PHYSICS

AIMED AT STUDENTS PREPARING FOR IIT JEE EXAMS

UNITS AND MEASUREMENTS

Examples

1. Repeated observations in an experiment gave the values $1.29, 1.33, 1.34, 1.35, 1.32, 1.36, 1.30,$ and 1.33. Calculate the mean value, absolute eror , relative error, and percentage error.

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2. The length and breadth of a rectangle are $(5.7 \pm 0.1)cm$ and $(3.4 \pm 0.2)cm$, respectively calculate the area of rectangle with error limits.

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3. The displacement covered by a body in time $(5.0 \pm 0.6)sis(40.4 \pm 0.4)m$. Calculate the speed of the body . Also determine the percentage error in the speed.

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4. 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 :

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5. The currect voltage relation of diode is given by $1 = \left(e^{1000V/T} - 1\right)mA$, where the applied voltage V is in volt and the temperature T is in degree Kelvin. If a student makes an error measuring $\pm 0.01V$ while measuring the current of $5mA$ at $300K$, what will be error in the value of current in mA?

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6. in an experiment the angles are required to be using an instrument, 29 divisions of the main scale exactly coincide with the 30 divisions of the vernier scale. If the sallest division of the main scale is half- a degree ($= 0.5^{\circ}$, then the least count of the instrument is :

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7. A physical quantity X is represented by $X = (M^{x}L^{-y}T^{-z}$. The maximum percantage errors in the measurement of $M, L,$ and $T,$ respectively , are $a\%, b\%$ and $c\%$. The maximum percentage error in the measurement of X will be

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8. 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 measurment of the current and the voltage difference are 3% each, then error in the value of resistance of the wire iS :

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9. Two resistors of resistances $R_1 = 100 \pm 3$ ohm and $R_2 = 200 \pm 4$ ohm are connected (a) in series, (b) in parallel. Find the equivalent resistance of the (a) series combination, (b) parallel combination. Use for (a) the relation $R = R_1 + R_2$ and for (b) $\frac{1}{R'} = \frac{1}{R_1} + \frac{1}{R_2}$ and $\frac{\Delta R'}{R}'^2 = \frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}$

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

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11. Let $[\varepsilon_0]$ denote the dimensional formula of the permittivity of the vacuum, and $[\mu_0]$ that of the permeability of the vacuum. If $M = mass, L = \leq n > h, T = time$ and $I = e \leq ctriccurrent$

,

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

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13. Write the dimensions of a/b in the relation $P = \frac{a - t^2}{bx}$, where P is the pressure , x is the distance , and t is the time .

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14. Check whether the relation $S = ut + \frac{1}{2}at^2$ is dimensionally correct or not , where symbols have their usual meaning .

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15. Young's modulus of steel is $19 \times 10^{10} N/m^2$ Express it in dyne/cm^2. Here dyne is the CG unit of force.

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16. The centripetal force F acting on a particle moving uniformly in a circle may depend upon mass (m), velocity (v) and radius (r) of the circle . Derive the formula for F using the method of dimensions.

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17. Derive an expression for time period (t) of a simple penduleum, which may depend upon : mass of bob (m), length of pendulum (I) and acceleration due to gravity(g).

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18. If the velocity of light (c) , gravitational constant (G) , and Planck's constant (h) are chosen as fundamental units , then find the dimensions of mass in new system.

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19. If $E, M, J,$ and G , respectively , denote energy , mass , angular momentum , and gravitational constant , then EJ^2 / M^5G^2 has the dimensions of

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20. In the equation $\left(\frac{1}{p\beta}\right) = \frac{y}{k_B T}$, where p is the pressure, y is the distance, k_B is Boltzmann constant and T is the tempreture. Dimensions of β are

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21. The vander 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 absoulte temperature, R is molar gas constant a, b and c are vander Wall's constants. The dimensional formula for ab is

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22. A screw gauge having 100 equal division and a pitch of length $1mm$ is used to measue the diameter of a wire of length $5.6cm$. The main scale reading is $1mm$ and 47^{th} circular division coincides with the scale. Find the curved surface area of wire in cm^2 to appropriate significant fihure.

$$\left(use\pi = \frac{22}{7}\right.$$

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23. In Searl's experiment, which is used to find Young's Modulus of elasticity, the diameter of experimental wire is $D = 0.05cm$

(measured by a scale of least count $0.001 cm$) and length is $L = 110 cm$ (measured by a scale of least count $0.1 cm$). A weight of $50 N$ causes an extension of $X = 0.125 cm$ (measured by a micrometer of least count $0.001 cm$). find the maximum possible error in the values of Young's modulus. Screw gauge and meter scale are free error.

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24. The side of a cube is measured by vernier callipers (10 divisions of a vernier scale coincide with 9 divisions of main scale, where 1 division of main scale is $1 mm$). The main scale reads $10 mm$ and first division of vernier scale coincides with the main scale. Mass of the cube is $2.736 g$. find the density of the cube in appropriate significant figures.

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C.U.Q

1. The relability of a measurement depends on

A. Precision

B. accuracy

C. systematic error

D. random error

Answer: B

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2. The error due to resolution of measuring instument is

A. personal error

B. random error

C. systematic error

D. gross error

Answer: C

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3. The error due to resolution of a measuring instrument is

A. random error

B. personal error

C. gross error

D. least count error

Answer: D

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4. The random error which exists invariably in screw gauge is

A. least count error

B. Zero error

C. gross error

D. backlash error

Answer: D

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5. The errors whch are estimated by statistical methods are

A. systematic errors

B. random errors

C. theoretical errors

D. gross errors

Answer: B

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6. The meaure of accuracy is

A. absoulte error

B. relative error

C. percentage error

D. both 2 and 3

Answer: D

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7. The decrease in percentage error

A. increases the accuracy

B. does not effect the accuracy

C. decreases the accuracy

D. both 2 and 3

Answer: A

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8. In a measurement both positive and negative errors are found to occur with equal probablaity. The type of erros is

A. proportional errors

B. systematic errors

C. determinate errors

D. both 2 and 3

Answer: D

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9. The erros that always occur in the measurement with screw gauge is

A. random errors

B. systematic errors

C. gross errors

D. neglibible errors

Answer: B

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10. A physical performs an experiment and taken 200 readings. He repeats the same experiment and now takes 800 readingbs. By doing so

A. the probable error remains same

B. the probable error is four times

C. the probable error is halved

D. the probable error si reduced by a factor ¼

Answer: D

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11. More the number of significant figures shows more the

A. accuracy

B. error

C. number of figures

D. value

Answer: A

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12. If a measured quanityh has n significant figures, the relibale digits in it are

A. n

B. $n-1$

C. $n+1$

D. $n/2$

Answer: B

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13. If the signigficant figures are more,

A. percentage error is more and accuracy is less

B. percentage error is less and accuracy is more

C. percentage error is less and accuracy is less

D. percentage error is more and accuracy is more

Answer: B

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14. The mathmatical operation in which the accuracy is limited to least accurate term is

A. addtion

B. subtraction

C. multiplication & division

D. both 1 and 2

Answer: D

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15. The time period of a seconds pendulum is measured repeately for the times by two stop watches. A, B if the readings are as follows, then

$S.NO$	A	B
1.	$20.1\,\text{sec}$	$2.56\,\text{sec}$
2.	$2.10\,\text{sec}$	$2.55\,\text{sec}$
3.	$1.98\,\text{sec}$	$2.57\,\text{sec}$

A. A is more accurate but b is more precise

B. B is more accurate but A is more precise

C. A, B are equallly precise

D. A, B are equally accurate

Answer: A

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16. If $X = a + b$, the maximum percentage error in the measurement of X will be

A. $\left(\frac{\Delta a}{a} + \frac{\Delta b}{b}\right) \times 100$

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. $\left(\frac{\Delta a}{a-b}-\frac{\Delta b}{a-b}\right)\times 100$

Answer: B

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

A. $\left(\frac{\Delta a}{a}+\frac{\Delta b}{b}\right)\times 100$

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. $\left(\frac{\Delta a}{a-b}-\frac{\Delta b}{a-b}\right)\times 100$

Answer: B

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18. If $Y = axb$, the maximum percentage error in the measurement of Y will be

A. $\left(\frac{\Delta a}{a} \times 100\right) / \left(\frac{\Delta b}{b} \times 100\right)$

B. $\left(\frac{\Delta a}{a} + \frac{\Delta b}{b}\right) \times 100$

C. $\left(\frac{\Delta a}{a} \times 100\right) \times \left(\frac{\Delta b}{b} \times 100\right)$

D. $\left(\frac{\Delta a}{a} - \frac{\Delta b}{b}\right) \times 100$

Answer: B

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

A. $\left(\frac{\Delta a}{a} \times 100\right) / \left(\frac{\Delta b}{b} \times 100\right)$

B. $\left(\frac{\Delta a}{a} + \frac{\Delta b}{b}\right) \times 100$

C. $\left(\frac{\Delta a}{a} \times 100\right) \times \left(\frac{\Delta b}{b} \times 100\right)$

D. $\left(\frac{\Delta a}{a} - \frac{\Delta b}{b}\right) \times 100$

Answer: B

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20. Of the following the dimensioless error is

A. systematic error

B. Gross error

C. Random error

D. Relative error

Answer: D

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21. In determining viscosity (η) by the equaction $\eta = \frac{\pi p r^4}{8 v l}$ which of the quantities must be measured more accuraltely

A. P

B. r

C. v

D. l

Answer: B

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22. The number of significant figures in 0.07 is

A. 4

B. 2

C. 3

D. 1

Answer: D

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23. Round off 20.96 to three significant figures

A. 20.9

B. 20

C. 21.0

D. 21

Answer: C

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24. The dimensional formula for strain energy density is

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

B. $[M^1L^2T^3]$

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

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

Answer: C

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25. The dimensional formula for areal velocity is

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

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

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

D. $[M^0L^2T^1]$

Answer: C

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26. The physical quantity having the same dimensional formula as that of force is

A. Torque

B. Work

C. pressure

D. thrust

Answer: D

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27. Nm^{-1} is the SI unit of

A. velocity gradient

B. Rydberg's constant

C. coefficient visosity

D. Spring constant

Answer: D

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28. If P is X-ray unit and Q is micron the P/Q is

A. 10^{-5}

B. 10^{5}

C. 10^{7}

D. 10^{-7}

Answer: D

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29. The dimension of mass is zero in the following physical quanties.

A. Surface tension

B. coefficient of viscosity

C. heat

D. Specific heat capacity

Answer: D

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30. The SI unit of a physical quantity is $\left[Jm^{-2}\right]$. The dimensinal formula for that quantity is

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

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

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

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

Answer: B

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31. $[Jm^{-2}]$ is the unit of

A. Surface tension

B. Viscosity

C. Strain energy

D. Intensity of energy

Answer: A

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32. The set of quantities which can form a group of fundamental quantities in any system of measurement is

A. Length, mass and time

B. Length, mass and velocity

C. Length, velocity and time

D. velocity, mass and time

Answer: A

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33. The fundamental unit which is common in $C.G.S$ and $S.I$ system is

A. metre

B. second

C. gram

D. all the above

Answer: B

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34. 1 a.m.u is equal to

A. $1.66 \times 10^{-24} g$

B. $1.66 \times 10^{-27} g$

C. $1.66 \times 10^{24} g$

D. $1.66 \times 10^{27} g$

Answer: A

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35. The modulus of elasticity is dimesionally equivalent to

A. Stress

B. surface tension

C. Strain

D. Coefficient of visocosity

Answer: A

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36. If x times momentum is work, then the dimensional formula of x is

A. $[L^{-1}T]$

B. $[LT^{-1}]$

C. $[ML^{-1}T^{-1}]$

D. $[ML^{1}T^{1}]$

Answer: B

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37. The following does not give the unit of energy

A. watt second

B. kilowatt hour

C. newton metre

D. pascal metre

Answer: D

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38. 1 fermi is equla to

A. $10^{-12}m$

B. $10^{-9}m$

C. $10^{-6}A^0$

D. 10^{-9} micron

Answer: D

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39. "Impulse per unit area" has same dimensions as that of

A. coefficient fo visosity

B. surface tension

C. bulk modulus

D. gravitational potential

Answer: A

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40. The following pair does not have same dimensions

A. Pressure, modulus of elasticity

B. Angular velocity, velocity gradient

C. Surface tension and force constant

D. Impulse and torque

Answer: D

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41. Dimensions of solar constant are

A. $[M^{-0}L^{0}T]$

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

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

D. $[M^{1}T^{-3}]$

Answer: D

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42. The following is a unitless and dimensionless quantity

A. Angle

B. Solid angle

C. Mechanical equivalent of heat

D. Coefficient of friction

Answer: D

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43. The unitless quantity is

A. velocity gradient

B. Pressure gradient

C. Displacement gradient

D. Force gradient

Answer: C

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44. If the unit of tension is divided by the unit of surface tension the derived unit will be same as that of

A. Mass

B. Length

C. Area

D. Work

Answer: B

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45. Atto is ....

A. An instrument used to measure gradient

B. An instrument used to measure the altitude

C. 10^{18}

D. 10^{-18}

Answer: D

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46. Nms^{-1} is the unit of

A. Pressure

B. Power

C. Potential

D. Pressure graident

Answer: B

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47. Which one of the following represnts the correct dimensions of the coefficient of viscocity?

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

B. $[MLT^{-1}]$

C. $[ML^{-1}T^{-1}]$

D. $[ML^{-2}T^{-2}]$

Answer: C

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48. The unit of Stefan's constant σ is

A. $Js^{-1}m^{-2}K^4$

B. $Kgs^{-3}K^4$

C. $Wm^{-2}K^{-4}$

D. $Nms^{-2}K^{-4}$

Answer: C

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49. Which one of the following is not measured in the units of energy

A. (couple) $\times$ (time)

B. moment of inertia $\times$ $(\text{angular velocity})^2$

C. force $\times$ distance

D. impulse $\times$ time

Answer: D

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50. An example to define length in the form of time at a place is

A. Wrist watch

B. Linear expansion of iron rod

C. Frequency of ripples on the surface of water

D. Frequency of ripples on the surface of water

Answer: D

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51. The one which is not the unit of length is

A. Angstrom unit

B. Micron

C. Par-sec

D. Steradian

Answer: D

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52. The physical quantity having the same dimensional formula as that of entropy is:

A. Latent heat

B. Thermal capacity

C. heat

D. Specific heat

Answer: B

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53. Js is the unit of

A. Energy

B. Angualr Momentum

C. Momentum

D. Power

Answer: B

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54. Which of the following cannot be expressed as duyne cm^{-2}?

A. Pressure

B. Longitudinal stress

C. Longitudinal strian

D. Young's modulus of elasticity

Answer: C

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55. The unit atmospheric pressure is:

A. metre

B. Kgwt

C. gcm^{-2}

D. bar

Answer: D

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56. The ratio between pico and giga is

A. 10^{21}

B. 10^{-21}

C. 10^{14}

D. 10^{8}

Answer: B

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57. 1 micron = ... Nanometer

A. 10^{-6}

B. 10^{-10}

C. 10^{3}

D. 10^{-3}

Answer: C

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58. Which of the following has smallest value?

A. peta

B. femto

C. kilo

D. hecto

Answer: B

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59. The physical quantity having dimension 2 in length is

A. Power

B. Acceleration

C. Force constant

D. Stress

Answer: A

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60. If m si the mass of drop of a liquid of radius $'r'$ then $\frac{mg}{\pi r}$ has the same dimensions of:

A. Surface tension

B. Tension

C. Young's Modulus

D. Coefficient of viscosity

Answer: A

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61. The intensity of a wave is defined as the energy transmitted per unit area per secound. Which of the following represents the dimensional formula for the intensity of the wave?

A. $[ML^0T^{-2}]$

B. $[ML^0T^{-3}]$

C. $[ML^0T^{-1}]$

D. $[ML^4T]$

Answer: B

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62. The fundamental quantity which has the same power in the dimensional formula of surface tension and coefficient of viscosity is

A. mass

B. length

C. time

D. none

Answer: A

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63. Electron volt is the unit of

A. Power

B. Potential difference

C. Charge

D. Energy

Answer: D

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64. One snake is equal to

A. $10^{-8} s$

B. $10^{-9} s$

C. $10^{-10} s$

D. $10^{9} s$

Answer: A

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65. Torr is the unit of physical quantity

A. density

B. pressure

C. torque

D. None

Answer: B

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66. The $S.I$ value of Mechanical equivalent of heat is:

A. 4.2

B. 1

C. 2.4

D. 2

Answer: B

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67. The physical quantity that has no dimensions is:

A. angular velocity

B. linear momentum

C. angular momentum

D. strian

Answer: D

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68. The physical quantities not having same dimensions are

A. Torque and work

B. momentum and Planck's constant

C. stress and Young's modulus

D. speed and $(\mu_0 \varepsilon_0)$

Answer: B

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69. A pair of physical quantities having the same dimensional formula are

A. Force and Work

B. Work and energy

C. Force and Torque

D. Work and Power

Answer: B

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70. The dimensional formula of calorie are

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

B. $[MLT^{-2}]$

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

D. $[MLT^{-1}]$

Answer: A

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71. The dimensional formula for coefficient of kinematic visocity is:

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

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

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

D. $[ML^{-1}T^{-1}]$

Answer: B

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72. The product of energy and time is called action. The4 dimensional formula for action is same as that for

A. force $\times$ velocity

B. impulse $\times$ distance

C. power

D. angular energy

Answer: B

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73. Specific heat is in joule per kg per $\hat{}(0)C$ rise of temperature. Its demensions are:

A. $[MLT^{-1}K^{-1}]$

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

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

D. $\left[MLT^2K^{-1}\right]$

Answer: C

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74. The dimensional formula for magnetic Moment of a magnet is

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

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

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

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

Answer: A

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75. Dimensions of CxR (Capacity x Resistance) is

A. frequency

B. energy

C. time period

D. current

Answer: C

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76. Dimensional formula of capacitance is

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

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

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

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

Answer: A

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77. Of the following quantities , which one has the dimensions different from the remaining three?

