length and mass

B. mass and time

C. length, mass and time

D. none of these

Answer: d

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3. Which of the following is NOT a derived unit?

A. joule

B. erg

C. dyne

D. mole

Answer: d

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4. Which of the following is the CORRECT way of writing units?

A. 25 ms length

B. 30kg

C. 5 Newton

D. 10 N

Answer: d

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5. Which one of the following methods is used to measure distance of a planet or a star from the earth?

A. echo

B. direct

C. parallax

D. paradox

Answer: c

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6. The mass of the body depends only on

A. temperature

B. pressure

C. quantity of matter contained in the body.

D. location of the body from the observer.

Answer: c

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7. Which of the following represents a unified atomic mass unit (lu)?

A. 8.333 of the mass of an atom of ^{12}C in kg

B. 0.8333 of the mass of an atoms of ^{12}C in g

C. 8.333 of the mass of an atoms of ^{12}C in g

D. 0.833 of the mass of an atom of ^{12}C in kg

Answer: d

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8. In cesium atomic clock_____ is used .

A. cesium-122 atom

B. cesium-132 atom

C. cesium-133 atom

D. cesium-134 atom

Answer: c

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9. A_____is the interval from one noon to the next noon.

A. mean solar day

B. solar day

C. lunar day

D. day

Answer: b

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10. Light year is a unit of

A. distance

B. time

C. temperature

D. luminous intensity

Answer: a

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11. Which of the following quantity is expressed as force per unit area

A. work

B. pressure

C. volume

D. density

Answer: b

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12. The physical quantity having the unit dyne g^{-1} is_____ .

A. velocity

B. mass

C. force

D. acceleration

Answer: d

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13. Write the SI unit of luminous intensity and the amount of substance.

A. watt, mol

B. lux, m

C. lumen

D. candela, mol

Answer: d

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14. Which of the following is a supplementary unit ?

A. Steradian

B. candela

C. kelvin

D. pascal

Answer: a

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15. The pessure of 10^3 dyne/cm^3 is equivalent to

A. $10N/m^2$

B. $10^2N/m^2$

C. $10^{-2}N/m^2$

D. $10^{-1}N/m^2$

Answer: b

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Classical Thinking Dimensional Analysis

1. $\left[L^{-1}M^{1}T^{-2}\right]$ are the dimensions of

A. joule constant

B. gravitational constant

C. pressure

D. force

Answer: c

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2. Checking the correctness of equations using the method of dimensions is based on

A. equality of inertial frame of reference.

B. the types of system of units

C. the method of measurement

D. principal of homogeneity of dimension.

Answer: d

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3. Choose the correct option.

A unitless quantity

A. always has a non - zero dimension.

B. may have a non - zero dimension .

C. never has a zero dimension.

D. has no fimensions.

Answer: d

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4. Which of the following in NOT a dimensionless quantity ?

A. angle

B. strain

C. specific gravity

D. density

Answer: d

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5. The unit of plane angle is radian , hence its dimension are

A. $\left[M^0L^0T^0\right]$

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

C. $\left[M^0L^1T^{-1}\right]$

D. $\left[M^1L^0T^{-1}\right]$

Answer: a

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6. Dimesional equation CANNOT be used

A. to check the correctness

B. to drive the relation between different physical quantities.

C. to find out constant of proportionality which may be pure number

D. to change from one system of units to another system

Answer: c

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7. If the dimensional formula for the physical quantity is $\left[M^1L^2T^{-2}\right]$ then the physical quantity is _____ .

A. torque

B. impulse

C. force

D. force per unit area

Answer: a

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8. If the dimensions of a physical quantity are given by $\left[L^a, M^b T^c\right]$,then the physical quantity will be

A. force ,if a = -1 , b=0,c=- 2

B. pressure, if a=-1,b=1,c=-2

C. velocity , if a =1, b=0,c=1

D. acceleration , if a=1,b=1,c=2

Answer: b

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Classical Thinking Order Of Magnitude And Significant Figure

1. The value of the magnitude rounded off to the nearest integral power of 10 is called

A. significant figure

B. uncertain number

C. significant number

D. order of magnitude

Answer: d

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2. Order of magnitude of $\left(10^6 + 10^3\right)$ is

A. 10^8

B. 10^9

C. 10^6

D. 10^3

Answer: c

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3. The length of a rod is 0.5×10^2 m , the order of magnitude of the length of the rod is

A. $10^3 m$

B. $10^2 m$

C. $10^1 m$

D. $10^{-1} m$

Answer: b

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4. The charge on the electron is 1.6×10^{-19} C

. The order of magnitude is

A. $10^{19}C$

B. $10^{18}m$

C. $10^{-18}C$

D. $10^{-19}C$

Answer: d

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5. Significant figures depends upon the _____ of the measuring instrument .

A. length

B. readings

C. number

D. accuracy

Answer: d

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6. The number of significant figures in 0.0009 is

A. 4

B. 3

C. 2

D. 1

Answer: d

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7. The number of significant figures in 0.400 is

A. 1

B. 2

C. 3

D. 4

Answer: c

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8. The number of significant figures 0.0500 is

A. 4

B. 3

C. 2

D. 1

Answer: b

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9. State the number of significant figures in 6.032 J .

A. 4

B. 3

C. 2

D. 1

Answer: a

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Classical Thinking Accuracy And Errors In Measurements

1. The different between the true value and measured value is called _____.

A. mistake

B. error

C. significant figure

D. fault

Answer: b

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2. If the pointer of the voltmetre is not exactly at the zero of the scale, then the error is called

A. instrumental error

B. systematic error

C. personal error

D. random error

Answer: b

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3. Zero error of an instrument introduces

A. systematic error

B. random error

C. instrumental error

D. none of these

Answer: a

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4. Accidental error can be minimised by

A. taking only one reading

B. taking small magnitude of the quantity.

C. selecting instrument with greater least conunt

D. selecting instrument with small least count.

Answer: d

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5. Zero error of an instrument introduces

A. faulty construction of instrument

B. wrong setting of instrument

C. lack of concentration of observer

D. worng procedure of handling the instrument .

Answer: a

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6. Error due to non-removl of parallax between pointer and its image in case of magnetic compass needle causes____.

A. instrumental error

B. persistant error

C. personal error

D. random error

Answer: c

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7. Instrumental error can be minimised by

A. taking large number of readings

B. using different accurate instrument for the same reading

C. adjusting zero of the instrument

D. mainataining the temperature of the surrounding.

Answer: b

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8. The magnitude of the difference between mean value and each individual value is called _____ .