A. energy density

B. force per unit area

C. product of charge per unit volume and voltage

D. Angular momentum per unit mass

Answer: D

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78. The dimensional formula fo resistivity in terms of M, L, T and Q where Q stands for the dimensions of charge is

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

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

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

D. $\left[MLT^{-1}Q^{-1}\right]$

Answer: A

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79. The dimensional formula for Magnetic Moment induction is

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

B. $\left[MT^{-2}A^{-1}\right]$

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

D. $\left[MT^{-2A}\right.$

Answer: B

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80. The dimensional formula for magnetic flux is

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

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

C. $\left[ML^{-2}T^{-2}I^{-1}\right.$

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

Answer: A

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81. The SI unit of a physical quantity having the dimensional formula of `[ML^(0)T^(-2) A^(-1)]

A. tesla

B. weber

C. amp metre

D. amp m^2

Answer: B

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82. What are the unit of $\frac{\mu_0}{4\pi}$

A. $NA^{-1}m^2$

B. NA^{-2}

C. Nm^2C^2

D. unitless

Answer: B

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83. If μ is the permeability and ε is the permittivity then $\frac{1}{\sqrt{\mu\varepsilon}}$ is equal to

A. speed of sound

B. speed of light in vacuum

C. speed of sound in medium

D. speed of light in medium

Answer: D

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84. $\left[\dfrac{\text{Permeability}}{\text{Permittivity}}\right]$ will have the dimesional formula of:

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

B. $[M^2L^2T^4A^2]$

C. $[M^2L^4T^{-6}A^{-4}]$

D. $[M^{-2}L^{-4}T^6A^4]$

Answer: C

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85. Siemen is the $S.I$ unit of

A. Electrical condutance

B. Electrical conductivity

C. Potential differnce

D. Inductance

Answer: A

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86. Which of the following quantities has the units $Kgm^2s^{-3}A^{-2}$?

A. Resistance

B. Inductance

C. Capacitance

D. Magnetic flux

Answer: A

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87. The SI unit of magnetic permebility is

A. Am^{-1}

B. Am^{-2}

C. Hm^{-2}

D. Hm^{-1}

Answer: D

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88. The dimensions of time in Electrical intensity is

A. -1

B. -2

C. -3

D. 3

Answer: C

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89. SI Unit of physical quantity whose dimensional formula is $M^{-1}L^{-2}T^{4}A^{2}$ is

A. ohm

B. volt

C. siemen

D. farad

Answer: D

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90. $\frac{1}{\sqrt{\text{Capacitance} \times \text{Inductance}}}$ have the Same unit as

A. time

B. velocity

C. velocity gradient

D. none of the above

Answer: C

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91. What are the units of $K\frac{1}{4\pi \in_0}$?

A. $C^2 N^{-1} m^{-2}$

B. $C^{-2} N^{-1} m^2$

C. $C^2 N^1 m^2$

D. unitless

Answer: B

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92. $[M^1L^2T^{-3}A^{-2}]$ si the dimensional formula of:

A. electric resistance

B. capacity

C. electric potential

D. specific resistance

Answer: A

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93. If L is the inductance, $'I'$ is current in the circuit, $\frac{1}{2}Li^2$ has the dimesions of

A. Work

B. Power

C. Pressure

D. Force

Answer: A

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94. The dimension of length in electrical resistance is

A. 2

B. 1

C. -2

D. -1

Answer: A

Watch Video Solution

95. If m is the mass, Q is the charge and B is the magnetic induction, m/BQ has the same dimensions as:

A. frequency

B. Time

C. Velocity

D. Acceleration

Answer: B

Watch Video Solution

96. If L has the dimensions of length, V that of potential and ε_0 is the permittivity of free space then quantity $\varepsilon_0 LV$ has the dimensions of

A. current

B. charge

C. resistance

D. voltage

Answer: B

Watch Video Solution

97. Dimensional formula of 'ohm' is same as

A. $\frac{h}{e}$

B. $\frac{h^2}{e}$

C. $\frac{h}{e^2}$

D. $\frac{h^2}{e^2}$

Answer: C

View Text Solution

98. If $'m'$ is the mass fo a body, $'a'$ is amplitude of vibration, and $'\omega'$ is the angular frequency, $\frac{1}{2}ma^2\omega^2$ has same dimensional formula as

A. impulse

B. moment of momentum

C. moment of interua

D. moment fo force

Answer: D

Watch Video Solution

Watch Video Solution

99. If C, R, L and I denot capacity resitance, inductance and electric current respecitively, the quantities having the same dimensions of time are

(a) CR, (b) L/R, (c) $\sqrt{L/C}$, (d) LI^2

A. a and b only

B. a and c only

C. a and b ony

D. a,b and c only

Answer: D

Watch Video Solution

100. Which of the follwing do not have the same dimensions as the other three? Given that l = length, m = mass, k = force constant , I = momet of intertia, B = magnetic induction, P_m = magnetic dipole moment, R = radius, g = acceleration due to gravity

A. $\sqrt{1/g}$

B. $\sqrt{I/P_mB}$

C. $\sqrt{k/m}$

D. $\sqrt{R/g}$

Answer: C

Watch Video Solution

101. Given that I = moment of inertia,

P_m = magnetic dipole moment and

B = magnetic induction, then the dimensional formula for I/P_mB is same as that of

A. time

B. length

C. time^2

D. length^2

Answer: C

Watch Video Solution

102. Given that m = mass, l = length, t = time and $i =$ current. The dimensional formula of ml^2/t^3i are the same as that of

A. electric field

B. electric potential

C. Capacitance

D. inductane

Answer: B

Watch Video Solution

103. If F is the force, μ is the permeability , H is the intensity of magneitc field and i is the electric current, tehn $\frac{F}{\mu H i}$ has the dimensions of

A. mass

B. length

C. time

D. energy

Answer: B

Watch Video Solution

104. If e, $\in_0$ h and c respectively present electric charge, permittivitty of free space, Planck's constant and speed of light then $\dfrac{e^2}{\in_0\ hc}$ has the dimensions of

A. a & b are correct

B. d & c are correct

C. a,b & c are correct

D. a,b, c & d are correct

Answer: C

Watch Video Solution

105. Two physical quantities are represented by P and Q. The dimensions of their product is $\left[M^2L^{-4}T^{-4}I^{-1}\right]$ and dimensions of their ratio is $\left[I^{-1}\right]$. Then P and Q respectively are

A. magnetic flux and Torque acting on a magnet

B. torque and Magnetic flux.

C. magnetic moment and Pole strength

D. magnetic moment and Magnetic permeability

Answer: A

Watch Video Solution

106. The relability of a measurement depends on

A. precision

B. accuracy

C. systematic error

D. random error

Answer: B

Watch Video Solution

107. The error due to resolution of a measuring instrument is

A. personal error

B. random error

C. systematic error

D. gross error

Answer: C

Watch Video Solution

108. The error due to resolution of a measuring instrument is

A. random error

B. personal error

C. gross error

D. least count error

Answer: D

Watch Video Solution

109. The random error which exists invariably in screw gauge is

A. least count error

B. Zero error

C. gross error

D. backlash error

Answer: D

Watch Video Solution

110. The errors whch are estimated by statistical methods are

A. systematic errors

B. random error

C. theoretical errors

D. gross error

Answer: B

Watch Video Solution

111. The measure of accuracy is

A. absolute error

B. relative error

C. percentage error

D. both 2 and 3

Answer: D

Watch Video Solution

112. The decrease in percentage error

A. increases the accuracy

B. does not effect the accuracy

C. decreases the accuracy

D. both 1 and 3

Answer: A

Watch Video Solution

113. In a measurement both positive and negative errors are found to occur with equal probability. The type of errors is

A. proportional errors

B. systematic errors

C. determinate errors

D. random error

Answer: D

Watch Video Solution

114. The erros that always occur in the measurement with screw gauge is

A. random error

B. systematic errors

C. gross error

D. negligible errors

Answer: B

Watch Video Solution

115. A physical performs an experiment and taken 200 readings. He repeats the same experiment and now takes 800 readingbs. By doing so

A. the probable error remains same

B. the probable error is four times

C. the probable error is halved

D. the probable error is reduced by a factor $\frac{1}{4}$

Answer: D

Watch Video Solution

116. More the number of significant figures shows more the

A. accuracy

B. error

C. number of figures

D. value

Answer: A

Watch Video Solution

117. If a measured quanityh has n significant figures, the relibale digits in it are

A. n

B. n-1

C. n+1

D. n/2

Answer: B

Watch Video Solution

118. If the significant figures are more,

A. percentage error is more and accuracy is less

B. percentage error is less and accuracy is more

C. percentage error is less and accuracy is less

D. percentage error is more and accuracy is more

Answer: B

Watch Video Solution

119. The mathematical operation in which the accuracy is limited to least accurate term is

A. addition

B. subtraction

C. multiplication & division

D. both 1 and 2

Answer: D

Watch Video Solution

120. The time period of a seconds pendulum is measured repeatedly for three times by two stop watches A,B. If the readings are as follows , then

S.NO	A	B
1.	2.01 sec	2.56 sec
2.	2.10 sec	2.55 sec
3.	1.98 sec	2.57 sec

A. A is more accurate but B is more precise

B. B is more accurate but A is more precise

C. A,B are equally precise

D. A,B are equally accurate

Answer: A

Watch Video Solution

121. If $X = a + b$, the maximum percentage error in the measurement of X will be

A. $\left(\frac{\Delta a}{a}+\frac{\Delta b}{b}\right)\times 100$

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. $\left(\frac{\Delta a}{a-b}-\frac{\Delta b}{a-b}\right)\times 100$

Answer: B

Watch Video Solution

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

A. $\left(\frac{\Delta a}{a}+\frac{\Delta b}{b}\right)\times 100$

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. $\left(\frac{\Delta a}{a-b}-\frac{\Delta b}{a-b}\right)\times 100$

Answer: B

Watch Video Solution

123. If $X = a + b$, the maximum percentage error in the measurement of X will be

A. $\left(\frac{\Delta a}{a} \times 100\right) / \left(\frac{\Delta b}{b} \times 100\right)$

B. $\left(\frac{\Delta a}{a} + \frac{\Delta b}{b}\right) \times 100$

C. $\left(\frac{\Delta a}{a} \times 100\right) \times \left(\frac{\Delta b}{b} \times 100\right)$

D. $\left(\frac{\Delta a}{a} - \frac{\Delta b}{b}\right) \times 100$

Answer: B

Watch Video Solution

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

A. $\left(\frac{\Delta a}{a} \times 100\right) / \left(\frac{\Delta b}{b} \times 100\right)$

B. $\left(\frac{\Delta a}{a} + \frac{\Delta b}{b}\right) \times 100$

C. $\left(\frac{\Delta a}{a} \times 100\right) \times \left(\frac{\Delta b}{b} \times 100\right)$

D. $\left(\frac{\Delta a}{a} - \frac{\Delta b}{b}\right) \times 100$

Answer: B

Watch Video Solution

125. Of the following the dimensionless error is

A. Systematic error

B. Gross error

C. Random error

D. Relative error

Answer: D

Watch Video Solution

126. In determining viscosity (η) by the equaction $\eta = \frac{\pi p r^4}{8 v l}$ which of the quantities must be measured more accuraltely

A. P

B. r

C. v

D. l

Answer: B

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127. The number of significant figures in 0.007 is

A. 4

B. 2

C. 3

D. 1

Answer: D

Watch Video Solution

128. Round off 20.96 to three significant figures

A. 20.9

B. 20

C. 21.0

D. 21

Answer: C

Watch Video Solution

129. The dimensional formula for strain energy density is

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

B. $[M^1L^2T^3]$

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

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

Answer: C

Watch Video Solution

130. The dimensional formula for areal velocity is

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

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

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

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

Answer: C

Watch Video Solution

131. The physical quantity having the same dimensional formula as that of force is

A. Torque

B. work

C. pressure

D. thrust

Answer: D

Watch Video Solution

132. Nm^{-1} is the SI unit of

A. velocity gradient

B. Rydberg's constant

C. coefficient of viscosity

D. Spring constant

Answer: D

Watch Video Solution

133. If P is X-ray unit and Q is micron the P/Q is

A. 10^{-5}

B. 10^{5}

C. 10^{7}

D. 10^{-7}

Answer: D

Watch Video Solution

134. The dimension of mass is zero in the following physical quanties.

A. Surface tension

B. coefficient of viscosity

C. heat

D. Specific heat capacity

Answer: D

Watch Video Solution

135. The SI unit of a physical quantity is $[Jm^{-2}]$. The dimensinal formula for that quantity is

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

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

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

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

Answer: B

Watch Video Solution

136. $\left[Jm^{-2}\right]$ is the unit of

A. Surface tension

B. Viscosity

C. Strain energy

D. Intensity of energy

Answer: A

Watch Video Solution

137. The set of quantities which can form a group of fundamental quantities in any system of measurement is

A. Length , mass and velocity

B. Length, mass and velocity

C. Length, velocity and time

D. Velocity , mass and time

Answer: A

Watch Video Solution

138. The fundamental unit which is common in $C.G.S$ and $S.I$ system is

A. metre

B. second

C. gram

D. all the above

Answer: B

Watch Video Solution

139. Assertion : 1 amu is equal to $931.48 MeV$.

Reason: 1 amu is equal to $\frac{1}{12}th$ the mass of C^{12} atom.

A. $1.66 \times 10^{-24} g$

B. $1.66 \times 10^{-27} g$

C. $1.66 \times 10^{24} g$

D. $1.66 \times 10^{27} g$

Answer: A

Watch Video Solution

140. The modulus of elasticity is dimensionally equivalent to

A. Stress

B. Surface tension

C. Strain

D. Coefficient of viscosity

Answer: A

Watch Video Solution

141. If x times momentum is work, then the dimensional formula of x is

A. $[L^{-1}T]$

B. $[LT^{-1}]$

C. $[ML^{-1}T^{-1}]$

D. $[ML^{1}T^{1}]$

Answer: B

Watch Video Solution

142. The following does not give the dimension of energy

A. watt second

B. kilowatt hour

C. newton metre

D. pascal metre

Answer: D

Watch Video Solution

143. 1 fermi is equal to

A. $10^{-12}m$

B. 10^{-9} m

C. $10^{-6}A^{0}$

D. 10^{-9} micron

Answer: D

Watch Video Solution

144. "Impulse per unit area" has same dimensions as that of

A. coefficient of viscosity

B. Surface tension

C. bulk modules

D. gravitational potential

Answer: A

Watch Video Solution

145. The following pair does not have same dimensions

A. Pressure, modulus of elasticity

B. Angular velocity, velocity gradient

C. Surface tension and force constant

D. Impulse and torque

Answer: D

Watch Video Solution

146. Dimensions of solar constant are

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

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

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

D. $[M^1 T^{-3}]$

Answer: D

Watch Video Solution

147. Which of the following is a unitless and dimensionless quantity

A. Angle

B. Solid angle

C. Mechanical equivalent of heat

D. Coefficient of friction

Answer: D

Watch Video Solution

148. The unitless quantity is

A. velocity gradient

B. Pressure gradient

C. Displacement gradient

D. Force gradient

Answer: C

Watch Video Solution

149. If the unit of tension is divided by the unit of surface tension the derived unit will be same as that of

A. Mass

B. Length

C. Area

D. Work

Answer: B

Watch Video Solution

150. Atto is ....

A. An instrument used to measure gradient

B. An instrument used to measure the altitude

C. 10^{18}

D. 10^{-18}

Answer: D

Watch Video Solution

151. Nms^{-1} is the unit of

A. Pressure

B. Power

C. Potential

D. Pressure gradient

Answer: B

Watch Video Solution

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

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

B. $[MLT^{-1}]$

C. $[ML^{-1}T^{-1}]$

D. $[ML^{-2}T^{-2}]$

Answer: C

Watch Video Solution

153. The unit of Stefan's constant σ is

A. $Js^{-1}m^{-2}K^{4}$

B. $Kgs^{-3}K^{4}$

C. $Wm^{-2}K^{-4}$

D. $Nms^{-2}K^{-4}$

Answer: C

Watch Video Solution

154. Which one of the following is not measured in the units of energy

A. (couple) $\times$ (angle turned through)

B. moment of inertia $\times$ $(\text{angular velocity})^2$

C. Force $\times$ distance

D. impulse $\times$ time

Answer: D

Watch Video Solution

155. An example to define length in the form of time at a place is

A. Wrist watch

B. Linear expansion of iron rod

C. Frequency of ripples on the surface of water

D. Seconds pendulum

Answer: D

Watch Video Solution

156. The one which is not the unit of length is

A. Angstrom unit

B. Micron

C. Par-sec

D. Steradian

Answer: D

Watch Video Solution

157. The physical quantity having the same dimensional formula as that of entropy is:

A. Latent heat

B. Thermal capacity

C. Heat

D. Specific heat

Answer: B

Watch Video Solution

158. Js is the unit of

A. Energy

B. Angular Momentum

C. Momentum

D. Power

Answer: B

Watch Video Solution

159. Which of the following cannot be expressed as dyne cm^{-2}?

A. Pressure

B. Longitudinal stress

C. Longitudinal strain

D. Young's modulus of elasticity

Answer: C

Watch Video Solution

160. The unit atmospheric pressure is:

A. Metre

B. kgwt

C. gcm^{-2}

D. bar

Answer: D

Watch Video Solution

161. The ratio between pico and giga is

A. 10^{21}

B. 10^{-21}

C. 10^{14}

D. 10^{8}

Answer: B

Watch Video Solution

162. 1 micron = ... Nanometer

A. 10^{-6}

B. 10^{-10}

C. 10^{3}

D. 10^{-3}

Answer: C

Watch Video Solution

163. Which of the following has smallest value?

A. peta

B. femto

C. kilo

D. hecto

Answer: B

Watch Video Solution

164. The physical quantity having dimension 2 in length is

A. Power

B. Acceleration

C. Force constant

D. Stress

Answer: A

Watch Video Solution

165. If m is the mass of drop of a liquid of radius $'r'$ then $\frac{mg}{\pi r}$ has the same dimensions of:

A. Surface tension

B. Tension

C. Young's Modulus

D. Coefficient of viscosity

Answer: A

Watch Video Solution

166. The intensity of a wave is defined as the energy transmitted per unit area per secound. Which of the following represents the dimensional formula for the intensity of the wave?

A. $[ML^0T^{-2}]$

B. $[ML^0T^{-3}]$

C. $[ML^0T^{-1}]$

D. $[ML^4T]$

Answer: B

Watch Video Solution

167. The fundamental quantity which has the same power in the dimensional formula of surface tension and coefficient of viscosity is

A. mass

B. length

C. time

D. none

Answer: A

Watch Video Solution

168. Electron volt is the unit of

A. Power

B. Potential difference

C. Charge

D. Energy

Answer: D

Watch Video Solution

169. One shake is equal to

A. $10^{-8}s$

B. $10^{-9}s$

C. $10^{-10}s$

D. $10^{9}s$

Answer: A

Watch Video Solution

170. Torr is the unit of physical quantity

A. density

B. pressure

C. torque

D. None

Answer: B

Watch Video Solution

171. The $S.I$ value of Mechanical equivalent of heat is:

A. 4.2

B. 1

C. 2.4

D. 2

Answer: B

Watch Video Solution

172. The physical quantity that has no dimensions is:

A. angular velocity

B. linear momentum

C. angular momentum

D. strain

Answer: D

Watch Video Solution

173. The physical quantities not having same dimensions are

A. torque and work

B. momentum and Planck's constant

C. stress and Young's modulus

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

Answer: B

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174. A pair of physical quantities having the same dimensional formula are

A. forced and Work

B. Work and Energy

C. Force and Torque

D. Work and Power

Answer: B

Watch Video Solution

175. The dimensional formula of calorie are

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

B. $[MLT^{-1}]$

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

D. $[MLT^{-1}]$

Answer: A

Watch Video Solution

176. The dimensional formula for coefficient of kinematic visocity is:

Watch Video Solution

177. The product of energy and time is called action. Therefore dimensional formula for action is same as that for

A. forced $\times$ velocity

B. impulse $\times$ distance

C. power

D. angular energy

Answer: B

Watch Video Solution

178. Specific heat is in joule/ kg/ kelvin rise of temperature. Its demensions are:

A. $[MLT^{-1}K^{-1}]$

B. $[ML^2T^{-2}K^{-1}]$

C. $[M^0L^2K^{-1}]$

D. $[MLT^{-2}K^{-1}]$

Answer: C

Watch Video Solution

179. Of the following quantities , which one has the dimensions different from the remaining three?

A. energy density

B. force per unit area

C. product of charge per unit volume and voltage

D. Angular momentum per unit mass

Answer: D

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180. If $'m'$ is the mass fo a body, $'a'$ is amplitude of vibration, and $'\omega'$ is the angular frequency, $\frac{1}{2}ma^2\omega^2$ has same dimensional formula as

A. impulse

B. moment of momentum

C. moment of inertia

D. moment of force

Answer: D

Watch Video Solution

181. Given that I = moment of inertia,

P_m = magnetic dipole moment and

B = magnetic induction, then the dimensional formula for I/P_mB is same as that of

A. time

B. length

C. time^2

D. length^2

Answer: C

Watch Video Solution

182. Given that m = mass, l = length, t = time and $i =$ current. The dimensional formula of $ml^2 / t^3 i$ are the same as that of

A. electric field

B. electric potential

C. capacitance

D. inductance

Answer: B

Watch Video Solution

183. Two physical quantities are represented by P and Q. The dimensions of their product is $\left[M^2L^{-4}T^{-4}I^{-1}\right]$ and dimensions of their ratio is $\left[I^{-1}\right]$. Then P and Q dimensional formula respectively are

A. magnetic flux and Torque acting on a magnet.

B. torque and Magnetic flux

C. magnetic moment and Pole strength

D. magnetic moment and Magneitc permeability

Answer: A

Watch Video Solution

LEVEL-I (C.W)

1. The accuracy in the measurement of the diameter of hydrogen atom as $1.06 \times 10^{-10} m$ is

A. 0.01

B. 106×10^{-10}

C. $\frac{1}{106}$

D. 0.01×10^{-10}

Answer: B

Watch Video Solution

2. The length of a rod is measured as $31.52 cm$. Graduations on the scale are up to

A. $1mm$

B. $0.1mm$

C. $0.1mm$

D. $0.02cm$

Answer: C

Watch Video Solution

3. If $L = (20 \pm 0.01)m$ and $B = (10 \pm 0.02)m$ then L/B is

A. $(2 \pm 0.03)m$

B. $(2 \pm 0.15)m$

C. $(2 \pm 0.01)m$

D. $(2 \pm 0.05)m$

Answer: D

Watch Video Solution

4. The radius of a sphere is measured as $(10 \pm 0.02\%)cm$. The error in the measurement of its volume is

A. 25.1

B. 25.12

C. 2.51

D. 251.2

Answer: C

Watch Video Solution

5. If length and breath of a plate are $(40 \pm 0.2)cm$ and $(30 \pm 0.1)cm$, the absolute error in the meaurement of area is

A. $10cm^2$

B. $8cm^2$

C. $9cm^2$

D. $7cm^2$

Answer: A

Watch Video Solution

6. If the length of a cylinder is measured to be $4.28cm$ with an error of $0.01cm$, the percentage error in the mesured length is nearly

A. 0.4%

B. 0.5%

C. 0.2%

D. 0.1%

Answer: C

Watch Video Solution

7. When 10 observations are taken, the random error is x, When 100 oberservations are taken, the random error becomes

A. $x/10$

B. x^2

C. $10x$

D. $\sqrt{x}$

Answer: A

Watch Video Solution

8. If $L_1 = (2.02 \pm 0.01)m$ and $L_2 = (1.02 \pm 0.01)m$ then $L_1 + 2L_2$ is (in m)

A. 4.06 ± 0.02

B. 4.06 ± 0.03

C. 4.06 ± 0.005

D. 4.065 ± 0.01

Answer: B

Watch Video Solution

9. A body travels unifromly a distance of $(20.0 \pm 0.2)m$ in time $(4.0 \pm 0.4)s$. The velocity of the body is

A. $(5.0 \pm 0.4)ms^{-1}$

B. $(5.0 \pm 0.2)ms^{-1}$

C. $(5.0 \pm 0.6)ms^{-1}$

D. $(5.0 \pm 0.1)ms^{-1}$

Answer: D

Watch Video Solution

10. If the value of $103.5kg$ is rounded off to three significant figures, then the value is

A. 103

B. 103.0

C. 104

D. 10.3

Answer: C

Watch Video Solution

11. The number of significant figures in $6.023 \times 10^{23} \text{mole}^{-1}$ is

A. 4

B. 3

C. 2

D. 23

Answer: A

Watch Video Solution

12. The side fo a cube is 2.5 metre. The volume of the cube of the significant figures is

A. 15

B. 16

C. 1.5

D. 1.6

Answer: B

Watch Video Solution

13. When a force is expressed in dyne, the number of sinificant figures is four. If it is expressed in newton, the number of

significant figures will become $\left(10^{5}\text{dyne} = 1N\right)$

A. 9

B. 5

C. 1

D. 4

Answer: D

Watch Video Solution

14. $\sqrt{2.0}$ is

A. 1.414

B. 1.4

C. 1.0

D. 1

Answer: B

Watch Video Solution

15. The mass of a box is $2.3kg$. Two marbles of masses $2.15g$ and $12.39g$ are added to it . Find the total mass of the box to the correct number of significant figures.

A. $2.348kg$

B. $2.3428kg$

C. $2.34kg$

D. $2.31kg$

Answer: D

Watch Video Solution

16. The number of significant figures in 0.10200 is

A. 6

B. 5

C. 3

D. 2

Answer: B

Watch Video Solution

17. When the number 0.046508 is reduced to 4 significant figures, then it becomes

A. 0.465

B. $4.650.8 \times 10^{-5}$

C. 4.651×10^{-2}

D. 4.650×10^{-2}

Answer: C

Watch Video Solution

18. With due regard to significant figures, the value of $(46.7 - 10.04)$ is

A. 36.7

B. 36.00

C. 36.66

D. 30.6

Answer: A

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

A. 0.0591

B. 0.0590

C. 0.590

D. 0.5906

Answer: B

Watch Video Solution

20. By rounding off, (a) 20.96 and (b) 0.0003125 to 3 significant figures we get

A. $21.0, 312 \times 10^{-4}$

B. $21.0, 3.12 \times 10^{-4}$

C. $2.10, 3.12 \times 10^{-4}$

D. $210, 3.12 \times 10^{-4}$

Answer: B

Watch Video Solution

21. If the unit of length is doubled and that of mass and time is halved, the unit of energy will be

A. doubled

B. 4 times

C. 8 times

D. same

Answer: C

Watch Video Solution

22. Given M is the mass suspended from a spring of force constant. k.The dimensional formula for $[M/k]^{1/2}$ is same as that for

A. frequency

B. time period

C. velocity

D. wavelength

Answer: B

Watch Video Solution

23. The dimensionla formula for the product of two physical quantities P and Q is $\left[ML^2T^{-2}\right]$. The dimensional formula of $\frac{P}{Q}$ is $\left[MT^{-2}\right]$. Then P and Q respectively are

A. Force and velocity

B. Momentum and displacement

C. Force and displacement

D. Work and velocity

Answer: C

Watch Video Solution

24. The fundamental physical quantites quanties 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

Watch Video Solution

25. The physical quantity which was the dimensional formula as that of $\frac{\text{energy}}{\text{mass} \times \text{length}}$ is

A. Force

B. Power

C. Pressure

D. Acceleration

Answer: D

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26. If J and E represent the angualr momentum and rotational kinetic energy of a body, $\dfrac{J^2}{2E}$ represents the following physical quantitiy.

A. Moment of couple

B. Moment fo force

C. Moment of inertia

D. Force

Answer: C

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27. If the fundamental units of length, mass and time are doubled, the unit of force will

A. doubled

B. halved

C. remain same

D. four times

Answer: C

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28. $\mu = A + \frac{B}{\lambda} + \frac{C}{\lambda^2}$ si dimensionally correct. The dimensions of A, B and C respectively are (μ, A, B, C are constant) where λ is wave length of wave

A. No, dimensions, L, L^2

B. L^2, No dimensions, L

C. L, L^2, No dimesions

D. L, No dimesions, L^2

Answer: A

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29. According to Bernoulli's theorem $\frac{p}{d} + \frac{v^2}{2} + gh$ = constant is (P is pressure, d is density, h is height, v is velocity and g is acceleration due to gravity)

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

B. $\left[M^0LT^0\right]$

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

D. $\left[M^0L^2T^{-4}\right]$

Answer: C

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30. The surface tension of a liquid in CGS system is 45 dyne cm^{-1}. Its value in SI system is

A. $4.5Nm^{-1}$

B. $0.045Nm^{-1}$

C. $0.0045 Nm^{-1}$

D. $0.45 NM^{-1}$

Answer: B

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31. If minutes is the unit of time. $10 ms^{-2}$ is the unit of acceleration and $100 kg$ is the unit of mass, the new unit of work in joule is

A. 10^5

B. 10^6

C. 6×10^6

D. 36×10^6

Answer: D

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32. The magnitude of force is $100N$. What will be its value if the units of mass and time are doubled and that of length is halved?

A. 25

B. 100

C. 200

D. 400

Answer: A

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33. A motor pumps water at the rate of Vm^3 per second, against a pressure PNm^{-2}. The power fo the motor is watt is

A. PV

B. (P/V)

C. (V/P)

D. $(V-P)$

Answer: A

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34. If the units of length and force are increased by four times the unit of energy will be incresed by

A. 16%

B. 1600%

C. 1500%

D. $400\%\ \%$

Answer: C

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35. SI unit and CGS unit of quantity vary by 10^3 times, it is:

A. Boltzmann constant

B. Gravitational constant

C. Planck's constant

D. Angular Momentum

Answer: B

Watch Video Solution

36. The value fo universal gravitationla constant G in CGS system is 6.67×10^{-8} dyne cm^2g^{-2}. Its value in SI system is

A. $6.67 \times 10^{-11} Nm^2kg^{-2}$

B. $6.67 \times 10^{-5} Nm^2kg^{-2}$

C. $6.67 \times 10^{-10} Nm^2kg^{-2}$

D. $6.67 \times 10^{-9} Nm^2kg^{-2}$

Answer: A

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37. The final velocity fo a particles falling freelly under graavity is given by $V^2 - U^2 = 2GX$ WHERE x is the distance covered. IF

$V = 18$ kmph. $g = 1000cms^{-2}, x = 120cm$ then $u = \dots ms^{-1}$

A. 2.4

B. 1.2

C. 1

D. 0.1

Answer: C

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38. The equaction which is dimensionally correct among the following is

A. $v = u + at^2$

B. $s = ut + at^3$

C. $s = ut + at^2$

D. $t = s + av$

Answer: C

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39. The dimensions of $'k'$ in the relation $V = k$ avt (where V is the volume of a liquid passing through any point in time t, $'a'$ is area of cross section, v is the velocity of the liquid) is

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

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

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

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

Answer: D

Watch Video Solution

40. If force (F), work (W) and velocity (V) are taken as fundamental quantites then the dimensional formula of Time (T) is

A. $[W^{1}F^{1}V^{1}]$

B. $[W^{1}F^{1}V^{-1}]$

C. $[W^{-1}F^{-1}V^{-1}]$

D. $[W^{-1}F^{-1}V^{-1}]$

Answer: D

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41. If force F, Mass M and time T are chosen as fundamental quanties the dimensional formula for length is

A. $[FMT]$

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

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

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

Answer: B

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42. If force F, Length L and time T are chosen as fundamental quantites, the dimensional formula for Mass is

A. $[FLT]$

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

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

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

Answer: D

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LEVEL-II (C.W)

1. The error in the measurement of the length of the sample pendulum is 0.2% and the error in time period 4%. The maximum possible error in measurement of $\frac{L}{T^2}$ is

A. 4.2%

B. 3.8%

C. 7.8%

D. 8.2%`

Answer: D

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2. The least count of a stop watch is $(1/5)s$. The time 20 oscillations of a pendulum is measured to be $25s$. The maximum percentage error in this measurement is

A. 8%

B. 1%

C. 0.8%

D. 16%

Answer: C

Watch Video Solution

3. The diameter of a wire as measured by a screw gauge was found to be $1.002cm$, $1.004cm$ and $1.006cm$. The absoulue error in the third reading is

A. $0.002cm$

B. $0.004cm$

C. $1.002cm$

D. Zero

Answer: A

Watch Video Solution

4. Force and area are measured as $20N$ and $5m^2$ with errors $0.05N$ and $0.0125m^2$. The maximum error in pressure is (SI unit)

A. 4 ± 0.625

B. 4 ± 0.5

C. 4 ± 0.125

D. 4 ± 0.02

Answer: D

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5. The length and breath of a recantangular object are $25.2cm$ and $16.8cm$ respecitively and have been measured to an accuracy of $0.1cm$. Relative error and percentage error in the area of the object are

A. $0.1\&1\,\%$

B. $0.02\&2\,\%$

C. $0.03\&3\,\%$

D. $0.4\&4\,\%$

Answer: A

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6. The velocity of light in vacumm is 30 crore m/s. This is expressed is standard form up to 3 significant figures as

A. $0.03 \times 10^{11} m/s$

B. $300 \times 10^{6} m/s$

C. $3.00 \times 10^8 m / s$

D. $0.030 \times 10^{10} m / s$

Answer: C

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7. The length, breath and thicknes of a recantagular lamina are $1.024m$, $0.56m$, and $0.0031m$. The volume is ....m^3

A. 1.8×10^{-3}

B. 1.80×10^{-3}

C. 0.180×10^{-4}

D. 0.00177

Answer: A

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8. The initial and final temperature of a liquid are measured to be $(67.7 \pm 0.2)^{0}c$ and $(76.3 \pm 0.3)^{0}c$ then rise in temperture with error limit is

A. $(8.6 \pm 0.2)^{0}C$

B. $(8.6 \pm 0.3)^{0}C$

C. $(8.6 \pm 0.5)^{0}C$

D. $(8.6 \pm 0.6)^{0}C$

Answer: C

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9. Less accurate of the four options gives below

A. 9.27

B. 41

C. 1.01

D. 9.00×10^0

Answer: B

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10. If the ratio of fundamental units in tow systems is $1:3$, then the ratio of momenta in the two system is

A. $1:3$

B. $1:9$

C. $1:27$

D. $3:1$

Answer: A

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11. The velocity of the waves on the surface of water is proptional to $\lambda^{a}\rho^{\beta}g^{\gamma}$ where λ = waver length, ρ = density and g =m acceleration due to gravity. Which of the following relation is correct?