A. absolute error

B. error in reading

C. most probable error

D. true error

Answer: a

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9. The formula for percentage error is

A. Percentage error $\frac{|\Delta a_m|}{a_m} \times 100\,\%$

B. Perecentage error $= \frac{1}{n}\sum_{i=1}^{n} |\Delta a_i| \times 100\,\%$

C. Percentage error $= \frac{a_m}{|\Delta a_m|} \times 100\,\%$

D. Percentage error $\frac{1}{n}\sum_{i=1}^{n} a_i \times 100\,\%$

Answer: a

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10. If $Y = a/b$, the maximum percentage error in the measurement of Y will be

A. $\dfrac{\Delta a/a}{\Delta b/b}$

B. $\dfrac{\Delta a}{a} + \dfrac{\Delta b}{b}$

C. $\dfrac{\Delta a}{a} - \dfrac{\Delta b}{b}$

D. $\dfrac{\Delta b/b}{\Delta a/a}$

Answer: b

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11. Given : $l_i = 44.2 \pm = 0.1$ and $l_2 = 23.1 \pm 0.1$ the uncertainty in $l_1 + l_2$ is

A. 0

B. 0.1

C. 0.2

D. 0.4

Answer: c

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12. Two resistance $R_1 = 50 \pm 2$ ohm and $R_2 = 60$ ohm connected in series , the equivalent resistance of the series combination in

A. (110 ± 4) ohm

B. (110 ± 2) ohm

C. (110 ± 5) ohm

D. (110 ± 6) ohm

Answer: c

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13. If $x = a^n$ then relative error is (when n is power of a).

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14. Thickness of the paper mesaured by micrometer screw gauge of least count 0.01 mm is 1.03 mm, the percentage error in the measurement of thickness of paper is

A. $1.1\ \%$

B. 1%

C. 0.97%

D. 0.8%

Answer: c

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Classical Thinking Miscellaneous

1. One micron is related to centimetre as

A. 1 micron = 10^{-8} cm

B. 1 micron =$10^{-6}cm$

C. 1 micron = 10^{-5} cm

D. 1 micron = $10^{-4}cm$

Answer: d

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Critical Thinking Units Of Measurements

1. If u_1 and u_2 are the units selected in two systems of measurement and n_1 and n_2 their numerical values, then

A. $n_1u_1 = n_2u_2$

B. $n_1u_1 + n_2u_2 = 0$

C. $n_1n_2 = u_1u_2$

D. $(n_1 + u_3) = (n_2 + u_2)$

Answer: a

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Critical Thinking System Of Units

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

A. S.I

B. M.K.S

C. F.P.S

D. C.G.S

Answer: a

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Critical Thinking Fundamental And Derived Units

1. The physical denote by

$$\frac{\text{mass} \times \text{pressure}}{\text{density}}$$

A. force

B. momentum

C. angular momentum

D. work

Answer: d

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2. Universal time is based on

A. rotation of the earth on it axis

B. Earth's orbital motion around the sum .

C. vibration of cesium atom

D. oscillation of qartz crystal

Answer: c

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3. 1 a.m.u is equivalent to

A. $1.6 \times 10^{-27} kg$

B. 934 Me

C. 1.6×10^{-24} kg

D. All of the above

Answer: d

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4. The S.I. unit of momentum is

A. $\frac{kg}{m}$

B. $\frac{kgm}{s}$

C. $\frac{kgm^2}{s}$

D. $(kg \times \quad \text{newton})$

Answer: b

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5. Curie is a unit of

A. energy of γrays

B. half life

C. radioactivity

D. intensity of γrays

Answer: c

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6. $S = A\left(1 - e^{Bxt}\right)$, where S is speed and x is displacement. The units of B is

A. $m^{-1}s^{-1}$

B. $m^{-2}s$

C. s^{-2}

D. s^{-1}

Answer: a

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7. To determine the young's modulus of a wire , the formula is $Y = \frac{F}{A} . \frac{L}{\Delta l}$, where L = l ength ,A = area of cross - section of the wire , ΔL = change in the length of the wire when streched with a force F. Find the conversion factor to change it from CGS t o MKS system.

A. 1

B. 10

C. 0.1

D. 0.01

Answer: c

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8. The moon subtends an angle of 57 minutes at the base line equal to radius of earth. What is the distance of moon from earth. Given radius of earth is 6400 km.

A. 11.22×10^9m

B. $3.86 \times 10^8 m$

C. 3.68×10^9 m

D. 3.68×10^8 m

Answer: b

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9. The angular diameter of the sun is 1920". If the distance of the sun from the earth is 1.5×10^{11}m, what is the linear diameter of the sun ?

A. $2.6 \times 10^9 m$

B. $0.7 \times 10^9 m$

C. 5.2×10^9m

D. 1.4×10^9 m

Answer: d

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Critical Thinking Dimensional Analysis

1. The fundamental physical quantities quantities that have same dimension in the

dimensional formula of Torque and Angular Momentum are

A. mass, time

B. time , length

C. mass, length

D. time,mole

Answer: c

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2. Which one of the following represents the correct dimensions of the coefficient of viscosity?

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

B. $\left[M^1L^{-1}T^{-1}\right]$

C. $\left[M^1L^{-1}T^{-1}\right]$

D. $\left[M^1L^{-2}T^{-2}\right]$

Answer: b

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3. Dimensions of electrical resistence are

A. $\left[M^1L^2T^2I^{-1}\right]$

B. $\left[M^1L^2T^2I^{-1}\right]$

C. $\left[M^1L^1T^{-3}I^{-2}\right]$

D. $\left[M^1L^2T^{-3}I^{-2}\right]$

Answer: d

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4. The dimensions of length in electric field, electric flux and electric dipole moment are respectively

A. L, L^2, L^3

B. L^3, L^2, L

C. L^{-1}, L^3, L^3

D. L, L^3, L

Answer: d

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5. If L denotes the inductance of an inductor through which a current i is flowing, the dimensions of Li^2 are

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

B. Not expressible in LMT

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

D. $\left[L^2M^2T^{-2}\right]$

Answer: a

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6. If the magnitude of length is halved and that of mass is double then dimension of force is

A. $\left[M^2L^{-2}T^{-2}\right]$

B. $\left[M^2L^{-1/2}T^{-2}\right]$

C. $\left[M^2L^{1/2}T^{-2}\right]$

D. $\left[M^1L^1T^{-2}\right]$

Answer: d

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7. Out of the following pairs, which one does NOT have identical dimensions?

A. Energy and moment of force

B. Work and torque

C. Density and surface energy

D. Pressure and stress

Answer: c

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8. Which of the following equations is dimensionally correct?

A. pressure = Energy per units volume

B. pressure = Energy per units area

C. pressure = Momentum $\times$ Volume $\times$ time

D. pressure = Force $\times$ area

Answer: a

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9. The dimensional formul for impulse is same as the dimensional formula for

A. acceleration

B. force

C. momentum

D. rate of change in momentum

Answer: c

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10. Which of the following pairs has the same dimensions?

A. Current density and charge density

B. Angualar momentum and momentum

C. Spring constant and surface energy

D. Force and torque

Answer: c

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11. A small steel ball of mass m and radius r is falling under gravity through a viscous liquid of coefficient of viscosity η. If g is the value of acceleration due to gravity. Then the terminal velocity of the ball is proportional to (ignore buoyancy)

A. $v \propto \frac{mgr}{\eta}$

B. $v \propto mg\eta r$

C. $v \propto \frac{mg}{\eta r}$

D. $v \propto \frac{\eta mg}{r}$

Answer: c

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12. A force F is given by $F = at + bt^2$, where t is time . What are the dimensions of a and b ?

A. $\left[M^1L^2T^{-1}\right]$ and $\left[M^1L^1T^0\right]$

B. $\left[M^1L^1T^{-3}\right]$ and $\left[M^1L^1T^{-4}\right]$

C. $\left[M^1L^1T^{-4}\right]$ and $\left[M^1L^1T^1\right]$

D. $\left[M^1L^{-3}T^1\right]$ and $\left[M^1L^1T^{-4}\right]$

Answer: b

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13. Write the dimensions of a/b in the relation $F = a\sqrt{x} + bt^2$ where F is force x is distance and t is time.

A. $\left[M^0L^0T^{-2}\right]$

B. $\left[M^0L^{1/2}T^2\right]$

C. $\left[M^0L^{1/2}T^2\right]$

D. $\left[M^0L^{-1/2}T^2\right]$

Answer: c

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14. For the equation $F = A^a v^b d^c$ where F is force, A is area, v si velocity and d is density with the dimensional anaysis gives the following values for the exponents.

A. 1,2,1

B. 2,1,1

C. 1,1,2

D. 0,1,1

Answer: a

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15. Using the principle of homogeneity of dimensions, find which of the following relation is correct? [T is the period, a is the redius of the orbit and M is the mass of the sun.

A. $T^2 = \frac{4\pi^2 a^3}{G}$

B. $T^2 = \frac{4\pi^2 a^3}{GM}$

C. $T^2 = 4\pi^2 a^3$

D. $T^2 = \frac{4\pi^2 a^3}{GM^2}$

Answer: b

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16. The period T of a soap bubble under SHM is given by $T = P^a D^b S^c$, where P is pressure, D, is density and S is surface tension. Then the values of a, b and c are

A. $-\frac{3}{2}, \frac{1}{2}, 1$

B. $-1, \ -2, 3$

C. $\frac{1}{2}, \ -\frac{3}{2} - \frac{1}{2}$

D. $1, 2, \frac{1}{3}$

Answer: a

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17. The equation of a wave is given by $Y = A \sin \omega \left(\frac{x}{v} - k \right)$, where ω is the angular

velocity and v is the linear velocity. Find the dimension of k.

A. LT

B. T

C. T^{-1}

D. T^2

Answer: b

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18. The dimensions of $\frac{a}{b}$ in the equation $P = \frac{a - t^2}{bx}$ where P is pressure, x is distance and t is time are

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

B. $\left[M^1 L^0 T^{-2}\right]$

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

D. $\left[M^1 L^{-2} T^2\right]$

Answer: b

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19. The equation of the state of some gases can be expressed as $\left(P+\frac{a}{V^2}(V-b)=RT\right.$. Here P is the pressure, V is the volume, T is the absolute temperature and a, b, R are constants. The dimensions of $\frac{a}{b}$ are

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

B. $\left[ML^{-1}T^{-2}\right]$

C. $\left[M^0L^3T^0\right]$

D. $\left[M^0L^6T^0\right]$

Answer: a

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20. If the speed of light c, acceleration due to gravity (g) and pressure (p) are taken as the fundamental quantities then the dimension of gravitational constant is

A. $\left[c^2 g^0 p^{-2}\right]$

B. $\left[c^0 g^2 p^{-1}\right]$

C. $\left[c g^3 p^{-2}\right]$

D. $\left[c^1 g^0 p^{-1}\right]$

Answer: b

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21. The value of acceleration due to gravity is $980 cms^{-2}$. What will be its value if the unit of length is kilometer and that of time is minute?

A. 980 km $\min^3$

B. 98 km $\min^3$

C. 35.28 km $\min^{-2}$

D. 28.35 km $\min^{-2}$

Answer: c

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Critical Thinking Order Of Magnitude And Significant Figure

1. Choose the correct option.

The magnitude of any physical quantity can be expressed as $A \times 10^n$ where n is a number called order of magnitude and A is

A. $0.1 \leq A \leq 1$

B. $0.5 \leq A < 5$

C. $5 \leq A < 9$

D. $1 \leq A > 9$

Answer: b

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2. The radius of the earth is 6400 km, the order of magnitude is

A. 10^7m

B. 10^4m

C. 10^3m

D. $10^2 m$

Answer: a

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3. The radius of the earth of 49 and the order of magnitude of 51

A. is same

B. differs by 1

C. is 1

D. is 2

Answer: b

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4. Find the number of seconds in 1 year. Express them in order magnitude.

A. $8.64 \times 10^4 s, 10^5 s$

B. $6.84 \times 10^4 s, 10^4 s$

C. $8.64 \times 10^5 s, 10^5 s$

D. $6.85 \times 10^4 s, 10^5 s$

Answer: a

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5. Figure which is of some significance but it does not necessarily denote certainty is defined as _____

A. special figures

B. characteristic figures

C. unknown figures

D. siginficant figure

Answer: d

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6. The number of significant figures in all the given numbers 25.12, 2009, 4.156 and 1.217×10^{-4} is

A. 1

B. 2

C. 3

D. 4

Answer: d

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7. The value of $\pi/53.2$ with due regard to singificant figures is,

A. 13.000

B. 13.00

C. 13.0

D. 13

Answer: c

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8. In the reading 2.614 cm of measurement with a vernier calliper, only uncertain figure is

A.

B.

C.

D.

Answer: c

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9. The side of a rectangle are 6.01 m and 12 m Taking the significant figures into account , the area of the rectangle is

A. $72.00cm^2$

B. $72.1cm^2$

C. $72m^2$

D. $72.12cm^2$

Answer: c

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Critical Thinking Accuaray And Errors In Measurements

1. Estimate the mean absolute error from the following dat1 .

20.17,21.23,20.79,22.07,21.78

A. 0.85

B. 0.58

C. 0.03

D. 0.01

Answer: b

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2. In the expression $A = \frac{xy^3}{Z^2}$ the percentage error is given by

A. $\left(\frac{\Delta x}{x} + 3\frac{\Delta y}{y} - 2\frac{\Delta z}{z}\right) \times 100\,\%$

B. $\left(\frac{\Delta x}{x} + \frac{3\Delta y}{y} + \frac{2\Delta z}{z}\right) \times 100\,\%$

C. $\left(\frac{\Delta x}{x} - \frac{3\Delta y}{y} - \frac{2\Delta z}{y}\right) \times 100\,\%$

D. $\left(\frac{\Delta x}{x} - 3\frac{\Delta y}{y} + 2\frac{\Delta z}{z}\right) \times 100$

Answer: b

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3. The least count of a screw gauge is 0.005 cm . The diameter of wire is 0.02 cm as measured by it. The percentage error in measurement is