A. $\alpha=\beta\neq\gamma$

B. $\beta=\gamma\neq\alpha$

C. $\gamma=\alpha\neq\beta$

D. $\alpha\neq\beta\neq\gamma$

Answer: C

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12. The work done $'w'$ by a body varies with displacement $'x'$ as $w = Ax + \frac{B}{(C-x)^2}$. The demensional formula for $'B'$ is

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

B. $[ML^4T^{-2}]$

C. $[MLT^{-2}]$

D. $[ML^2T^{-4}]$

Answer: B

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13. If the units of mass, tieme and length are $100g$, $20cm$ and 1 minute respectivelty then equivalent energy for $1000erg$ in the new system will be

A. 90

B. 900

C. 2×10^6

D. 300

Answer: A

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14. The ratio of SI unit to the CGS unit of plank's constant is

A. $10^7 : 1$

B. $10^4 : 1$

C. $10^6 : 1$

D. $1 : 1$

Answer: A

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15. The velocity fo a body is expressed as $V = G^a M^b R^c$ where G is gravitational constant. M is mass, R is radius. The values of exponents a, b and c are:

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

B. $1, 1, 1$

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

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

Answer: A

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16. The velocity fo a spherical ball through a visocous liquid is given by $v = v_0(1 - e^{kt})$, where v_0 is the initial velocity and t represents time. If K depends on radius of ball (r), coefficient of viscosity (η) and mass fo the ball (m), tehn

A. $k = mr / \eta$

B. $k = \eta m / r$

C. $k = r\eta / m$

D. $k = mr\eta$

Answer: C

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17. Calculate x in the equation : $(velocity)^x = (pressired \Leftrightarrow .)^{3/2} \times (density)^{-3/2}$

A. 1

B. 2

C. 3

D. -3

Answer: C

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18. 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. $a = 1, b = 2, c = 1$

B. $a = 2, b = 1, c = 1$

C. $a = 1, b = 1, c = 2$

D. $a = 0, b = 1, c = 1$

Answer: A

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19. The length of pendalum is measured as $1.01m$ and time for 30 oscillations is measured as one minuted 3 secounds. Error in length is $0.01m$ minute 3 seconds. The percenrage error in the measurement of acceleration due to gravity is.

A. 1

B. 5

C. 10

D. 15

Answer: C

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20. The dimensional formula of $\frac{1}{2}\mu_0 H^2 (\mu_0$ = permeability of free space and H = magnetic field intensity) is

A. MLT^{-1}

B. ML^2T^{-2}

C. $ML^{-1}T^{-2}$

D. ML^2T^{-1}

Answer: C

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

A. MLT^{-4}, MLT^{-2}

B. MLT^{-3}, MLT^{-4}

C. ML^2T^{-3}, ML^2T^{-2}

D. ML^2T^{-3}, ML^3T^{-4}

Answer: B

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22. When a wave traverses a medium, the displacement of a particle located at $'x'$ at a time $'t'$ is given by $y = a\sin(bt - cx)$, where a, b and c are constants of the wave, which of the following is a quantity with dimensions?

A. y/a

B. bt

C. cx

D. b/c

Answer: D

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23. The Energy (E) angular momentum (L) and universal gravitational constant (G) are chosen as fundamental quantities. The dimensions of universal gravitational constant in the dimensional formula of Planks constant (h) is

A. 0

B. -1

C. $5/3$

D. 1

Answer: A

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24. If the absoulte errors in two physical quantites A and B are a and b respectively, then the absoulte error in the value of $A - B$ is

A. $a - b$

B. $b - a$

C. $a \pm b$

D. $a + b$

Answer: D

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25. The velocity v of a particle at time A is given by $v = at + \frac{b}{l+c}$ where a ,b and c are constant The dimensions of a,b and c are respectively

A. $a = [L^2], b = [T], c = [LT^2]$

B. $a = [LT^2], b = [LT], c = [L]$

C. $a = [LT^{-2}], b = [L], c = [T]$

D. $a = [L], b = [LT], c = [T^2]$

Answer: C

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26. A body weighs $22.42g$ and has a measured volume of 4.7 the possible errors in the measurement of mass and volume are

$0.01g$ and 0.1. Then the maximum percentage error in the density will be

A. $22\ \%$

B. $2.2\ \%$

C. $0.22\ \%$

D. $0.022\ \%$

Answer: B

Watch Video Solution

27. If energy E, velocity v and time T are taken as fundamental quanties, the dimensional formula for surface tension is

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

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

C. $[Ev^{-2}T^{-1}]$

D. $[E^{-2}v^{-2}T^{-1}]$

Answer: A

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28. If power (p) suface tension (T) and Planck's constant (h) are arranged, so theat 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

Answer: A

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LEVEL-III

1. The measured mass and volume of a body are $53.63g$ and $5.8cm^3$ respectively, with possible errors of $0.01g$ and $0.1cm^3$. The maximum percentage error in density is about

A. 0.2%

B. 2%

C. 5%

D. 10%

Answer: B

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2. 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. $0.2mm$

B. $0.05mm$

C. $0.1mm$

D. $0.2mm$

Answer: D

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3. The resistance of metal is given by $V = IR$, The voltage in the resistance is $V = (8 \pm 0.5)V$ and current in the resistance is $I = (2 \pm 0.2)A$, the value fo resistance with its percentage error is

A. $(4 \pm 16.25\,\%\,)\Omega$

B. $(4 \pm 2.5\,\%\,)\Omega$

C. $(4 \pm 0.04\,\%\,)\Omega$

D. $(4 \pm 1\,\%\,)\Omega$

Answer: A

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4. In an experiment, the values of refractive indices of glass were found to be $1.54, 1.53, 1.44, 1.54, 1.56$ and 1.45 in successive measurements (i) mean value of refreactive index of glass (ii) mean absolute error (iii) relative error and (iv) percentage error are respectively.

A. $1.51, 0.04, 0.03\%, 3\%$

B. $1.51, 0.4, 0.03\%, 3\%$

C. $15.1, 0.04, 0.03\%, 3\%$

D. $1.51, 0.4, 0.3\%, 3\%$

Answer: A

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5. As student performs an experiment for determine of $g\left[=\frac{4\pi^2L}{T^2}\right]$. $L \approx 1m$, and has commits an error of ΔL for T he tajes the teime of n osciollations wityh the stop watch of least count ΔT. For which of the following data the measurement of g will be most accurate?

A. $\Delta L = 0.5$, $\Delta T = 0.1 n = 20$

B. $\Delta L = 0.5$, $\Delta T = 0.1 n = 50$

C. $\Delta L = 0.5$, $\Delta T = 0.01 n = 20$

D. $\Delta L = 0.5$, $\Delta T = 0.05 n = 50$

Answer: D

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6. A recantanglar metal slab of mass 33.333 has its length $8.0 cm$, breath $5.0 cm$ and thickness $1 mm$. The mass is measured with accuracy up to $1 mg$ with a senstive balance. The length and breath are measured with vernier calipers having a least count of $0.01 cm$. The thickness is measured with a new a screw gauge of least count $0.01mm$. The percentage accuracy in density calculated from the above measurements is

A. $13\ \%$

B. $130\ \%$

C. $1.3\ \%$

D. $16\ \%$

Answer: C

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7. The initial and final temperature are recorded as $(40.6 \pm 0.3)^0 C$ and $(50.7 \pm 0.2)^0 C$. The rise in temperaute is

A. $10.1^0 C$

B. $(10.1 \pm 0.3)^0 C$

C. $(10.1 \pm 0.5)^0 C$

D. $(10.1 \pm 0.1)^0 C$

Answer: C

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8. In the measurement of a physical quantity $X = \frac{A^2 B}{C^{1/3} D^3}$. The percentage erros introduced in the measurments of the quantities A, B, C and D are $2\%, 2\%, 4\%$ and 5% respectively. Then the minimum amount of percentage of error in the meaurement fo X is contributed by

A. A

B. B

C. C

D. D

Answer: C

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9. There are atomic (Cesium) clocks capable of measuring time with an accuracy of 1 part in 10^{11}. If two such clocks are operated to precision, then after running for 5000 years, these will record a difference of

A. 1 day

B. $1s$

C. $10^{11}s$

D. 1 year

Answer: B

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10. If the length of a simple pendulum is recorded as $(90 \pm 0.2)cm$ and period as $(1.9 \pm 0.02)s$, the percentage fo error in the measurement of acceleration due to gravity is

A. 4.2

B. 2.1

C. 1.5

D. 2.8

Answer: B

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11. In the determination of the Young's modulus of a given wiere, the force, length, radius and extension in the wire are measured as

$(100 \pm 0.01)N$, $(1.25 \pm 0.02)m$

$(0.01 \pm 0.0002)m$ and $(0.01 \pm 0.00002)m$, respectively. The percentage error in teh measurement of Young's modulus is

A. 4.37

B. 2.37

C. 0.77

D. 2.77

Answer: A

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12. The radius (r), length (l) and resistance (x) of a thin wire are

$(0.2 \pm 0.02)cm$, $(80 \pm 0.1)cm$, and $(30 \pm 1)\Omega$ respectively. The percentage error in the specific resistance is

A. $23.4\ \%$

B. $25.4\ \%$

C. $26\ \%$

D. $27.5\ \%$

Answer: A

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13. When a current of (2.5 ± 0.5) ampere flows through a wire, it develops a potential difference of (20 ± 1) volt, the resistance of the wire is

A. $(8 \pm 2)\Omega$

B. $(10 \pm 3)\Omega$

C. $(18 \pm 4)\Omega$

D. $(20 \pm 6)\Omega$

Answer: A

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14. Two objects A and B are of lengths $5cm$ and $7cm$ determined with errors $0.1cm$ and $0.2cm$ respecitively. The error in determining (a) the total length and (b) the difference in their lengths are

A. $(12 \pm 0.3), (2 \pm 0.3)$

B. $(7 \pm 0.3), (2 \pm 0.3)$

C. $(12 \pm 0.3), (12 \pm 0.3)$

D. $(12 \pm 0.3), (2 \pm 0.6)$

Answer: A

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15. In a sample pendulum experiment, length is measured as $31.4cm$ with an accuracy of $1mm$. The time for 100 ocscillations of pendulum is $112s$ with an accuracy of $0.01s$. The percentage accuracy in g is

A. 1

B. 2.8

C. 1.3

D. 2.1

Answer: D

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16. Three pieces of silver have masses $2.3kg$, $41.15g$ and $30.19g$. The toal mass fo correct significant figures in (in kg)

A. 2.37032

B. 2.370

C. 2.37

D. 2.4

Answer: D

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17. The sum of the given two numbers with regard to significant figures is

A. 4.55×10^{-6}

B. 4.5×10^{-6}

C. 4.6×10^{-6}

D. 4×10^{-6}

Answer: C

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18. The dimensions of a wooden block are $1.1m \times 2.36m \times 3.1m$. The number of significant figures in its volume should be

A. 1

B. 2

C. 3

D. 4

Answer: B

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19. In the relation $P = \frac{\alpha}{\beta} e^{-\alpha z / k\theta}$, P is preesure, K is Botzmann's constant, Z is distance and θ is temperature. The dimensional formula of β wll be

A. $[M^0 L^2 T^0]$

B. $[M^1 L^2 T^1]$

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

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

Answer: A

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20. The richardson equaction is given by $I = AT^2e^{-B/kT}$. The dimensional formula for AB^2 is same as that for A and B are constants

A. IT^{-2}

B. kT

C. Ik^2

D. Ik^2/T

Answer: C

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21. The heat generated in a circuit is given by $Q = I^2 Rt$, where I is current , R is resistance , and t is time . If the percentage errors in measuring $I, R,$ and $tare 2\%$, 1% , and 1% , respectively , then the maximum error in measuring heat will be

A. 2%

B. 3%

C. 4%

D. 6%

Answer: D

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Single Option Questions

1. The number of significant figures in 0.06900 is

A. 1.5

B. 4

C. 2

D. 3

Answer: B

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2. The sum of the numbers 436.32, 227.2 and 0.301 in appropriate significant figures is

A. 663.821

B. 664

C. 663.8

D. 663.82

Answer: B

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

A. $1.6048gcm^{-3}$

B. $1.69cm^{-3}$

C. $1.7gcm^{-3}$

D. $1.695gcm^{-3}$

Answer: C

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4. The numbers 2.745 and 2.735 on rounding off to 3 significant figures will give

A. 2.75 and 2.74

B. 2.74 and 2.73

C. 2.75 and 2.73

D. 2.74 and 2.74

Answer: D

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

A. $164 \pm 3cm^2$

B. $163.2 \pm 2.6cm^2$

C. $163.6 \pm 2.6cm^2$

D. $163.62 \pm 3cm^2$

Answer: A

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6. Which of the following pairs of physical quantites does not have same dimensional formula ?

A. Work and torque

B. Angular momentum and plank's constant

C. Tension and surface tension

D. Impules and linear momentum

Answer: C

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7. Measure of two quantities along with the precision of respective measuring instrument is $A = 2.5ms^{-1} \pm 0.5ms^{-1}$,B=0.10s+-0.01s`. The value of AB will be

A. $(0.25 \pm 0.08)m$

B. $(0.25 \pm 0.5)m$

C. $(0.25 \pm 0.05)m$

D. $(0.25 \pm 0.135)m$

Answer: A

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8. You measure two quantities as $A = 1.0m \pm 0.2m$, $B = 2.0m \pm 0.2m$. We should report correct value for $\sqrt{AB}$ as

A. $1.4 \pm 0.4m$

B. $1.41m \pm 0.15m$

C. $1.4 \pm 0.3m$

D. $1.4 \pm 0.2m$

Answer: D

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9. Which of the following measurement is most precise?

A. $5.00mm$

B. $5.00cm$

C. $5.00m$

D. $5.00km$

Answer: A

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10. The mean length of an object is $5cm$. Which of the following measurement is most accurate?

A. $4.9cm$

B. $805cm$

C. $5.25cm$

D. $5.4cm$

Answer: A

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

A. 1.9×10^{10}

B. 1.9×10^{11}

C. 1.9×10^{12}

D. 1.9×10^{13}

Answer: C

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

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

B. $\left[p^{2}AT\right]$

C. $pA^{-1/2}T\right]$

D. $\left[pA^{1/2}T\right]$

Answer: D

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More than One Answer Questions

1. On the basis of dimensions, decide which of the following relation for the displacement of a particle undergoing simple harmonic motion is not correct :

A. $y = a \sin 2\pi t / T$

B. $y = a \sin vt$

C. $y = \frac{a}{T} \sin\left(\frac{t}{a}\right)$

D. $y = a\sqrt{2}\left(\sin\frac{2\pi t}{T} - \cos\frac{2\pi t}{T}\right)$

Answer: B::C

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2. If P, Q, R are physical quantities, having different dimensions, which of the following combinations can never be a meaningful quantity ?

A. $(P - Q)/R$

B. $PQ - R$

C. PQ/R

D. $(R + Q)/P$

Answer: B::D

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3. Photon is quantum of radiation with energy E =hv where v is frequency and h is Planck's constant. The dimensions of h are the same as that of

A. linear impulse

B. angular impulse

C. linear momentum

D. angular momentum

Answer: B::D

Watch Video Solution

4. If Planck's constant (h) and speed of light in vacuum (c) are taken as two fundamental quantites, which on of the following can, in addition, be taken to express length, mass and time in terms of the three chosen fundamental quantities ?

A. Mass of electron (m_e)

B. Universal gravitational constant (G)

C. Charge of electron (e)

D. Mass of proton (m_p)

Answer: A::B::D

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5. Which of the following ratios express pressure?

A. Force/Area

B. $\text{Energy}/\text{Volume}$

C. $\text{Energy}/\text{Area}$

D. $\text{Force}/\text{Volume}$

Answer: A::B

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6. Which of the following are not a unit of time ?

A. Second

B. Parsec

C. year

D. light year

Answer: B::D

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7. A book with many printing errors contains four different forumlae for the displacement y of a particle undergoing a certain periodic motion : (i) $y = a\frac{\sin(2\pi t)}{T}$ (ii) $y = a\sin vt$ (iii) $y = \frac{a}{T}\frac{\sin(t)}{a}$ (iv)$y = \frac{a}{\sqrt{2}}\left[\frac{\sin(2\pi t)}{T} + \frac{\cos(2\pi t)}{T}\right]$ Here, a is maximum displacement of particle, v is speed of particle, T is time period of motion. Rule out the wrong forumlae on dimensinal grounds.

A. $y = A \sin(2\pi t / T)$

B. $y = A \sin(Vt)$

C. $y = A / T \sin(t / A)$

D. $y = \frac{A}{\sqrt{2}}(\sin \omega t + \cos \omega t)$

Answer: B::C

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8. Three of the quantites defined below have the same demsional formula. Identify them.

A. $\sqrt{\text{Energy}/\text{mass}}$

B. $\sqrt{\text{pressure/density}}$

C. $\sqrt{\text{Force/linear density}}$

D. $\sqrt{\text{Angular frequency/radius}}$

Answer: A::B::C

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9. The SI unit of inductance, the henry can be written as

A. $\text{weber}/\text{ampere}$

B. $\text{volt secound/ampere}$

C. $\text{joule}/(\text{ampere})^{-2}$

D. ohm/secound

Answer: A::B

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LEVEL-I (H.W)

1. The accuracy of a clock is one part in 10^{10}. The maximum difference between two such clocks operating for 10^{10} secounds is......

A. $1s$

B. $5s$

C. $10s$

D. $10^{10}s$

Answer: A

Watch Video Solution

2. The length of a rod is measured as $35.3cm$ then the gradutions ont eh scale are up to

A. $1cm$

B. $1mm$

C. $0.01mm$

D. $0.1mm$

Answer: B

Watch Video Solution

3. If $L = 2.06cm \pm 0.02cm$.

A. $3.17cm \pm 0.05cm$,

B. $2.06cm \pm 0.05cm$

C. $3.17cm \pm 0.2cm$

D. $3.17cm \pm 0.03cm$

Answer: A

View Text Solution

4. The radius fo sphere is measured as $(5.2 \pm 0.2)cm$ then the percentage error in volume of the ball is.....

A. 11%

B. 4%

C. 7%

D. 9%

Answer: A

Watch Video Solution

5. If the length and beradth of a plate are $(5.0 \pm 0.2)cm$ and $(4.0 \pm 0.1)cm$ the the absolue error in measurment of area is...

A. $10cm^2$

B. $11cm^2$

C. $12cm^2$

D. $1.3cm^2$

Answer: D

Watch Video Solution

6. If the length of a cylinder is measured to be $8.28cm$ with an error of $0.01cm$ then the percentage error in measured length is nearly.