A. 0.25

B. 0.2

C. 0.15

D. 0.05

Answer: a

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4. The error in measurement of radius of a sphere is 0.1% then error in its volume is -

A. $0.1\ \%$

B. $0.2\ \%$

C. $0.25\ \%$

D. $0.3\ \%$

Answer: d

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5. The pressure on a square plate is measured by measuring the force on the plate and the length of the sides of the plate. If the maximum error in measurement of force and length are respectively 4% and 2%, the maximum error in the measurement of pressure is

A. 0.01

B. 0.02

C. 0.06

D. 0.08

Answer: d

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6. The percentage error in the measurment of mass of a body is 0.75% and the percenatage error in the measurement of its speed is 1.85%. Then the percentage error in the measurement of its kinetic energy is

A. 7.05 %

B. $4.45\ \%$

C. $2.6\ \%$

D. $1.1\ \%$

Answer: b

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7. The error in the measurement of length (L) of time simple pendulum is 0.1% and the error in the period (T) is 3%. The maximum possible error in the measurement of $\frac{L}{T^2}$ is

A. 2.9%

B. 3.1%

C. 5.9%

D. 6.1%

Answer: d

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8. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$ where l is

about 100 cm and is known to have 1 mm accuracy. The period is about 2 s. The time of 100 oscillation is measured by a stop watch of least count 0.1 s. The percentage error is g is

A. 0.1%

B. 1%

C. 0.3%

D. 0.8%

Answer: c

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9. The length , breadth and height of a rectangular block of wood were measured to be $l = 13.12 \pm 0.02cm, b = 7.18 \pm 0.01$ cm, $h = 4.16 \pm 0.02$ cm

The perecentage error in the volume of the block will be .

A. 0.07

B. $0.77\ \%$

C. $0.72\ \%$

D. $0.27\ \%$

Answer: b

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10. The heat dissipated in a resistance can be determined form the relation : $H = \frac{I^2 Rt}{4.2}$ cal .

If the maximum errors in the measurement of current , resistance , and time are 2%, 1%, and 1%, what would be the maximum error in the dissipated heat ?

A. 0.05

B. 0.04

C. 0.06

D. 0.5%

Answer: c

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Critical Thinking Miscellaneous

1. If momentum (p), area (A) and time$(t)$are taken to be fundamental quantities then energy has the dimensional formula

A. $\left[P^1A^{-1/2}T^{-1}\right]$

B. $\left[P^1A^{1/2}T^{-1}\right]$

C. $\left[P^2A^{-1}T^{-1}\right]$

D. $\left[P^1A^{-1}T^{-1}\right]$

Answer: b

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2. Assertion : Avogadro number is the number of atoms in one gram mole.

Reason : Avogadro number is a dimensionless constant.

A. Assertion is True ,Reason is True , Reason is a correct explanation for Assertion.

B. Assertion is True , Reason is True , Reason is not a correct explanation for Assertion

C. Assertion is True , Reason is False

D. Assertion is False , Reason is False

Answer: c

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3. Assertion : Avogadro number is the number of atoms in one gram mole.

Reason : Avogadro number is a dimensionless constant.

A. Assertion is True , Reason is True , Reason is a correct explanation for Assertion

B. Assertion in True , Reason is True , Reason is not a correct explanation for Assertion

C. Assertion is True, Reason in False

D. Assertion is False, Reason in False .

Answer: a

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Competitive Thinking Fundamental And Derived Units

1. S.I . Unit of surface tension is

A. $\frac{N}{m}$

B. $\frac{J}{m}$

C. $J - m$

D. $\frac{J}{m^2}$

Answer: d

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2. Which of the following is not the unit of energy ?

A. watt - hour

B. electron volt

C. N m

D. kgm^2s^{-2}

Answer: c

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3. What is dimension of a in Van der Waal's equations ?

A. Nm^2/mole

B. Nm^2/mole

C. N^2m/mole

D. m^2

Answer: d

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4. Units of a and b in van der Waal's equation $\left(P+\frac{an^2}{V^2}\right)(V-nb)=nRT$ are

Watch Video Solution

5. The S. I units of the constant in Wein's displacement law are

A. cmK^{-1}

B. mk

C. cm^2k^{-1}

D. cmk^{-2}

Answer: b

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6. Which of the following is the unit of specific heat

A. kcal / gm k

B. cal/gm k

C. j/kg k

D. erg / kg k

Answer: c

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7. A-s is unit of

A. capacitance

B. charge

C. energy

D. power

Answer: b

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8. S.I unit of specificf resistance is

A. Ωcm

B. Ωm

C. Ω / cm

D. mho-cm

Answer: b

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9. The unit of permeability of vacuum (μ_0) is _____ .

A. $\frac{N}{A}$

B. $\frac{N}{A^2}$

C. NA

D. $\frac{J}{A^2}$

Answer: b

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10. 1 Tesla =

A. 1 Wb/m

B. 1 J/AM

C. 1 N/Am

D. 1Am/N

Answer: c

Watch Video Solution

11. Units of $'\lambda$ in rodiocativity is

A. m

B. $(\text{Unit of half life})^{-1}$

C. $(\text{year})^{-1}$

D. sec

Answer: b

Watch Video Solution

12. If $x = at + bt^2$ where x is in meter (m) and t is in hour (hr) then unit of b will be .

A. m^2 / hr

B. m

C. m / hr

D. m / hr^2

Answer: d

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13. If the unit of length and force be increased four times, then the unit of energy is

A. increased 4 times

B. increased 8 times

C. increased 16 times

D. decreased 16 times

Answer: c

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14. The surface tension of a liquid is 10^8 dyne cm^{-1}. It is equivalent to

A. $10^7 N/m$

B. $10^6 N/m$

C. $10^5 N/m$

D. $10^4 N/m$

Answer: c

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Competitive Thinking Dimensional Analysis

1. If R and L represent respectively resistance and self inductance, which of the following combinations has the dimensions of frequency

A. $\sqrt{\frac{L}{R}}$

B. $\frac{L}{R}$

C. $\sqrt{\frac{R}{L}}$

D. $\frac{R}{L}$

Answer: b

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2. A quantity X is given by $\in_0 L\frac{\Delta V}{\Delta t}$, where $\in_0$ is the permittivity of free space, L is a length, ΔV is a potential difference and Δt is a time interval. The dimensional formula for X is the same as that of -

A. Resistance

B. Charge

C. Voltage

D. Current

Answer: d

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3. Planck constant has the same dimensions as

A. energy

B. angular momentum

C. mass

D. force

Answer: b

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4. The dimensions of Planck's constant is the same as the product of

A. Force and time

B. Force, displacement and time

C. Force and velocity

D. Force and displacement

Answer: b

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5. Which of the following set have different dimensions?