A. 0.4%

B. 0.2%

C. 0.1%

D. 0.5%

Answer: C

Watch Video Solution

7. A student performs exeriment with simple pendulum and measures time for 10 vibrations. If the measures the time for 100 vibrations, the error in measurement of time period will be reduced by a factor of......

A. 10

B. 90

C. 100

D. $1\bar{0}00$

Answer: A

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8. If $L_1 = (3.03 \pm 0.02)m$ and $L_2 = (2.01 \pm 0.02)m$ then $L_1 + 2L_2$ in (in m)

A. 7.05 ± 0.06

B. 6.05 ± 0.06

C. 6.05 ± 0.02

D. 7.05 ± 0.02

Answer: A

Watch Video Solution

9. A body travels uniformly a distance of $(13.8 \pm 0.2)m$ in a time $(4.0 \pm 0.3)s$. Find the velocity of the body within error limits and the percentage error.

A. $(3.45 \pm 0.2)ms^{-1}$

B. $(3.45 \pm 0.3)ms^{-1}$

C. $(3.45 \pm 0.4)ms^{-1}$

D. $(3.45 \pm 0.5)ms^{-1}$

Answer: B

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10. The pressure on a square plate is mesaurement by measuring the force on the plate. If the maximum error in the measurment of force and length are respectively 4% and 2% then the maximum error in Measument of pressure is..........

A. 1%

B. 2%

C. 6%

D. 8%

Answer: D

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11. 2.34 is obtained by rounding off the number

A. 2.346

B. 2.355

C. 2.335

D. 2.334

Answer: C

Watch Video Solution

12. The number of singnificant figures in 0.0006032 is

A. 7

B. 4

C. 5

D. 2

Answer: B

Watch Video Solution

13. The radius of disc is $1.2cm$ its area according to idea of significant figures is..........

A. $4.5216cm^2$

B. $4.521cm^2$

C. $4.52cm^2$

D. $4.5cm^2$

Answer: D

Watch Video Solution

14. When Energy is expressed in erg the no of significant figure is four. If it is expressed in joule the no of significant figures will become

A. 9

B. 5

C. 1

D. 4

Answer: D

Watch Video Solution

15. $\sqrt{58.97}$ is

A. 7.679

B. 7.68

C. 7.6

D. 7.7

Answer: A

Watch Video Solution

16. A stick has a length of $12.132cm$ and an other stick has a length of $12.4cm$ then the total length of the stick is...........

A. $24.53cm$

B. $24.5cm$

C. $2.\overline{45}cm$

D. $2.453cm$

Answer: B

Watch Video Solution

17. The respective number of signficant figures for the numbers $23.023, 0.0003$ and 2.1×10^{-3} are

A. $5, 1, 2$

B. $5, 1, 5$

C. $5, 5, 2$

D. $4, 4, 2$

Answer: A

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18. The number of significiant figures in $5.69 \times 10^{15} kg$ is

A. 1

B. 2

C. 3

D. 4

Answer: C

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19. The value of $124.2 + 52.487$ with due regard to significant places is........

A. 176.69

B. 176.7

C. $\overline{1}76$

D. 177

Answer: B

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20. The value fo $\frac{9.270}{41}$ with due regard to significant figures is.....

A. 0.226

B. $0.\ 23$

C. 0.2

D. 0.2261

Answer: B

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21. When 57.986 is rounded off to 4 significant figures, then it becomes............

A. 58

B. 57.00

C. $\overline{57}.90$

D. 57.99

Answer: D

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22. If $'L'$ is length of sample pendulum and $'g'$ is acceleration due to gravity then the dimensional formula for $\left(\frac{l}{g}\right)^{\frac{1}{2}}$ is same

that for

A. frequency

B. velocity

C. time period

D. wavelength

Answer: C

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23. The demensional formula for the product of two physical quantites P and Q is $[L^2T^{-2}]$ the dimensional formula of P/Q is $[T^2]$ the P and Q respectively are......

A. distance and velocity

B. distance and acceleration

C. displacement and velocity

D. displacement and force

Answer: B

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24. The fundamental physical quantites that have same dimesions in the dimensional formula of force and Energy are..............

A. mass, time

B. time, length

C. mass, length

D. time, mole

Answer: A

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25. The η is rigidity modulus, r is the radius , l is the length and C is the moment fo the couple then $\frac{2lc}{\pi\eta r^4}$ has the dimensions of...........

A. Angle

B. Mass

C. Length

D. Frequency

Answer: A

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26. The acceleration of an object vareis with time as $a = AT^2 + BT + C$ taking the unit of time as $1 \sec$ and acceleration as ms^{-2} then the units of A, B, C respectively are.........

A. $ms^{-3}, ms^{-2}, ms^{-1}$

B. ms^{-2}, ms^{-1}, ms

C. $ms^{-1}, ms^{-2}, ms^{-3}$

D. $ms^{-4}, ms^{-3}, ms^{-2}$

Answer: D

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27. If $\eta = \frac{A}{B}\log(Bx + C)$ is dimensionally true, then (here η is the coefficent of visocosity and x is the distance)

A. C is dimensionless constant

B. B has dimensions of -1 in length

C. The dimensional formula of A is $ML^{-2}T^{-1}$.

D. All are true

Answer: D

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28. If the velocity (v) of a body in time $'t'$ is given by $V = AT^3 + BT^2 + CT + D$ then the dimensionas of C are...............

A. $[LT^{-1}]$

B. $[LT^{-2}]$

C. $[LT^{-3}]$

D. $\left[LT^{-4}\right]$

Answer: B

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29. In the relation $V = \frac{\pi}{8}\frac{Pr^4}{nl}$, where the letters have their usual meanings , the dimensions of V are

A. $M^0L^3T^0$

B. $M^0L^3T^{-1}$

C. $M^0L^{-3}T^{-1}$

D. $M^1L^3T^0$

Answer: B

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30. If the acceleration due to gravity is $10ms^{-2}$ and unit of length and time are changed in kilometer and hour respectively the numerical value of the acceleration is

A. 36000

B. 72000

C. 36000

D. $\overline{12960}0$

Answer: D

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31. The magnitude of Energy is $100J$ What will be its value if the units of mass and time are doubled and that fo length is halved?

A. $100J$

B. $200J$

C. $400J$

D. $800J$

Answer: D

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32. If the units of mass and velocity are increased by two times then the unit of momentum will be increased by............

A. $400\ \%$

B. $200(\ \%\ )$

C. $300\ \%$

D. $100\ \%$

Answer: C

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33. SI unit and CGS unit of quantity vary by 10^7 times, it is ....

A. Boltzmann's constant

B. Gravitational constant

C. Planck's constant

D. Angular momentum

Answer: B

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34. The initial velocity of a particle is given by $u^2 = v^2 - 2gx$ where x is the distance covered. IF $u = 18kmh^{-1}, g = 1000cm/s^2 x = 150cm$ then $v = ...m/s$

A. $\sqrt{45}$

B. $\sqrt{55}$

C. $\sqrt{35}$

D. $\sqrt{65}$

Answer: B

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35. The eqaction which is dimensionally correct among the following is

A. $v = u + \frac{1}{2}at$

B. $v = ut + at$

C. $s = ut + at^3$

D. $t = s + av$

Answer: A

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36. The dimensions of γ in the relation $v = \sqrt{\frac{\gamma p}{\rho}}$ (where v is velocity, p is pressure , ρ is density)

A. Dimensionless

B. $[LT^{-1}]$

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

D. $[ML^{-3}]$

Answer: A

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37. If frequency F, velocity V , and density D are considered fundamental units , the dimensional formula for momentum will be

A. $(\rho v^4 f^{-3})$

B. $(\rho v^3 f^{-1})$

C. $(\rho v f^2)$

D. $(\rho^2 v^2 f^2)$

Answer: A

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38. If momentum (p), Mass (M), Time (T) are chosen as fundamental quantites then the dimensional formula for length is..........

A. $(P^1T^1M^1)$

B. $(P^1T^1M^2)$

C. $(P^1T^1M^{-1})$

D. $(P^2T^2M^1)$

Answer: C

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39. If pressure P, velocity V and time T are taken as fundamental physical quantities, the dimensional formula of force if

A. $[P^1 V^1 T^1]$

B. $[P^1 V^2 T^1]$

C. $[P^1 V^1 T^2]$

D. $[P^1 V^2 T^2]$

Answer: D

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LEVEL-II (H.W)

1. The error in the measurement fo length of a simple pendulum is 0.1% and error in the time period is 2%. The possible maximum error in the quantity having dimensional formula LT^2 is

A. 1.1%

B. 2.1%

C. 4.1%

D. 6.1%

Answer: C

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2. The length of a cyclinder is measured as $5cm$ using a vernier calipers of least count $0.1mm$. The percentage error in the measured length is nerarly

A. 0.5%

B. 2%

C. 20%

D. 0.2%

Answer: D

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3. The diameter of a wire as measured by a screw gauge was found to be $1.002cm$, $1.000cm$ and $1.006cm$. The absoulue error in the first reading.

A. $0.001cm$

B. $0.04cm$

C. $0.006m$

D. $0.003cm$

Answer: A

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4. The 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 particles per unit volume for the value of x meant to x_2 and x_1 . Find the dimensions of D called diffusion constant.

A. $M^0L^1T^2$

B. $M^0L^1T^{-4}$

C. $M^0L^1T^{-3}$

D. $M^0L^2t^{-1}$

Answer: D

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5. The external and internal diameter of a hollow cylinder are determined with vernier calipers and the results are recorded as $(4.23 \pm 0.001)cm$ and $(3.89 \pm 0.01)cm$. The thickness of the cyclinder wall within the limits of error is

A. $0.34 \pm 0.1CM$

B. $0.34 \pm 0.02cm$

C. $0.34 \pm 0.4cm$

D. $0.17 \pm 0.1cm$

Answer: D

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6. The density of a cube is measured by measuring its mass and length of its side. If the maximum errors in the measurements of mass and length are 3% and 2% respectively. Then the maximum error in the measurement of density is :

A. $9\,\%$

B. $19\,\%$

C. $10\,\%$

D. $90\,\%$

Answer: A

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7. The diameter of a sphere is $3.34m$. Calculate its volume with due regard to significant figures.

A. 19.5169

B. 9.516

C. 19.5

D. 19.51

Answer: C

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8. The length , breath and thickness of a metal sheet are $4.234m$, $1.005m$, and $2.01cm$ respectively then the volume of the sheet is

A. $0.08m^3$

B. $0.0855m^3$

C. $0.085m^3$

D. $0.087m^3$

Answer: B

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9. The sides of a rectangle are $(10.5 \pm 0.2)cm$ and $(5.2 \pm 0.1)cm$. Calculate its perimeter with error limits .

A. $(31.4 \pm 0.6)cm$

B. $(31.4 \pm 0.2)cm$

C. $(31.4 \pm 0.1)cm$

D. $(31.4 \pm 0.9)cm$

Answer: A

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10. If the ratio of fundamental units in two systems are $2:3$ the ratio of force in these two systems is

A. $1:3$

B. $1:1$

C. $3:1$

D. $1:27$

Answer: B

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11. If $L, R, C,$ and V, respectively , represent inductance , resistance , capacitance and potential difference , then the dimensions of L/RCV are the same as those of

A. Charge

B. $1/\text{Charge}$

C. Current

D. $1/\text{Current}$

Answer: D

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12. Hydrostatic pressure $'P'$ varies with displacement $'x'$ as $P = \frac{A}{B}\log(Bx^2 + C)$ whre A, B and C are constants. The dimensional formula for $'A'$ is

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

B. $[MLT^{-2}]$

C. $[ML^{-2}T^{-2}]$

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

Answer: D

View Text Solution

13. The units of force, velocity and energy are 100dyne, $10 cms^{-1}$ and $500 erg$ respectively. The units of mass, length and time are

A. $5g, 5cm, 5s$

B. $5g, 4cm, 5s$

C. $0.5g, 5cm, 5s$

D. $5g, 0.5cm, 5s$

Answer: B

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14. The ratio of SI unit to CGS unti of gravitational constant of

A. $1:10^3$

B. $10^3:1$

C. $1:1$

D. $1:10^7$

Answer: A

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15. The frequency f of vibrations of a mass m suspended from a spring of spring constant k is given by $f = Cm^x k^y$, where C is a dimensionnless constant. The values of x and y are, respectively,

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

B. $-\frac{1}{2}, -\frac{1}{2}$

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

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

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16. If the period $'T'$ of a drop under surface tension $'s'$ is given by $T = \sqrt{d^a r^b S^c}$ where d is the density , r is the radius of the drop. If $a = 1, c = -1$ then the value of b is

A. 1

B. 2

C. 3

D. -1

Answer: C

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17. If the velocity (V), acceleration (A), and force (F) are taken as fundamental quantities instead of mass (M), length (L), and $time(T)$, the dimensions of young's modulus (Y) would be

A. FA^2V^{-4}

B. FA^2V^{-5}

C. FA^2V^{-3}

D. FA^2V^{-2}

Answer: A

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18. The time dependence of a physical quantity P is given by $P = P_0 e^{-\alpha t^2}$, where α is a constant and t is time . Then constant α is//has

A. is dimensionless

B. has dimensions of T^{-2}

C. has dimensions of P

D. has dimensions of T^2

Answer: B

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19. The value fo x in the formula $Y = \frac{2mgl^{x}}{5bt^{3}e}$ where m is the mass, $'g'$ is acceleration due to gravity, l is length , $'b'$ is the breath, $'t'$ is the thickness and e is the extension and Y is Young's Modulus is

A. 3

B. 2

C. 1

D. 4

Answer: A

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20. The velocity of sound in air (V) pressure (P) and density of air (d) are related as $V \alpha p^{x} d^{y}$. The values of x and y respectively are

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

B. $-\frac{1}{2}, -\frac{1}{2}$

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

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

Answer: D

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ILLUSTRATION

1. The moon is observed from two diametrically opposite points A and B on earth. The angle θ substended at the moon by the two directions of observation is $1^\circ 54'$. Given the diameter of earth to be about $1.276 \times 10^7 m$, calculate the distance of moon from earth.

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2. Calculate the angle in radians of

(i) 1° (degree)

(ii) 1 (minute of arc or arc minute) and

(iii) 1 (second of arc or arc sec)

in radian.(Use $360^\circ = 2\pi rad$,$1^\circ = 60^\circ$ and $1' = 60^\circ$ and $1' = 60^{''}$)

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3. A man wishes to estimate the distance of a nearby tower from him. He stands at a point A in front of the tower C and spots a very distant object O in line with AC. He then walks perpendicualr to AC upto B, a distaance of 100m and looks at O and C again. Since O is very distant, the direction of BO is practically the same as AO, but he finds the line of sight of C shifted from the original line of sight by an angle $\theta = 40^\circ (\theta \text{is known as parallax})$. Estimate the distance fo the tower C from his original position A.

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4. If the size of a nucleus $(\approx 10^{-15} m)$ is scaled up to the tip of a sharp pin $(\approx 10^{-5} m)$, what roughly is the size of an atom?

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5. The length of a straight line is measured a number of times by a number of observers. The following are the results of these measurements. Decide precision and Accuracy.

$\text{Actual length} = 3.785 CM \pm 0.001 cm$

Ist set of measurements 3.8 cm, 3.9 cm, 3.7 cm

2nd set of measurements 3.478 cm, 3.479 cm, 3.478 cm, 3.478 cm, 3.479 cm

3rd set of measurements 3.55 cm, 3.65 cm, 3.45 CM, 3.35 cm

4th set of measurements 3.784 cm, 3.785 cm, 3.784 cm, 3.785 cm, 3.784 cm.

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6. Two clocks are being tested against a standard clock located in a national laboratory. At 12:00:00 noon by the standard clock, the readings of the two clocks are :

	Clock 1	Clock 2
Monday	12 : 00 : 05	10 : 15 : 06
Tuesday	12 : 01 : 15	10 : 14 : 59
Wednesday	11 : 59 : 08	10 : 15 : 18
Thursday	12 : 01 : 50	10 : 15 : 07
Friday	11 : 59 : 15	10 : 14 : 53
Saturday	12 : 01 : 30	10 : 15 : 24
Sunday	12 : 01 : 19	10 : 15 : 11

If you are doing an experiment that requires precision time interval measurements, which of the two clocks will you prefer ?

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7. In an experiment, the values of refractive indices of glass were found to be $1.54, 1.53, 1.44, 1.54, 1.56$ and 1.45 in successive measurements (i) mean value of refreactive index of glass (ii) mean absolute error (iii) relative error and (iv) percentage error are respectively.

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8. हम एक सरल लोलक कस दोलन - काल ज्ञात करते है । प्रयोग के क्रमिक मापनों में लिए गए पाठ्यांक हैं : 2.63 s, 2.56 s, 2.42 s, 2.71 s एवं 2.80 s । निरपेक्ष त्रुटि , सापेक्ष त्रुटि एवं प्रतिशत त्रुटि परिकलित कीजिए ।

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9. If $L = 2.06cm \pm 0.02cm$

$B = 1.11cm \pm 0.03cm$

What are (L + B) and (L - B) equal to ?

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10. Two objects A and B are of lengths $5cm$ and $7cm$ determined with errors $0.1cm$ and $0.2cm$ respecitively. The error in determining (a) the total length and (b) the difference in their lengths are

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11. If $L = 2.01m \pm 0.01m$, what is 3L?

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12. If $L_1 = (2.02 \pm 0.01)m$ and $L_2 = (1.02 \pm 0.01)m$ then $L_1 + 2L_2$ is (in m)

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13. The length and breath of a recantangular object are $25.2cm$ and $16.8cm$ respecitively and have been measured to an accuracy of $0.1 cm$. Relative error and percentage error in the area of the object are

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14. In a sample pendulum experiment, length is measured as $31.4 cm$ with an accuracy of $1 mm$. The time for 100 ocscillations of pendulum is $112 s$ with an accuracy of $0.01 s$. The percentage accuracy in g is

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15. If $L = 20.04 m \pm 0.01 m$

$B = 2.52 m \pm 0.02 m$. What are the values of $(L \times B)$ and (L / B)?

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16. One side of a cube is measured as $a = 4.03 \pm 1\%$. What is its value?

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17. The density of a cube is measured by measuring its mass and the length of its sides. If the maximum errors in the measurement of mass and length are 3% and 2%, respectively, then find the maximum error in the measurement of the density of cube.

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18. The error in the measurement of the radius of a sphere is 1%. Find the error in the measurement of volume.

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19. An experiment measures quantites a, b, c and X is calculated from the formula

$$X = \frac{ab^2}{c^3}$$

If the percentage errors in a, b, c are $\pm 1\%$, $\pm 3\%$, $\pm 2\%$ respectively, the perentage error in X can be

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20. The percentage errors in the measurement of mass and speed are 2% and 3%, respectively . How much will be the maximum error in the estimation of KE obtained by measuring mass and speed?

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21. In the measurement of a physical quantity $X = \frac{A^2 B}{C^{1/3} D^3}$.

The percentage erros introduced in the measurments of the quantities A, B, C and D are $2\%, 2\%, 4\%$ and 5% respectively. Then the minimum amount of percentage of error in the meaurement fo X is contributed by

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22. The dimensional formula for a physical quantity x is $[M^{-1} L^3 T^{-2}]$. The errors in measuring the quantities $M, L,$ and $T,$ respectively are $2\%, 3\%,$ and 4%. The maximum percentage of error that occurs in measuring the quantity x is

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23. In Poiseuilli's method of determination of coefficient of viscosity, the physical quantity that requires greater accuracy in measurement is

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24. In an experiment of simple pendulum, the errors in the measurement of length of the pendulum (L) and time period (T) are 3% and 2% respectively. The maximum percentage error in the value of L/T^2 is

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25. The measured mass and volume of a body are $2.42g$ and $4.7cm^3$ respectively with possible error 0.01 g and 0.1 cc. Find the maximum error in density.

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26. A recantangular metal slab of mass 33.333 has its length $8.0cm$, breath $5.0cm$ and thickness $1mm$. The mass is measured with accuracy up to $1mg$ with a senstive balance. The length and breath are measured with vernier calipers having a least count of $0.01cm$. The thickness is measured with a new a screw gauge of least count $0.01mm$. The percentage accuracy in density calculated from the above measurements is

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27. The error in the measurement of the length of a simple pendulum is 0.1% and the error in the time period is 2%. What is the possible percentage of error in the physical quantity having the dimensional formula LT^{-2}?

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28. The heat generated in a circuit is dependent upon the resistance, current and time for which the current is flown. If the error in measuring the above are 1%, 2% and 1% respectively, then maximum error in measuring the heat is

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29. Two resistors of resistances $R_1 = 100 \pm 3$ ohm and $R_2 = 200 \pm 4$ ohm are connected (a) in series, (b) in parallel. Find the equivalent resistance of the (a) series combination, (b) parallel combination. Use for (a) the relation $R = R_1 + R_2$ and for (b) $\frac{1}{R'} = \frac{1}{R_1} + \frac{1}{R_2}$ and $\frac{\Delta R'}{R}{}^{,2} = \frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}$

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30. The period of oscillation of a simple pendulum is $T = 2\pi\sqrt{L/g}$. Measured value of L is $20.0cm$ known to $1mm$ accuracy and time for 100 oscillations of the pendulum is found to be 90 s using a wrist watch of 1 s resolution. What is the accuracy in the determination of g?

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31. Find significant in the followingr observations .

(i) $0.007gm$ (ii) $2.64 \times 10^{24}kg$ (iii) $0.2370gm/cm^3$ (iv) $6.320J/K$ (v) $6.032N/m^2$ (vi) $0.0006032K^{-1}$.

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32. Round off to 3 significant figures :

i) 20.93

ii) 0.0003125

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33. Find the value of 2.2 + 4.08+ 3.125 + 6.3725 .

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34. A stick has a length of 12.132 cm and another stick has a length of 12.4 cm .

(a) If the two sticks are placed end to end , what is their total length ?

(b) If the two sticks and placed sides by side, what is the difference in their lengths ?

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35. find the value of 44.8 - 21.235 .

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36. Solve with due regard to significant figures.

(i) 46.7 -10.04

(ii) $(3.0 \times 10^{-8}) + (4.5 \times 10^{-6})$

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37. Find the product of 1.2 ,2.54 and 3.257 with due regard to significant figures.

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

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39. Find out the results of the following operations.

i) 117.3×0.0024

ii) $9.27 \div 41$

iii) 42×0.041

iv) $124.2 + 52.487$

v) 124.2 - 52.487

vi) $\sqrt{58.97}$

viii) $(17.5)^2$

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40. The mass of $1.2cm^3$ of a certain substance is 5.74 g. Its density with due regard to significant figure is

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41. If a circular piece of tin has a measured radius of 2.6 cm, then what is its circumference?

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42. Derive an expression for the rate of flow of a liquid through a capillary tube. Assume that the rate of flow depends on i) pressure gradient $\left(\frac{P}{l}\right)$, (ii) The radius, r and (iii) the coefficient of viscosity, η. The value of the proportionally constant k $= \frac{\pi}{8}$

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43. The dimensionla formula for the product of two physical quantities P and Q is $\left[ML^2T^{-2}\right]$. The dimensional formula of $\frac{P}{Q}$ is $\left[MT^{-2}\right]$. Then P and Q respectively are

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44. 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 is the volume, T is the absolute temperature and a, b & R are constants. The dimensions of 'a' are : -

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45. If E, M, L and G denote energy, mass, angular momentum and gravitational constant repectively then the quantity (E^2L^2/M^5G^2) has the dimensions of :-

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46. If pressure P, velocity V and time T are taken as fundamental physical quantities, the dimensional formula of force if

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

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48. If velocity of light c, planck's constant h and gravitational constnat G are taken as fundamental quantities then the dimensions of the length will be

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49. If unit of mass is taken as 1 kg of time as 1 minute and that acceleration due to gravity is taken as $9.81ms^{-2}$, what is the unit of energy ?

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ILLUSTRATIONS

1. The diameter of a sphere is 4.24 m . Calculate its surface area with due regard to significant figures .

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2. Each side of a cube is measured to be 7.203 m . What is (i) the total surface area and (ii) the volume of the cube to appropriate significant figures ?

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3. The length of a rod is 2.5 cm and diameter is 2.5 mm. The volume of the rod with due consideration to significant figures is

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

Watch Video Solution

5. Convert Newton into dyne.

Watch Video Solution

6. Convert the unit of workdone from MKS system to CGS system.

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7. Let us check the dimensional correctness of the relation $v = u + at.$

Watch Video Solution

8. Check the accuracy of the relation $s = ut + \frac{1}{2}at^2$ where s is the distance travelled by the with uniform acceleration a in time t and having initial velocity u.

Watch Video Solution

9. Consider the equation $T = 2\pi\sqrt{\frac{l}{g}}$ and check whether it is correct or not.

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10. Derive an expression for time period (t) of a simple penduleum, which may depend upon : mass of bob (m), length of pendulum (l) and acceleration due to gravity(g).

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11. The velocity of sound (v) in a gas depends upon coefficint of volume elesticity E of the gas and density d of the gas. Use method of dimensions to derive the formula for v.

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12. A gas bubble, from an exlosion under water, oscillates with a period T proportional to p^(a)d^(b)E^(c). $Where$'P' $isthestaticpressure$, 'd'$isthedensityofwater$'E' $isthe \to tale \neq rgyofthe \exp losion. F \in dthevaluesof$a, b and, c`.

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EVALUATE YOURSELF - 1

1. If the percentage errors in measuring mass and velocity of a particle are respectively 2% and 1% percentage error in measuring its kinetic energy isp

A. 1%

B. 2%

C. 4%

D. 8%

Answer: D

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2. Mass and length of a metal cube are $10kg \pm 0.1kg$ and $1m \pm 0.02m$. Its density with percentage error is

A. $10k\frac{g}{m} \pm 7\%$

B. $10k\frac{g}{m} \pm 3\%$

C. $10/3k\frac{g}{m} \pm 7\%$

D. $10/3k\frac{g}{m} \pm 3\%$

Answer: A

3. If $X = \frac{a^3 b^2}{\sqrt{c}}$ and percentage changes in a,b and c are 2% increase, 1% decreases and 2% decrease respectively then percentage increase or decrease in X is

A. 5% increase

B. 5% decrease

C. 9% increase or decrease

D. 9% increase

Answer: A

4. Two resistances $R_1 = 100 \pm 3\Omega$ and $R_2 = 200 \pm 4\Omega$ are connected in series . Find the equivalent resistance of the series combination.

A. $(300 \pm 1)ohm$

B. $(300 \pm 7)ohm$

C. $(300 \pm 12)ohm$

D. $\left(\frac{200}{3} \pm 1\right)ohm$

Answer: B

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5. The initial and final temperatures of liquid in a container are observed to be $7.63 \pm 0.4^{\circ} C$ and $67.7 \pm 0.3^{\circ} C$. Determine the fall in the temperature of the liquid.

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6. A capacitor of capacitance $C = 2.0 \pm 0.1 \mu F$ is charged to a voltage $V = 20 \pm 0.2V$. What will be the charge Q on the capacitor ? Use $Q = CV$.

A. $(40 \pm 1.2 \times 10^{-6})$ Coulomb

B. $(40 \pm 0.1 \times 10^{-6})$ Coulomb

C. $(40 \pm 0.3 \times 10^{-6})$ Coulomb

D. $(40 \pm 2.4 \times 10^{-6})$ Coulomb

Answer: D

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7. The resistance $R = \frac{V}{I}$, where $V = (100 \pm 5.0)V$ and $I = (10 \pm 0.2)A$. Find the percentage error in R.

A. 2%

B. 7%

C. 5%

D. 1%`

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8. What is the percentage error in the measurement of time period of a pendulum if maximum errors in the measurement of l ands g are 2% and 4% respectively?

A. 6%

B. 4%

C. 3%

D. 5%

Answer: C

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9. The relative density of material of a body is found by weighting it first in air and then in water . If the weight in air is $(5.00 \pm 0.05)N$ and the weight in water is $(4.00 \pm 0.05)N$. Find the relative density along with the maximum permissible percentage error.

A. (5.00 ± 0.05)

B. $5.00 \pm 11\%$

C. (5.00 ± 0.10)

D. $5.00 \pm 6\,\%$

Answer: B

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10. The length of a rod is $(11.05 \pm 0.05) cm$. What is the length of two such rods?

A. $(22.1 \pm 0.05) cm$

B. $(22.10 \pm 0.05) cm$

C. $(22.1 \pm 0.05) m$

D. $(22.10 \pm 0.10) cm$

Answer: D

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EVALUATE YOURSELF - 2

1. The order of $(2)^{30}$ is approximately :

A. 10^{9}

B. 10^{10}

C. 10^{15}

D. 10^{20}

Answer: A

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2. Each side of a cube is measured to be 6.203m. What is the total surface area and volume of the cube to appropriate significant figures?

A. $411.3m^2$

B. $322.6m^2$

C. $311.3m^2$

D. $422.6m^2$

Answer: C

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3. 12.5g of a substance occupies $1.5cm^3$. Express its density by keeping the significant figures in view.

A. $8.3gcm^{-3}$

B. $8.33gcm^{-3}$

C. $8.333gcm^{-3}$

D. $8.2gcm^{-3}$

Answer: A

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4. When 2.0347 is added to 15.7, the sum

A. 17.7347

B. 17.734

C. 17.13

D. 17.7

Answer: D

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5. The length and breadth of a metal sheet are 3.124m and 3.002m respectively. The area of this sheet upto correct significant figure is

A. $9.376m^2$

B. $9.378m^2$

C. $9.379m^2$

D. $9.388m^2$

Answer: B

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6. Substract 3.2×10^{-6} from 4.7×10^{-4} with due regard to significant figures.

A. 4.7×10^{-4}

B. 5.4×10^{-4}

C. 3.7×10^{-4}

D. 2.7×10^{-4}

Answer: A

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7. (a).Add $3.8 \times 10^{-6} \rightarrow 4.2 \times 10^{-5}$ with due regard to significant figures.

(b). Subtract $3.2 \times 10^{-6} \varrho m 4.7 \times 10^{-4}$ with regard to significant figures.

(c). Subtract $1.5 \times 10^3 \sigma m 4.8 \times 10^4$ with due regard to significant figures.

A. $4.6x10^{-5}$

B. $4.6x10^{-6}$

C. $4.6x10^{-7}$

D. $4.6x10^{-8}$

Answer: A

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8. The diameter of a sphere is 2.78 m . Calculate its volume with due regard to significant figures .

A. $11.3m^3$

B. $12.3m^3$

C. $10.3m^3$

D. $9.3m^3$

Answer: A

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9. A thin wire has length of 21.7 cm and radius 0.46 mm. Calculate the volume of the wire to correct significant figures?

A. $0.14cm^3$

B. $0.34cm^3$

C. $0.24cm^3$

D. $0.84cm^3$

Answer: A

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EVALUATE YOURSELF - 3

1. The number of significant figures in 3400 is

A. 3

B. 4

C. 2

D. 1

Answer: C

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2. Which of the following is dimensionally same?

A. Pressure =momentum per unit volume

B. Pressure=momentum per unit volume per unit time

C. Pressure = energy per unit volume

D. Pressure=energy per unit area

Answer: C

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3. The dimesional formula for impulse is _____

A. $[MLT^2]$

B. $[MLT^{-1}]$

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

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

Answer: B

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4. Which one of the following pairs are not dimensionally identical?

A. Heat energy and work

B. Impulse and momentum

C. Frequency and angular velocity

D. Displacement and angular displacement

Answer: D

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5. The numerical values and units of a physical quantity in two different system of units are n_1, n_2 and u_1, u_2 respectively. Then

A. $n_1 u_2 = n_2 u_1$

B. $n_1 u_1 \_ (2) = n_2 u_2 \_ (1)$

C. $n_1 = n_2$ and $u_1 = u_2$

D. $n_1 u_1 = n_2 u_2$

Answer: D

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6. The acceleration due to gravitiy is 9.8 ms^{-2}. Give its dimensional formula.

A. $[MLT^{-2}]$

B. $[M^0LT^{-2}]$

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

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

Answer: B

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7. $G = 6.67 \times 10^{-11} kg^{-1} m^3 s^{-2}$. Convert it into CGS system.

A. $6.67 \times 10^{-8} cm^3 / g \sec^2$

B. $6.67 \times 10^{-7} cm^3 / g \sec^2$

C. $6.67 \times 10^{-9} cm^3 / g \sec^2$

D. $6.67 \times 10^{-3} cm^3 / g \sec^2$

Answer: A

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8. The smallest and largest units of length are.

A. Millimeter and Centimeter

B. Fermi and Parsec

C. Millimeter and Kilometer

D. Millimeter and Light Year

Answer: B

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9. Match the type of unit (column A) with its corresponding example (column B)

Column A	Column B
(a) Base unit	(p) N
(b) Derived unit	(q) Hp
(c) Improper unit	(r) Kg – wt
(d) Practical unit	(s) rad
(e) Supplementry unit	(t) kg

A. t, p, s, qr

B. p, q, r, s, t

C. p, r, q, s, t

D. t, p, r, q, s

Answer: D

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10. Which of the following is a dimensional constant?

A. refreactive index

B. dielectric constant

C. relative density

D. gravitational constant.

Answer: D

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11. Dimensional formula for latent heat is_______

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

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

C. $[MLT^{-2}]$

D. $[ML^2T^{-2}]$

Answer: A

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EVALUATE YOURSELF - 4

1. Given $F = (a/t) + bt^2$ where F denotes force and t time. The diamensions of a and b are respectively:

A. $[MLT^{-1}]$ and $[MLT^{-4}]$

B. $[LT^{-1}]$ and $[T^{-2}]$

C. [T] and $[T^{-2}]$

D. $\left[LT^{-2}\right]$ and $\left[T^{-2}\right]$

Answer: A

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2. One kilowatt-hour is equal to :

A. 3.6×10^{6}joule

B. 3.6×10^{5}joule

C. 10^{3}joule

D. 10^{7}joule

Answer: A

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3. if a particle F is applied on a body and it moves with a velocity v , the power will be

A. $[FV^2]$

B. [FV]

C. $[F/V^2]$

D. $[F/V]$

Answer: B

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4. If the energy, $E = G^p h^q c^r$, where G is the universal gravitational constant, h is the Planck's constant and c is the velocity of light, then the values of p are q and r are, respectively

A. $-1/2, 1/2$ and $5/2$

B. $1/2, \ -1/2$ and $-5/2$

C. $-1/2, 1/2$ and $3/2$

D. $1/2, \ -1/2$ and $-3/2$

Answer: A

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5. If mass (M), length (L) and force (F) are considered as fundamental quantities then, find the dimensional formula for time

A. $M^{1/2}L^{-1/2}F^{1/2}$

B. $M^{-1/2}L^{-1/2}F^{1/2}$

C. $M^{1/2}L^{-1/2}F^{1/2}$

D. $M^{1/2}L^{1/2}F^{-1/2}$

Answer: D

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6. 1 J/s is equivalent to $nerg/s$ where n is

A. 10^5

B. 10^7

C. 10^6

D. 10^{-7}

Answer: B

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7. The dimension of universal gravitational constant are

A. $M^{-1}L^2T^{-3}$

B. $M^{-1}L^{-2}T^{-3}$

C. $M^{-1}L^3T^{-2}$

D. $M^{-3}L^1T^{-2}$

Answer: C

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8. Which of the following quantity has dimensional formula as $(ML^{-1}T^{-2})$?