A. Pressure, Young's modulus , stress

B. e.m.f potential difference , electric potential

C. Heat , work done energy

D. dipole moment , electric flux, electric field

Answer: d

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6. The dimension of universal gravitational constant are

A. $\left[ML^2T^{-1}\right]$

B. $\left[M^{-1}L^3T^{-2}\right]$

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

D. $\left[ML^3T^{-2}\right]$

Answer: b

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7. Dimensions of angular momentum is

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

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

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

D. $\left[M^1L^0T^{-1}\right]$

Answer: c

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8. The dimensions of $\varepsilon_0\mu_0$ are

A. $\left[M^0L^{-2}T^2\right]$

B. $\left[M^0L^2T^{-2}\right]$

C. $\left[M^0L^1T^{-1}\right]$

D. $\left[M^0L^{-1}T^1\right]$

Answer: c

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9. The surface tension is $T = \frac{F}{l}$, then the dimensions of surface tension is

A. $\left[M^1 L^2 T^2\right]$

B. $\left[M^1 L^0 T^{-2}\right]$

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

D. $\left[M^0 L^0 T^{-2}\right]$

Answer: b

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10. Dimension of force constant is given by

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

B. $\left[M^0L^1T^{-1}\right]$

C. $\left[M^1L^0T^{-2}\right]$

D. $\left[M^1L^0T^{-1}\right]$

Answer: c

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11. The dimensions of k in equation F = kx are

A. $\left[M^1L^0T^{-2}\right]$

B. $\left[M^0L^1T^{-1}\right]$

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

D. $\left[M^1L^0T^{-1}\right]$

Answer: a

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12. An object is moving through the liquid. The viscous damping force acting on it is proportional to the velocity. Then dimensions of constant of proportionality are

A. $\left[M^1L^{-1}T^{-1}\right]$

B. $\left[M^1L^1T^{-1}\right]$

C. $\left[M^0L^1T^{-1}\right]$

D. $\left[M^1L^0T^{-1}\right]$

Answer: d

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13. The dimensional formula for Reynold's number is

A. $\left[L^0 M^0 T^0\right]$

B. $\left[L^1 M^1 T^1\right]$

C. $\left[L^{-1} M^1 T^1\right]$

D. $\left[L^1 M^1 T^{-1}\right]$

Answer: a

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14. The unit of universal gas constant is

A. $\left[ML^2T^{-2}\theta^{-}\right]$

B. $\left[ML^2T^{-2}\theta\right]$

C. $\left[ML^3T^{3/2}T^{-2}\right]$

D. None of these

Answer: a

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15. The relation between force F and density d is $F = \frac{x}{\sqrt{d}}$.

The dimension of x is

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

B. $\left[L^{1/2}M^{1/2}T^{-2}\right]$

C. $\left[L^{-1}M^{1/2}T^{-2}\right]$

D. $\left[L^{1}M^{1/2}T^{-2}\right]$

Answer: a

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16. In the following dimensionally correct equation $F = \frac{X}{\text{Linear Density}}$, where F is the force. What is the dimensional formula for X?

A. $\left[M^2L^0T^{-2}\right]$

B. $\left[M^0L^0T^{-1}\right]$

C. $\left[L^2T^{-2}\right]$

D. $\left[M^0L^2T^{-2}\right]$

Answer: a

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17. The units of constants a in van der Waal's equation is

A. $\left[M^1L^{-1}T^{-2}mol^{-2}\right]$

B. $\left[M^1L^3T^{-2}mol^{-2}\right]$

C. $\left[M^1L^5T^{-2}mol^{-2}\right]$

D. $\left[M^1L^3T^{-2}mol^{-1}\right]$

Answer: c

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18. Let $[\in_0]$ denote the dimensional formula of the permittivity of vacuum. If M= mass, L=length, T=Time and A= electric current, then:

A. $[\varepsilon_0] = [M^1 L^{-3} T^2 A]$

B. $[\varepsilon_0] = [M^{-1} L^{-3} T^4 A^2]$

C. $[\varepsilon_0] = [M^{-1} L^{-3} T^4 A^2]$

D. $[M^0 L^0 T^0 A^0]$

Answer: b

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19. The dimensional formula for electric field is

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

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

C. $\left[M^1L^1T^3A^1\right]$

D. $\left[M^0L^0T^0A^0\right]$

Answer: c

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20. The dimensional formula of capacitance is _____. Take Q as the dimension formula of chagre .

A. $\left[M^1L^{-2}T^{-2}Q^{-2}\right]$

B. $\left[M^1L^2T^{-2}Q^{-2}\right]$

C. $\left[M^1L^1T^2Q^1\right]$

D. $\left[M^{-1}L^{-2}T^2Q^2\right]$

Answer: d

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21. The dimensions of $\frac{1}{2} \in_0 E^2$, where $\in_0$ is permittivity of free space and E is electric field, is :-

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

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

C. $\left[L^2 M^1 T^2\right]$

D. $\left[L^1 M^1 T^1\right]$

Answer: b

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22. Dimension of magnetic flux is

A. $\left[M^0L^1T^0A^1\right]$

B. $\left[M^0L^{-3}T^0A^1\right]$

C. $\left[M^0L^1T^1A^{-1}\right]$

D. $\left[M^0L^2T^0A^1\right]$

Answer: a

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23. Select the dimensional formula of $B^2/2\mu_0$

.

A. $\left[M^1L^1T^0A^1\right]$

B. $\left[M^0L^{-3}T^{-2}A^{-1}\right]$

C. $\left[M^0L^1T^1A^{-1}\right]$

D. $\left[M^0L^2T^0A^1\right]$

Answer: d

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24. Dimensional formula of magnetic flux is

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

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

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

D. $\left[M^1L^{-1}T^{-2}\right]$

Answer: b

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25. The dimensional formula of mobility is _____ .

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

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

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

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

Answer: d

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26. Dimensions of solar constant are

A. $\left[MLT^{-2}\right]$

B. $\left[M^0L^0T^0\right]$

C. $\left[ML^0T^{-3}\right]$

D. $\left[M^0LT^{-3}\right]$

Answer: c

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27. The velocity v of a particle at time t is given by $v = at + \frac{b}{t+c}$, where a, b and c are constants. The dimensions of a, b, c are respectively :-

A. L,LT and T^2

B. LT^{-2}, L and T

C. L^2, T and LT^3

D. LT^3, LT and L

Answer: b

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28. If E,M,J and G respectively denote energy , mass angular momentum and gravitational constant then $\frac{EJ^2}{M^5G^2}$ has the dimensions of .