A. Temperature

B. Kinetic energy

C. Pressure

D. Angular Speed

Answer: C

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9. Find the dimensions of Planck's constant h from the equatioin $E = hv$ where E is the energy and v is the frequency.

A. ML^2T^{-1}

B. ML^2T^2

C. $M^{-1}L^3T^{-2}$

D. $M^{-3}L^1T^{-2}$

Answer: A

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10. Centripetal force (F) on a body of mass (m) moving with uniform speed (v) in a circle of radius (r) depends upon m, v and r. The formula for the centripetal force using theory of dimensons.

A. kmv^2

B. $\frac{kmv^2}{r}$

C. $\frac{km^2v^2}{r}$

D. $\frac{km^2v}{r}$

Answer: B

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C.U.Q -ADDITIONAL QUESTIONS

1. The dimensional formula for magnetic Moment of a magnet is

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

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

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

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

Answer: A

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2. Dimensions of C x R (Capacity x Resistance) is

A. frequency

B. energy

C. time period

D. current

Answer: C

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3. Dimensional formula of capacitance is

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

B. $[M^1L^2T^4I^{-2}]$

C. $[M^1L^2T^2]$

D. $[MLT^{-1}]$

Answer: A

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4. The dimensional formula fo resistivity in terms of M, L, T and Q where Q stands for the dimensions of charge is

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

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

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

D. $\left[MLT^{-1}Q^{-1}\right]$

Answer: A

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5. Dimensional formula for Magnetic Induction is__________.

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

B. $\left[MT^{-2}A^{-1}\right]$

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

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

Answer: B

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6. The dimensional formula for magnetic flux is

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

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

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

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

Answer: A

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7. The SI unit of a physical quantity having the dimensional formula of `"[ML^(0)T^(-2) A^(-1)]"

A. tesla

B. weber

C. amp metre

D. amp m^2

Answer: A

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8. What are the unit of $\frac{\mu_0}{4\pi}$

A. $Na^{-1}m^2$

B. NA^{-2}

C. Nm^2C^2

D. unitless

Answer: B

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9. If μ is the permeability and ε is the permittivity then $\frac{1}{\sqrt{\mu\varepsilon}}$ is equal to

A. speed of sound

B. speed of light in vacuum

C. speed of sound in medium

D. speed of light in medium

Answer: D

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10. $\left[\frac{\text{Permeability}}{\text{Permittivity}}\right]$ will have the dimesional formula of:

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

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

C. $\left[M^2L^4T^{-6}A^{-4}\right]$

D. $\left[M^{-2}L^{-4}T^6A^4\right]$

Answer: C

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11. Siemen is the $S.I$ unit of

A. Electrical conductance

B. Electrical conductivity

C. Potential difference

D. Inductance

Answer: A

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12. Which of the following quantities has the units $Kgm^2s^{-3}A^{-2}$?

A. Resistance

B. Inductance

C. capacitance

D. Magnetic flux

Answer: A

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13. The S.I. unit of magnetic permeability is

A. Am^{-1}

B. Am^{-2}

C. Hm^{-2}

D. Hm^{-1}

Answer: D

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14. The dimensions of time in Electrical intensity is

A. -1

B. -2

C. -3

D. 3

Answer: C

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15. SI Unit of physical quantity whose dimensional formula is $M^{-1}L^{-2}T^{4}A^{2}$ is

A. ohm

B. volt

C. siemen

D. farad

Answer: D

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16. $\dfrac{1}{\sqrt{\text{Capacitance} \times \text{Inductance}}}$ have the Same unit as

A. time

B. velocity

C. velocity gradient

D. none of the above

Answer: C

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17. What are the units of $K\frac{1}{4\pi \in_0}$?

A. $C^2N^{-1}m^{-2}$

B. $C^{-2}N^1m^2$

C. $C^2N^1m^2$

D. unitless

Answer: B

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18. $\left[M^1L^2T^{-3}A^{-2}\right]$ si the dimensional formula of:

A. electric resistance

B. capacity

C. electric potential

D. specific resistance

Answer: A

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19. If L is the inductance, $'I'$ is current in the circuit, $\frac{1}{2}Li^2$ has the dimesions of

A. Work

B. Power

C. Pressure

D. Force

Answer: A

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20. The dimension of length in electrical resistance is

A. 2

B. 1

C. -2

D. -1

Answer: A

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21. If m is the mass, Q is the charge and B is the magnetic induction, m / BQ has the same dimensions as:

A. frequency

B. Time

C. velocity

D. Acceleration

Answer: B

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22. If L has the dimensions of length, V that of potential and ε_0 is the permittivity of free space then quantity $\varepsilon_0 LV$ has the dimensions of

A. current

B. charge

C. resistance

D. voltage

Answer: B

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23. Dimensional formula of 'ohm' is same as

A. $\frac{h}{e}$

B. $\frac{h^2}{e}$

C. $\frac{h}{e^2}$

D. $\frac{h^2}{e^2}$

Answer: C

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24. If C, R, L and I denot capacity resitance, inductance and electric current respecitively, the quantities having the same dimensions of time are

(a) CR, (b) L/R, (c) $\sqrt{L/C}$, (d) LI^2

A. CR

B. L/R

C. $\sqrt{LC}$

D. LI^2

Answer: D

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25. Which of the following do not have the same dimensions as the other three ? Give that l=length , m=mass , k=force constant, I= moment of inertia, B=magnetic

A. $\sqrt{l/g}$

B. $\sqrt{I/P_mB}$

C. $\sqrt{k/m}$

D. $\sqrt{R/g}$

Answer: C

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26. If F is the force, μ is the permeability , H is the intensity of magneitc field and i is the electric current, tehn $\frac{F}{\mu Hi}$ has the

dimensions of

A. Mass

B. length

C. time

D. Energy

Answer: B

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27. If e, $\in_0$, h and c respectively represent electric, charge, permittivity of free space, Planck's constant and speed of light then $\frac{e^2}{\in_0 hc}$ has the dimensions of

a) angle

b) relative density

c) strain

d) current

A. a & b are correct

B. d & c are correct

C. a,b & c are correct

D. a,b,c & d are correct

Answer: C

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EXERCISE -I (C.W)

1. The accuracy in the measurement of the diameter of hydrogen atom as $1.06 \times 10^{-10} m$ is

A. 0.01

B. 1.06×10^{-10}

C. $\frac{1}{106}$

D. 0.01×10^{-10}

Answer: C

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2. The length of a rod is measured as $31.52cm$. Graduations on the scale are up to

A. 1mm

B. 0.01 mm

C. 0.1mm

D. 0.02 mm

Answer: C

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3. If $L = (20 \pm 0.01)m$ and $B = (10 \pm 0.02)m$ then L/B is

A. $(2 \pm 0.03)m$

B. $(2 \pm 0.015)m$

C. $(2 \pm 0.01)m$

D. $(2 \pm 0.005)m$

Answer: D

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4. The radius of a sphere is measured as $(10 \pm 0.02)cm$. The error in the measurment of its volume is

A. 25.lcc

B. 25.12 cc

C. 2.51 cc

D. 251.2 cc

Answer: C

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5. If length and breath of a plate are $(40 \pm 0.2)cm$ and $(30 \pm 0.1)cm$, the absolute error in the meaurement of area is

A. $10cm^2$

B. $8cm^2$

C. $9cm^2$

D. $7cm^2$

Answer: A

Watch Video Solution

6. If the length of a cylinder is measured to be $4.28cm$ with an error of $0.01cm$, the percentage error in the mesured length is nearly

A. 0.4%

B. 0.5%

C. 0.2%

D. 0.1%

Answer: C

Watch Video Solution

7. When 10 observations are taken, the random error is x, When 100 oberservations are taken, the random error becomes

A. x/10

B. x^2

C. $10x$

D. $\sqrt{x}$

Answer: A

Watch Video Solution

8. If $L_1 = (2.02 \pm 0.01)m$ and $L_2 = (1.02 \pm 0.01)m$ then $L_1 + 2L_2$ is (in m)

A. 4.06 ± 0.02

B. 4.06 ± 0.03

C. 4.06 ± 0.0054

D. 4.06 ± 0.01

Answer: B

Watch Video Solution

9. A body travels unifromly a distance of $(20.0 \pm 0.2)m$ in time $(4.0 \pm 0.4)s$. The velocity of the body is

A. $(5.0 \pm 0.4)ms^{-1}$

B. $(5.0 \pm 0.2)ms^{-1}$

C. $(5.0 \pm 0.6)ms^{-1}$

D. $(5.0 \pm 0.1)ms^{-1}$

Answer: D

Watch Video Solution

10. If the value of $103.5kg$ is rounded off to three significant figures, then the value is

A. 103

B. 103.0

C. 104

D. 10.3

Answer: C

Watch Video Solution

11. The number of significant figures in $6.023 \times 10^{23} \text{mole}^{-1}$ is

A. 4

B. 3

C. 2

D. 23

Answer: A

Watch Video Solution

12. The side fo a cube is 2.5 metre. The volume of the cube of the significant figures is

A. 15

B. 16

C. 1.5

D. 1.6

Answer: B

Watch Video Solution

13. When a force is expressed in dyne, the number of sinificant figures is four. If it is expressed in newton, the number of significant figures will become $\left(10^5 \text{dyne} = 1N\right)$

A. 9

B. 5

C. 1

D. 4

Answer: D

Watch Video Solution

14. $\sqrt{2.0}$ is

A. 1.414

B. 1.4

C. 1.0

D. 1

Answer: B

Watch Video Solution

15. The mass of a box is 2.3 kg . Two marbles of masses 2.15 g and 12.48 g are added to it. The total mass of the box is

A. 2.31463 kg

B. 2.315kg

C. 2.31 kg

D. 2.3 kg

Answer: D

Watch Video Solution

16. The number of significant figures in 0.10200 is

A. 6

B. 5

C. 3

D. 2

Answer: B

Watch Video Solution

17. When the number 0.046508 is reduced to 4 significant figures, then it becomes

A. 0.0465

B. 4650.8×10^{-5}

C. 4.651×10^{-2}

D. 4.650×10^{-2}

Answer: C

Watch Video Solution

18. With due regard to significant figures, the value of $(46.7 - 10.04)$ is

A. 36.7

B. 36.00

C. 36.66

D. 30.6

Answer: A

Watch Video Solution

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

A. 0.0591

B. 0.0590

C. 0.590

D. 0.5906

Answer: B

Watch Video Solution

20. By rounding off, (a) 20.96 and (b) 0.0003125 to 3 significant figures we get

A. $21.0, 312 \times 10^{-4}$

B. $21.0, 3.12 \times 10^{-4}$

C. $2.10, 3.12 \times 10^{-4}$

D. $210, 3.12 \times 10^{-4}$

Answer: B

Watch Video Solution

21. If the unit of length is doubled and that of mass and time is halved, the unit of energy will be

A. doubled

B. 4 times

C. 8 times

D. same

Answer: C

Watch Video Solution

22. Given M is the mass suspended from a spring of force constant. k.The dimensional formula for $[M/k]^{1/2}$ is same as that for

A. frequency

B. time period

C. velocity

D. wavelength

Answer: B

Watch Video Solution

23. The dimensionla formula for the product of two physical quantities P and Q is $\left[ML^2T^{-2}\right]$. The dimensional formula of $\frac{P}{Q}$ is $\left[MT^{-2}\right]$. Then P and Q respectively are

A. Force and velocity

B. Momentum and displacement

C. Force and displacement

D. work and velocity

Answer: C

Watch Video Solution

24. The fundamental physical quantites quanties 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

Watch Video Solution

25. The physical quantity which was the dimensional formula as that of $\frac{\text{energy}}{\text{mass} \times \text{length}}$ is

A. Force

B. Power

C. Pressure

D. Acceleration

Answer: D

Watch Video Solution

26. If J and E represent the angualr momentum and rotational kinetic energy of a body, $\frac{J^2}{2E}$ represents the following physical quantitiy.

A. Moment of couple

B. Moment of force

C. moment of inertia

D. Force

Answer: C

Watch Video Solution

27. If the fundamental units of length, mass and time are doubled, the unit of force will

A. doubled

B. halved

C. remain same

D. four times

Answer: C

Watch Video Solution

28. $\mu = A + \frac{B}{\lambda} + \frac{C}{\lambda^2}$ si dimensionally correct. The dimensions of A, B and C respectively are (μ, A, B, C are constant) where

λ is wave length of wave

A. No dimensions , L L^2

B. L^2, No dimensions , L

C. L, L^2, No dimensions

D. L , No dimensions , L^2

Answer: A

Watch Video Solution

29. According to Bernoulli's theorem $\frac{p}{d} + \frac{v^2}{2} + gh$ = constant is (P is pressure, d is density, h is height, v is velocity and g is acceleration due to gravity)

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

B. $[M^0LT^0]$

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

D. $\left[M^0L^2T^{-4}\right]$

Answer: C

Watch Video Solution

30. The surface tension of a liquid in CGS system is 45 dyne cm^{-1}. Its value in SI system is

A. $4.5Nm^{-1}$

B. $0.045Nm^{-1}$

C. $0.0045Nm^{-1}$

D. $0.45Nm^{-1}$

Answer: B

Watch Video Solution

31. If minutes is the unit of time. $10ms^{-2}$ is the unit of acceleration and $100kg$ is the unit of mass, the new unit of work in joule is

A. 10^5

B. 10^6

C. 6×10^6

D. 36×10^6

Answer: D

Watch Video Solution

32. The magnitude of force is $100N$. What will be its value if the units of mass and time are doubled and that of length is halved?

A. 25

B. 100

C. 200

D. 400

Answer: A

Watch Video Solution

33. A motor pumps water at the rate of Vm^3 per second, against a pressure PNm^{-2}. The power fo the motor is watt is

A. PV

B. (P/V)

C. (V/P)

D. (V-P)

Answer: A

Watch Video Solution

34. If the units of length and force are increased by four times the unit of energy will be incresed by

A. 16%

B. 1600%

C. 1500%

D. 400%

Answer: C

Watch Video Solution

35. SI unit and CGS unit of quantity vary by 10^3 times, it is:

A. Boltzmann constant

B. Gravitational constant

C. Planck's constant

D. Angular Momentum

Answer: B

Watch Video Solution

36. The value fo universal gravitationla constant G in CGS system is 6.67×10^{-8} dyne $cm^2 g^{-2}$. Its value in SI system is

A. $6.67 \times 10^{11} Nm^2 Kg^{-2}$

B. $6.67 \times 10^{-5} Nm^2 Kg^{-2}$

C. $6.67 \times 10^{-10} Nm^2 kg^{-2}$

D. $6.67 \times 10^{-9} Nm^2 Kg^{-2}$

Answer: A

Watch Video Solution

37. The final velocity fo a particles falling freelly under graavity is given by $V^2 - U^2 = 2GX$ WHERE x is the distance covered. IF $V = 18$ kmph. $g = 1000 cms^{-2}$, $x = 120 cm$ then $u = ... ms^{-1}$

A. 2.4

B. 1.2

C. 1

D. 0.1

Answer: C

Watch Video Solution

38. The equaction which is dimensionally correct among the following is

A. $v = u + at^2$

B. $s = ut + at^3$

C. $s = ut + at^2$

D. $t = s + av$

Answer: C

Watch Video Solution

39. The dimensions of $'k'$ in the relation $V = k$ avt (where V is the volume of a liquid passing through any point in time t, $'a'$ is area of cross section, v is the velocity of the liquid) is

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

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

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

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

Answer: D

Watch Video Solution

40. If force (F), work (W) and velocity (V) are taken as fundamental quantites then the dimensional formula of Time (T) is

A. $[W^1F^1V^1]$

B. $[W^1F^1V^{-1}]$

C. $[W^{-1}F^{-1}V^{-1}]$

D. $[W^1F^{-1}V^{-1}]$

Answer: D

Watch Video Solution

41. If force F, Mass M and time T are chosen as fundamental quanties the dimensional formula for length is

A. [FMT]

B. $[FM^{-1}T^2]$

C. $[FM^2T^{-2}]$

D. $[F^{-1}M^{-2}T^{-2}]$

Answer: B

Watch Video Solution

42. If force F, Length L and time T are chosen as fundamental quantites, the dimensional formula for Mass is

A. [FLT]

B. $[F^{-1}L^{-1}T^{-2}]$

C. $[F^{-2}L^{-2}T^{-2}]$

D. $[F^{1}L^{-1}T^{-2}]$

Answer: D

Watch Video Solution

EXERCISE -I (H.W)

1. The accuracy of a clock is one part in 10^{10}. The maximum difference between two such clocks operating for 10^{10} secounds is......

A. 1s

B. 5s

C. 10s

D. $10^{10}s$

Answer: A

Watch Video Solution

2. The length of a rod is measured as $35.3cm$ then the graduations on the scale are up to

A. 1 cm

B. 1 mm

C. $0.01mm$

D. 0.1 mm

Answer: D

Watch Video Solution

3. If $L = 2.06cm \pm 0.02cm,$

B=1.11 cm $\pm 0.03cm,$

then L+B equals to

A. $3.17cm \pm 0.05cm$

B. $2.06cm \pm 0.05cm$

C. $3.17cm \pm 0.02cm$

D. $3.17cm \pm 0.03cm$

Answer: A

Watch Video Solution

4. The radius fo sphere is measured as $(5.2 \pm 0.2)cm$ then the percentage error in volume of the ball is.....

A. 11%

B. 4%

C. 7%

D. 9%

Answer: A

Watch Video Solution

5. If the length and beradth of a plate are $(5.0 \pm 0.2)cm$ and $(4.0 \pm 0.1)cm$ the the absolue error in measurment of area is...

A. $10cm^2$

B. $11cm^2$

C. $12cm^2$

D. $1.3cm^2$

Answer: D

Watch Video Solution

6. If the length of a cylinder is measured to be $8.28cm$ with an error of $0.01cm$ then the percentage error in measured length is nearly.