A. length

B. angle

C. mass

D. time

Answer: b

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29. The function f is given by $f = A\sin\alpha x + B\cos\beta t$, where x is displacement and t is the time. The dimensions of α / β is

A. velocity^-1

B. velocity gradient

C. angualr velocity

D. angular momentum

Answer: a

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30. $X = 3YZ^2$ find dimension of Y in (MKSA) system, if X and Z are the dimension of capacity and magnetic field respectively

A. $\left[M^{-3}L^{-2}T^{-4}A^{-1}\right]$

B. $\left[M^{1}L^{-2}\right]$

C. $\left[M^{-3}L^{-2}T^{4}A^{4}\right]$

D. $\left[M^{-3}L^{-2}T^{8}A^{4}\right]$

Answer: d

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31. Plank 's constant (h) speed of light in vacuum (C) and newton 's gravitational constant (G) are three fundamental constant .Which of the following combinations of these has the dimension of length?

A. $\sqrt{\frac{Ge}{h^{\frac{1}{2}}}}$

B. $\frac{\sqrt{hG}}{c^{3/2}}$

C. $\frac{\sqrt{hG}}{c^{5/2}}$

D. $\sqrt{\frac{hc}{G}}$

Answer: b

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32. A spherical liquid drop is placed on a horizontal plane . A small distrubance cause the volume of the drop to oscillate . The time period oscillation (T) of the liquid drop depends on radius (r) of the drop , density (ρ)

and surface tension tension (S) of the liquid. Which amount the following will be be a possible expression for T (where k is a dimensionless constant)?

A. $k\sqrt{\frac{\rho r}{S}}$

B. $k\sqrt{\frac{\rho^2 r}{S}}$

C. $k\sqrt{\frac{\rho^2 r}{S}}$

D. $k\sqrt{\frac{\rho r^2}{S^2}}$

Answer: c

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33. A physical energy of the dimension of length that can be formula cut of c, G and $\frac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of light G is universal constant of gravilation e is change

A. $\frac{1}{c^2}\left[G\frac{e^2}{4\pi \in_0}\right]^{1/2}$

B. $c^2\left[G\frac{e^2}{4\pi \in_0}\right]^{1/2}$

C. $\frac{1}{c^2}\left[\frac{e^2}{G4\pi \in_0}\right]^{1/2}$

D. $\frac{1}{e}G\frac{e^2}{4\pi \in_0}$

Answer: a

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34. In the relation, $P = \frac{\alpha}{\beta} e^{\frac{\alpha Z}{k\theta}} P$ is pressure, Z is distance, k is Boltzmann constant and θ is the temperature. The dimensional formula of β will be-

A. $\left[M^0 L^2 T^0\right]$

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

C. $\left[M^1 L^0 T^{-1}\right]$

D. $\left[M^0 L^2 T^{-1}\right]$

Answer: a

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35. The number of significant figure in 0.002305 is

A. 6

B. 4

C. 7

D. 2

Answer: b

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36. The respective number of signficant figures for the numbers $23.023, 0.0003 \text{ and } 2.1 \times 10^{-3}$ are

A. 4,4,2

B. 5,1,2

C. 5,1,5

D. 5,5,2

Answer: b

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37. In a experiment the angle are required to be measured using an instrument. 26 divisions of the main scale exactly coincide with the 30 divisions of the vernier scale . If the smallest division of the main scale is half -a-degree $(=0.5^{\circ})$ then the least count of the instrument is .

A. one minute

B. half minute

C. one degree

D. half degree

Answer: a

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38. A vernier calipers has $1mm$marks on the main scale. It has 20 equal divisions on the Verier scale which match with 16 main scale

divisions. For this Vernier calipers, the least count is

A. 0.02 cm

B. 0.05 cm

C. 0.1 mm

D. 0.2 mm

Answer: d

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39. The diameter of a cylinder is measured using a Vernier callipers with no zero error. It is found that the zero of the Vernier scale lies between $5.10cm$ and $5.15cm$ of the main scale. The Vernier scale has 50 divisions equivalent to $2.45cm$. The 24^{th} division of the Vernier scale exactly coincides with one of the main scale divisions. the diameter of the cylinder is

A. 5.112 cm

B. 5.124 cm

C. 5.136 cm

D. 5.148 cm

Answer: b

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40. A student measured the length of a rod and wrote it as 3.50 cm. Which instrument did he use to measure it ?

A. A meter scale

B. A vernier calliper where the 10 divisions in vernier scale matches with 9 division in main scale and main scale has 10 divisions in 1 cm

C. A screw gauge having 100 divisions in the circular scale and pitch as 1 mm

D. A screw gauge having 50 divisions in the circular scale and pitch as 1mm

Answer: b

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41. In a vernier callipers, one main scale division is x cm and n divisions of the vernier scale coincide with (n-1) divisions of the main scale. The least count (in cm) of the callipers is :-

A. $\left(\frac{n-1}{n}\right) \times n$

B. $\frac{nx}{(n-1)}$

C. $\frac{x}{n}$

D. $\frac{x}{(n-1)}$

Answer: c

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42. A screw gauge gives the following reading when used to mesure the diametre of a wire.

Main scale reading : $0mm$

Circular scale reading : $52 \div isions$

Given that $1mm$ on main scale corresponds to 100 divisions of the circular scale. the diameter of wire from the above data is :

A. 0.52 cm

B. 0.052 cm

C. 0.026 cm

D. 0.005 cm

Answer: b

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43. A spectrometer gives the following reading when used to measure the angle of a prism.

Main scale reading =58.5 degree

Vernier scale reading =0.9 divisions

Given that 1 divisions on main scale corresponds to 0.5 degree. Total divisions on the vernier scale is 30 and match with 29 divisions of the main scale. the angle of the prism from the above data is :

A. 58.59 degree

B. 58.77 degree

C. 58.65 degree

D. 59 degree

Answer: a

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Competitive Thinking Accuray And Errors In Measurements

1. Choose the INCOREET statement out of the folloiwng .

A. Every measurement by any measuring instrument has some error.

B. Every calculated physical quantity that is based on mesured values has some error

C. A measurement can have more accuracy but less precision and vice versa

D. The percentage error is different form relative error

Answer: d

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2. Assertion: The error in the measurement of radius of sphere is $0.3\,\%$. The permissible error in its surface area is $0.6\,\%$.

Reason: The permissible error is calculated by the formula $\frac{\Delta A}{A} = \frac{4\Delta r}{r}$.

A. Assertion is True , Reason in True , Reason is a correct explaintion for Assertion .

B. Assertion is True , Reason is True , Reason is not a correct explanation for

Assertion

C. Assertion is True , Reason in False

D. Assertion is False, Reason is False

Answer: c

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3. If $Y = a - b$, the maximum percentage error in the measurement of Y will be

A. $\left[\frac{\Delta a}{a-b} - \frac{\Delta b}{a-b}\right] \times 100$

B. $\left[\frac{\Delta a}{a-b}+\frac{\Delta b}{a-b}\right]\times 100$

C. $\left[\frac{\Delta a}{a}-\frac{\Delta b}{b}\right]\times 100$

D. $\left[\frac{\Delta a}{a}-\frac{\Delta b}{b}\right]\times 100$

Answer: b

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4. The radius of a sphere is (5.3 ± 0.1)cm` The percentage error in its volume is

A. $3+6.01\times\frac{100}{5.3}$

B. $\frac{1}{3} \times 0.01 \times \frac{100}{5.3}$

C. $\left(\frac{3 \times 0.1}{5.3}\right) \times 100$

D. $\frac{0.1}{5.3} \times 100$

Answer: c

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5. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the

current and the voltage difference are 3% each, then error in the value of resistance of the wire is

A. 0.06

B. Zero

C. 0.01

D. 0.03

Answer: a

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6. In an experiment four quantities a,b,c and d are measure with percentage error 1% , 2% , 3% ,and 4% respectively quantity is P is calculate as follow

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

A. 0.14

B. 0.1

C. 0.07

D. 0.04

Answer: a

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7. Let $x = \left[\frac{a^2b^2}{c}\right]$ be the physical quantity. If the percentage error in the measurement of physical quantities a,b, and c is 2,3 and 4 per cent respectively, then percentage error in the measurement of x is

A. 0.07

B. 0.14

C. 0.21

D. 0.28

Answer: c

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8. Two full turns of the circular scale of a screw gauge cover a distance of 1 mm on its main scale . The total number of divisions on the circular scale is 50. Further more it is found that the screw gauge has a zero error of - 0.02 mm . While measuring the diameter of a thin

wire , a student notes the main scale reading of 3 mm and the number of circular scale divisions in line with the main scale as 37. The diameter of the wire is

A. 3.73 cm

B. 3.67 cm

C. 3.38 cm

D. 3.32 cm

Answer: c

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9. A screw gauge with a pitch of $0.5mm$ and a circular scale with 50 divisions is used to measure the thickness of a thin sheet of Aluminum. Before starting the measurement, it is found that wen the jaws of the screw gauge are brought in c0ntact, the 45^{th} division coincide with the main scale line and the zero of the main scale is barely visible. what is the thickness of the sheet if the main scale readind is $0.5mm$ and the $25th$ division coincide with the main scale line?

A. 0.80 cm

B. 0.70 cm

C. 0.50 cm

D. 0.75 cm

Answer: a

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10. A student measured the diameter of a small steel ball using a screw gauge of least count $0.001cm$. The main scale reading is

$5mm$ and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of $-0.004cm$, the correct diameter of the ball is

A. $0.521cm$

B. $0.529cm$

C. 0.053 cm

D. 0.526 cm

Answer: d

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11. The density of a solid ball is to be determined in an experiment. The diameter of the ball is measured with a screw gauge, whose pitch is $0.5mm$ and there are 50 divisions on the circular scale. The reading on the main scale is $2.5mm$ and that on circular scale is 20 divisions. if the measured mass of the ball has a relative error of 2%, the relative percentage error in the density is

A. 0.9%

B. 2.4%

C. 3.1%

D. 4.2%

Answer: c

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12. A force $\vec{F}$ applied on a square plate of length L. If the percentage error in the determination of L is 3% and in F is 4% , the

permissible error in the calculation of pressure is

A. 0.13

B. 0.1

C. 0.07

D. 0.12

Answer: b

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13. The density of a material in the shape of a cube is determined by measuring three sides of the cube and its mass. If the relative errors in measuring the mass and length are respectively 1.5% and 1%, the maximum error in determining the density is:

A. 4.5%

B. 6%

C. 2.5%

D. 3.5%

Answer: a

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14. In the determination if Young's modulus $\left(\left(Y = \frac{4MLg}{\pi l d^2}\right.\right.$ by using searle's method, a wire of length $L = 2m$ and diameter $d = 0.5mm$ is used. For a load $M = 2.5kg$, an extension $l = 0.25mm$ in the length of the wire is observed. Quantites D and l are measured using a screw gauge and a micrometer, respectively. they have the same

pitch of $0.5mm$. the number of divisions on their circular scale is 100. the contrubution to the maximum probable error of the Y measurement

A. due to the errors in the measurements of d and l are the same.

B. due to the error is the measurement of d is twice that due to the error in the measurement of l.

C. due to the error in the measurement of is twice that due to the error in the

measurement of d.

D. due to the error in the measurement of d is four times that due to the error in the measurment of l.

Answer: a

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15. If the time period of a simple pendulum is $T = 2\pi\sqrt{l/g}$, then the fractional error in acceleration due to gravity is

A. $\frac{4\pi^2 \Delta l}{\Delta T^2}$

B. $\frac{\Delta l}{l} - 2\frac{\Delta l}{T}$

C. $\frac{\Delta l}{l} + 2\frac{\Delta T}{T}$

D. None of these

Answer: c

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16. A student measures the value of g with the help of a simple pendulum using the formula

$g = \frac{4\pi^2 L}{T^2}$. He measures length L with a meter scale having least count 1 mm and finds it 98.0 cm . The time period is measured with the help of a watch of least count 0.1s . The time of 20 oscillations is found to be 40.4 s. The error Δg in the measurment of g is $\left(\text{ in} m/s^2 \right)$.

A. $9.68\left[\frac{0.1}{98} + 0.1\right]$

B. $9.86\left[\frac{1}{98} + 0.1\right]$

C. $9.68\left[\frac{0.1}{98} + \frac{0.1}{20}\right]$

D. $9.68\left[\frac{1}{98} + \frac{1}{20}\right]$

Answer: a

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17. The period of oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{L}{g}}$. Meaured value of L is $20.0cm$ know to $1mm$ accuracy and time for 100 oscillation of the pendulum is found to be $90s$ using a wrist watch of $1s$ resolution. The accracy in the determinetion of g is :

A. 0.02

B. 0.03

C. 0.01

D. 0.05

Answer: b

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18. The following observations were taken for dtermining the surface tension of water by capillary tube method: diameter of capillary , $D = 1.25 \times 10^{-2} m$ and rise of water in

capillary , $h = 1.45 \times 10^{-2} m$. Taking $g = 9.80 ms^{-2}$ and using the relation $T = (rgh/2) \times 10^3 Nm^{-1}$, what is the possible error in measurement of surface tension T?

(a) 2.4% (b) 15% (c) 1.6% (d) 0.15%`

A. 0.15%

B. 1.5%

C. 2.4%

D. 10%

Answer: b

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Competitive Thinking Miscellaneous

1. One femtometer is equivalent to

A. 10^{15}m

B. $10^{-15}m$

C. $10^{-12}m$

D. 10^{12}m

Answer: b

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2. Which of the following units denotes the dimensions ML^2/Q^2, where Q denotes the electric charge ?

A. henry (H)

B. H/m^2

C. weber (Wb)

D. Wb/m^2

Answer: a

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3. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are

A. $\left[FVT^{-1}\right]$

B. $\left[FVT^{-2}\right]$

C. $\left[FV^{-1}T^{-1}\right]$

D. $\left[FV^{-1}T\right]$

Answer: d

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4. If energy (E) , velocity (V) and time (T) are chosen as the fundamental quantities , the dimensions formula of surface tension will be

A. $\left[EV^{-2}T^{-1}\right]$

B. $\left[EV^{-1}T^{-2}\right]$

C. $\left[EV^{-2}T^{-2}\right]$

D. $\left[E^{-2}V^{-1}T^{-3}\right]$

Answer: c

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5. If the velocity of surface wave (v) depends upon surface tension (T), coefficient of viscosity (η) and density (ρ) then the expression for v will be .

A. $\frac{T^2}{\rho\eta}$

B. $\frac{T}{\eta}$

C. $\frac{\eta\rho}{T^3}$

D. $\frac{\rho}{\eta}$

Answer: b

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6. The ratio of the dimension of Planck's constant and that of moment of inertia is the dimension of

A. angular

B. time

C. velocity

D. frequency

Answer: d

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Evaluation Test

1. When dimensions of a given physical quantity are given,the physical quantity is unique .

A. The statement and its converse both are true .

B. The statement is false but is converse is true.

C. The statement is true but its converse is true .

D. The statement is true but its convers is false .

Answer: c

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2. The quantities A and B are related by the relation $A/B = m$, where m is the linear mass density and A is the force , the dimensions of B will be

A. latent heat

B. pressure

C. work

D. momentum

Answer: a

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3. The reading of a constant potential difference are noted four times by a student. The student averages the zero error of the voltmeter . The average measurment of the potential difference is

A. percise and accurate

B. precise but not accurate

C. accurate but not precise

D. not accurate and not precise

Answer: b

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4. The 'rad' is the correct unit used to report the measurement of :

A. the rate of decay of radioactive source

B. the ability of a beam of gamma ray photons to produce ions in a target .

C. the energy delivered by radiation to a target

D. the biological effect of radiation .

Answer: d

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5. The dimension of magnetic field in M, L, T and C (coulomb) is given as

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

B. $\left[L^{-2}T^{2}C^{+2}\right]$

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

D. $\left[M^{1}L^{-2}T^{2}C^{2}\right]$

Answer: c

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6. Two full turns of the circular scale of a screw gauge cover a distance of 1 mm on its main scale . The total number of divisions on the circular scale is 50. Further more it is found

that the screw gauge has a zero error of - 0.02 mm . While measuring the diameter of a thin wire , a student notes the main scale reading of 3 mm and the number of circular scale divisions in line with the main scale as 37. The diameter of the wire is

A. 4.37 mm

B. 4.39 mm

C. 4.74 mm

D. 4.76 mm

Answer: b

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7. The potential energy of a particle varies with distance x from a fixed origin as $U = \frac{A\sqrt{x}}{x^2 + B}$, where A and B are dimensional constants, then find the dimensional formula for AB.

A. $\left[M^1 L^{7/2} T^{-2}\right]$

B. $\left[M^1 L^{11/2} T^{-2}\right]$

C. $\left[M^1 L^{5/2} T^{-2}\right]$

D. $\left[M^1 L^{9/2} T^{-2}\right]$

Answer: b

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8. Assertion : The number 37800 has three siginficant digits .

Reason : All non - zero digits are significant .

A. Assertion is True , Reason in True , Reason is a correct explantion for Assertion.

B. Assertion is True , Reason is True, Reason is not a correct explanation for Assertion .

C. Assertion is True , Reason in False .

D. Assertion is False but , Reason is False .

Answer: b

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9. If $A = B + \frac{C}{D+E}$ the dimensions of B and C are $\left[M^0LT^{-1}\right]$ and $\left[M^0LT^0\right]$, respectively . Find the dimensions of A, D and E.

A. $A = \left[M^0L^0T^{-1}\right], D = [T], E = [LT]$

B. $A = \left[MLT^0\right], D = \left[T^2\right], E = \left[T^2\right]$

C.

$A = \left[MLT^{-1}\right], D = [MT], E = [MT]$

D. $A = \left[M^0LT^{-1}\right], D[T], E = [T]$

Answer: d

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10. In the measurement of a physical quantity $X = \frac{A^2B}{C^{1/3}D^3}$. The percentage errors introduced in the measurement of the quantites A,B,C and D are 1%, 3% , 4% and 5% respectively . Then the minimum amount of percenatage of error in the measurment of X is contributed by

A. A

B. B

C. C

D. D

Answer: c

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11. If E = energy , G = gravitational constant , I = impulse and M = mass the dimension $\frac{GI^2M}{E^2}$

is same as that of

A. spring constant

B. wavelenght

C. energy gradient

D. Rydberg constant

Answer: b

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12. Choose the correct statement

A. A dimensionally correct equation must be correct .

B. A dimensionally correct equation may be correct

C. A dimensionally incorrect equations must be incorrect

D. A dimensionally incorrect equation may be correct

Answer: d

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13. Number of particles is given by $n = -D\frac{n_2 - n_1}{x_2 - x_1}$ crossing a unit area perpendicular to X-axis in unit time, where n_1 and n_2 are number of particles per unit volume for the value of x meant to x_2 and x_1. Find dimensions of D called as diffusion constant

A. $\left[M^0L^1T^2\right]$

B. $\left[M^0L^2T^4\right]$

C. $\left[M^0L^1T^{-3}\right]$

D. $\left[M^0L^2T^{-1}\right]$

Answer: d

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14. When a screw gauge is comletely closed, zero of circular scale is 4 divisions abvoe the reference line of graduation. If L.C of screw gauge is 10^{-3} cm, the zero error is

A. -4×10^{-3} cm

B. $+4 \times 10^{-3}$ cm

C. -0.004 mm

D. $+0.004$ mm

Answer: a

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15. Which of the following is not dimensionless?

A. `Relative refractive index

B. Relative permittivity

C. Relative density

D. Relative velocity

Answer: d

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16. The jaws of a vernier callipers touch the inner wall of calorimeter without any undue pressure. The position of zero of vernier scale on the main scale reads 3.48 cm. The 6^{th} of

vernier scale division is coinciding with any main scale division. Vernier constant of callipers is 0.01 cm. Find actual internal diameter of calorimeter, when it is observed that the vernier scale has a zero error of -0.03cm.

A. 3.37 cm

B. 3.57 cm

C. 3.42 cm

D. 3.54 cm

Answer: b

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17. The thin metallic strip of vernier callipers moves downward from top to bottom in such a way that it just touches the surface of beaker. Main scale reading of calliper is 6.4 cm whereas its vernier constant is 0.1 mm. The 4^{th} of vernier scale division is coinciding with main scale division. The actual depth of berker in mm is (when zero of vernier coincides with zero of main scale)

A. 6.64 cm

B. 6.42 cm

C. 6.44 cm

D. 6.13 cm

Answer: c

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