A. 0.4%

B. 0.2%

C. 0.1%

D. 0.5%

Answer: C

Watch Video Solution

7. A student performs exeriment with simple pendulum and measures time for 10 vibrations. If the measures the time for 100 vibrations, the error in measurement of time period will be reduced by a factor of......

A. 10

B. 90

C. 100

D. 1000

Answer: A

Watch Video Solution

8. If $L_1 = (3.03 \pm 0.02)m$ and $L_2 = (2.01 \pm 0.02)m$ then $L_1 + 2L_2$ in (in m)

A. 7.05 ± 0.06

B. 6.05 ± 0.06

C. 6.05 ± 0.02

D. 7.05 ± 0.02

Answer: A

Watch Video Solution

9. A body travels uniformly a distance of $(13.8 \pm 0.2)m$ in a time $(4.0 \pm 0.3)s$. Find the velocity of the body within error limits and the percentage error.

A. $(3.45 \pm 0.2)ms^{-1}$

B. $(3.45 \pm 0.3)ms^{-1}$

C. $(3.45 \pm 0.4)ms^{-1}$

D. $(3.45 \pm 0.5)ms^{-1}$

Answer: B

Watch Video Solution

10. 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. 1%

B. 2%

C. 6%

D. 8%

Answer: D

Watch Video Solution

11. 2.34 is obtained by rounding off the number

A. 2.346

B. 2.355

C. 2.335

D. 2.334

Answer: C

Watch Video Solution

12. The number of singnificant figures in 0.0006032 is

A. 7

B. 4

C. 5

D. 2

Answer: B

Watch Video Solution

13. The radius of disc is $1.2cm$ its area according to idea of significant figures is..........

A. $4.5216cm^2$

B. $4.521cm^2$

C. $4.52cm^2$

D. $4.5cm^2$

Answer: D

Watch Video Solution

14. When Energy is expressed in erg the no of significant figure is four. If it is expressed in joule the no of significant figures will become

A. 9

B. 5

C. 1

D. 4

Answer: D

Watch Video Solution

15. $\sqrt{57.97}$ is

A. 7.679

B. 7.68

C. 7.6

D. 7.7

Answer: A

Watch Video Solution

16. A stick has a length of $12.132cm$ and an other stick has a length of $12.4cm$ then the total length of the stick is...........

A. 24.53 cm

B. 24.5 cm

C. 2.45 cm

D. 2.453 cm

Answer: B

Watch Video Solution

17. The respective number of significant figures for the numbers 23.023, 0.0003 and 2.1×10^{-3} are

A. 5,1,2

B. 5,1,5

C. 5,5,2

D. 4,4,2

Answer: A

Watch Video Solution

18. The number of significiant figures in $5.69 \times 10^{15} kg$ is

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

19. The value of $124.2 + 52.487$ with due regard to significant places is........

A. 176.69

B. 176.7

C. 176

D. 177

Answer: B

Watch Video Solution

20. The value fo $\frac{9.270}{41}$ with due regard to significant figures is.....

A. 0.226

B. 0.23

C. 0.2

D. 0.2261

Answer: B

Watch Video Solution

21. When 57.986 is rounded off to 4 significant figures, then it becomes............

A. 58

B. 57.00

C. 57.9

D. 57.99

Answer: D

Watch Video Solution

22. If $'L'$ is length of sample pendulum and $'g'$ is acceleration due to gravity then the dimensional formula for $\left(\frac{l}{g}\right)^{\frac{1}{2}}$ is same that for

A. frequency

B. velocity

C. time period

D. wavelength

Answer: C

Watch Video Solution

23. The demensional formula for the product of two physical quantites P and Q is $\left[L^2T^{-2}\right]$ the dimensional formula of

P/Q is $[T^2]$ the P and Q respectively are......

A. distance and velocity

B. distance and acceleration

C. displacement and velocity

D. displacement and force

Answer: B

Watch Video Solution

24. The fundamental physical quantites that have same dimesions in the dimensional formula of force and Energy are..............

A. mass, time

B. time, length

C. mass, length

D. time, mole

Answer: A

Watch Video Solution

25. The η is rigidity modulus, r is the radius , l is the length and C is the moment of the couple then $\frac{2lc}{\pi\eta r^4}$ has the dimensions of...........

A. Angle

B. Mass

C. Length

D. Frequency

Answer: A

Watch Video Solution

26. The acceleration of an object vareis with time as $a = AT^2 + BT + C$ taking the unit of time as $1 \sec$ and acceleration as ms^{-2} then the units of A, B, C respectively are.........

A. $ms^{-3}, ms^{-2}, ms^{-1}$

B. ms^{-2}, ms^{-1}, ms

C. $ms^{-1}, ms^{-2}, ms^{-3}$

D. $ms^{-4}, ms^{-3}, ms^{-2}$

Answer: D

Watch Video Solution

27. If $\eta = \frac{A}{B}\log(Bx + C)$ is dimensionally true, then (here η is the coeffıcent of visocosity and x is the distance)

A. C is dimensionless constant

B. B has dimensions of -1 in length

C. The dimensional formula of A is $ML^{-2}T^{-1}$

D. All are true

Answer: D

Watch Video Solution

28. If the velocity (v) of a body in time $'t'$ is given by $V = AT^3 + BT^2 + CT + D$ then the dimensionas of C are...............

A. $[LT^{-1}]$

B. $[LT^{-2}]$

C. $[LT^{-3}]$

D. $[LT^{-4}]$

Answer: B

Watch Video Solution

29. In the relation $V = \frac{\pi}{8}\frac{Pr^4}{nl}$, where the letters have their usual meanings , the dimensions of V are

A. $M^0L^3T^0$

B. $M^0L^3T^{-1}$

C. $M^0L^{-3}T^{-1}$

D. $M^1L^3T^0$

Answer: B

Watch Video Solution

30. If the acceleration due to gravity is $10ms^{-2}$ and unit of length and time are changed in kilometer and hour respectively the numerical value of the acceleration is

A. 36000

B. 72000

C. 36000

D. 129600

Answer: D

Watch Video Solution

Watch Video Solution

31. The magnitude of Energy is $100J$ What will be its value if the units of mass and time are doubled and that fo length is halved?

A. 100 J

B. 200 J

C. 400 J

D. 800 J

Answer: D

Watch Video Solution

32. If the units of mass and velocity are increased by two times then the unit of momentum will be increased by............

A. $400\ \%$

B. $200\ \%$

C. $300\ \%$

D. $100\ \%$

Answer: C

Watch Video Solution

33. SI unit and CGS unit of quantity does not vary by 10^{7} times, it is ....

A. Boltzmann constant

B. Gravitational constant

C. Planck's constant

D. Angular momentum

Answer: C

Watch Video Solution

34. The initial velocity of a particle is given by $u^2 = v^2 - 2gx$ where x is the distance covered. IF $u = 18kmh^{-1}, g = 1000cm/s^2 x = 150cm$ then $v = ...m/s$

A. $\sqrt{45}$

B. $\sqrt{55}$

C. $\sqrt{35}$

D. $\sqrt{65}$

Answer: B

Watch Video Solution

35. The eqaction which is dimensionally correct among the following is

A. $v = u + \frac{1}{2}at$

B. $v = ut + at$

C. $s = ut + at^3$

D. $t = s + av$

Answer: A

Watch Video Solution

36. The dimensions of γ in the relation $v = \sqrt{\frac{\gamma p}{\rho}}$ (where v is velocity, p is pressure , ρ is density)

A. Dimensionless

B. $[LT^{-1}]$

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

D. $[ML^{-3}]$

Answer: A

Watch Video Solution

37. If frequency F, velocity V , and density D are considered fundamental units , the dimensional formula for momentum will be

A. $(\rho v^4 f^{-3})$

B. $(\rho v^3 f^{-1})$

C. $(\rho v f^2)$

D. $(\rho^2 v^2 f^2)$

Answer: A

Watch Video Solution

38. If momentum (p), Mass (M), Time (T) are chosen as fundamental quantites then the dimensional formula for length is..........

A. $(P^1 T^1 M^1)$

B. $(P^1 T^1 M^2)$

C. $(P^1 T^1 M^{-1})$

D. $(P^2 T^2 M^1)$

Answer: C

Watch Video Solution

Watch Video Solution

39. If pressure P, velocity V and time T are taken as fundamental physical quantities, the dimensional formula of force if

A. $\left[P^1 v^1 T^1\right]$

B. $\left[P^1 v^2 T^1\right]$

C. $\left[P^1 v^1 T^2\right]$

D. $\left[P^1 v^2 T^2\right]$

Answer: D

Watch Video Solution

EXERCISE -II (C.W)

1. The error in the measurement of the length of the sample pendulum is 0.2% and the error in time period 4%. The maximum possible error in measurement of $\frac{L}{T^2}$ is

A. 4.2%

B. 3.8%

C. 7.8%

D. 8.2%

Answer: D

Watch Video Solution

2. The least count of a stop watch is $(1/5)s$. The time 20 oscillations of a pendulum is measured to be $25s$. The maximum percentage error in this measurement is

A. $8\ \%$

B. $1\ \%$

C. $0.8\ \%$

D. $16\ \%$

Answer: C

Watch Video Solution

3. The diameter of a wire as measured by a screw gauge was found to be $1.002cm$, $1.004cm$ and $1.006cm$. The absoulue error in the third reading is

A. 0.002 cm

B. 0.004 cm

C. 1.002 cm

D. zero

Answer: A

Watch Video Solution

4. Force and area are measured as $20N$ and $5m^2$ with errors $0.05N$ and $0.0125m^2$. The maximum error in pressure is (SI unit)

A. 4 ± 0.0625

B. 4 ± 0.05

C. 4 ± 0.125

D. 4 ± 0.02

Answer: D

Watch Video Solution

Watch Video Solution

5. The length and breath of a recantangular object are $25.2cm$ and $16.8cm$ respecitively and have been measured to an accuracy of $0.1cm$. Relative error and percentage error in the area of the object are

A. 0.01 & 1%

B. 0.02 & 2 %

C. 0.03 & 3 %

D. 0.04 & 4%

Answer: A

Watch Video Solution

6. The velocity of light in vacumm is 30 crore m/s. This is expressed is standard form up to 3 significant figures as

A. $0.003 \times 10^{11} m/s$

B. $300 \times 10^{6} m/s$

C. $3.00 \times 10^{8} m/s$

D. $0.030 \times 10^{10} m/s$

Answer: C

Watch Video Solution

7. The length, breath and thicknes of a recantagular lamina are $1.024m$, $0.56m$, and $0.0031m$. The volume is ....m^3

A. 1.8×10^{-3}

B. 1.80×10^{-3}

C. $0.180 \times 10(-4)$

D. 0.00177

Answer: A

Watch Video Solution

8. The initial and final temperature of a liquid are measured to be $(67.7 \pm 0.2)^0 c$ and $(76.3 \pm 0.3)^0 c$ then rise in temperture with error limit is

A. $(8.6 \pm 0.2)^0 C$

B. $(8.6 \pm 0.3)^0 C$

C. $(8.6 \pm 0.5)^0 C$

D. $(8.6 \pm 0.6)^0 C$

Answer: C

Watch Video Solution

9. Less accurate of the four options gives below

A. 9.27

B. 41

C. 1.01

D. 9.00×10^0

Answer: D

Watch Video Solution

10. If the ratio of fundamental units in tow systems is $1:3$, then the ratio of momentum in the two system is

A. $1:3$

B. $1:9$

C. $1:27$

D. $3:1$

Answer: A

Watch Video Solution

11. The velocity of the waves on the surface of water is proptional to $\lambda^{a}\rho^{\beta}g^{\gamma}$ where λ = waver length, ρ = density and g =m acceleration due to gravity. Which of the following relation is correct?

A. $\alpha = \beta \neq \gamma$

B. $\beta = \gamma \neq \alpha$

C. $\gamma = \alpha \neq \beta$

D. $\alpha \neq \beta \neq \gamma$

Answer: C

Watch Video Solution

12. The work done $'w'$ by a body varies with displacement $'x'$ as $w = Ax + \frac{B}{(C - x)^2}$. The demensional formula for $'B'$ is

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

B. $[ML^4T^{-2}]$

C. $[MLT^{-2}]^4$

D. $\left[ML^2T^{-4}\right]$

Answer: B

Watch Video Solution

13. If the units of mass, tieme and length are $100g$, $20cm$ and 1 minute respectivelty then equivalent energy for $1000erg$ in the new system will be

A. 90

B. 900

C. 2×10^6

D. 300

Answer: A

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Watch Video Solution

14. The ratio of SI unit to the CGS unit of plank's constant is

A. $10^7 : 1$

B. $10^4 : 1$

C. $10^6 : 1$

D. $1 : 1$

Answer: A

Watch Video Solution

15. The velocity fo a body is expressed as $V = G^a M^b R^c$ where G is gravitational constant. M is mass, R is radius. The values of exponents a, b and c are:

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

B. 1,1,1

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

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

Answer: A

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16. The velocity fo a spherical ball through a visocous liquid is given by $v = v_0(1 - e^{kt})$, where v_0 is the initial velocity and t represents time. If K depends on radius of ball (r), coefficient of viscosity (η) and mass fo the ball (m), tehn

A. $K = mr/\eta$

B. $K = \eta m/r$

C. $K = r\eta/m$

D. $K = mr\eta$

Answer: C

Watch Video Solution

17. Calculate x in the equation :

$(velocity)^x = (pressired \Leftrightarrow .)^{3/2} \times (density)^{-3/2}$

A. 1

B. 2

C. 3

D. -3

Answer: C

Watch Video Solution

18. 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. a=1, b=2, c=1

B. a=2, b=1, c=1

C. a=1, b=1, c=2

D. a=0, b=1, c=1

Answer: A

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19. The length of pendalum is measured as $1.01m$ and time for 30 oscillations is measured as one minuted 3 secounds. Error in length is $0.01m$ minute 3 seconds. The percenrage error in the measurement of acceleration due to gravity is.

A. 1

B. 5

C. 10

D. 15

Answer: C

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20. The dimensional formula of $\frac{1}{2}\mu_0 H^2 (\mu_0$ = permeability of free space and H = magnetic field intensity) is

A. MLT^{-1}

B. ML^2T^{-2}

C. $ML^{-1}T^{-2}$

D. ML^2T^{-1}

Answer: C

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

A. MLT^{-4}, MLT^{-2}

B. MLT^{-3}, MLT^{-4}

C. ML^2T^{-3}, ML^2T^{-2}

D. $ML^2T^{-3}, -ML^3T^{-4}$

Answer: B

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22. When a wave traverses a medium, the displacement of a particle located at $'x'$ at a time $'t'$ is given by $y = a\sin(bt - cx)$, where a, b and c are constants of the wave, which of the following is a quantity with dimensions?

A. y/a

B. bt

C. cx

D. b/c

Answer: D

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23. The Energy (E) angular momentum (L) and universal gravitational constant (G) are chosen as fundamental quantities. The dimensions of universal gravitational constant in the dimensional formula of Planks constant (h) is

A. 0

B. -1

C. $5/3$

D. 1

Answer: A

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24. If the absoulte errors in two physical quantites A and B are a and b respectively, then the absoulte error in the value of $A - B$ is

A. a-b

B. b-a

C. $a \pm b$

D. a+b

Answer: D

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25. The velocity (V) of a particle (in cm/s) is given in terms of time (t) in sec by the equation $V = at + \frac{b}{c+t}$. The dimensions of a, b and c are

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26. A body weighs $22.42g$ and has a measured volume of 4.7 the possible errors in the measurement of mass and volume are $0.01g$ and 0.1. Then the maximum percentage error in the density will be

A. 22%

B. 2.2%

C. 0.22%

D. 0.02%

Answer: B

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27. If energy E, velocity v and time T are taken as fundamental quanties, the dimensional formula for surface tension is

A. $[Ev^{-2}T^{-2}]$

B. $[E^2vT^{-2}]$

C. $[Ev^{-2}T^{-1}]$

D. $[E^{-2}v^{-2}T^{-1}]$

Answer: A

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28. If power (P), surface tension (S) 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

Answer: A

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EXERCISE-II (H.W)

1. The error in the measurement fo length of a simple pendulum is 0.1% and error in the time period is 2%. The possible maximum error in the quantity having dimensional formula LT^2 is

A. $1.1\ \%$

B. $2.1\ \%$

C. $4.1\ \%$

D. $6.1\ \%$

Answer: C

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2. The length of a cyclinder is measured as 5 cm using a vernier calipers of least count 0.1 mm. The percentage error in the measured length is nearly

A. $0.5\ \%$

B. $2\ \%$

C. $20\ \%$

D. 0.2%

Answer: D

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3. The diameter of a wire as measured by a screw gauge was found to be $1.002cm$, $1.000cm$ and $1.006cm$. The absolute error in the first reading.

A. 0.001 cm

B. 0.004 cm

C. 0.006 cm

D. 0.003 cm

Answer: A

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4. 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. $M^0L^1T^2$

B. $M^0L^2T^{-4}$

C. $M^0L^1T^{-3}$

D. $M^0L^2T^{-1}$

Answer: D

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5. The external and internal diameter of a hollow cylinder are determined with vernier calipers and the results are recorded as $(4.23 \pm 0.001)cm$ and $(3.89 \pm 0.01)cm$. The thickness of the cyclinder wall within the limits of error is

A. $0.34 \pm 0.01cm$

B. $0.34 \pm 0, 02cm$

C. $0.34 \pm 0.04cm$

D. $0.17 \pm 0.01cm$

Answer: D

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6. The density of a cube is measured by measuring its mass and the length of its sides. If the maximum errors in the measurement of mass and length are 3% and 2%, respectively, then find the maximum error in the measurement of the density of cube.

A. 9%

B. 19%

C. 10%

D. 90%

Answer: A

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7. The diameter of a sphere is $3.34m$. Calculate its volume with due regard to significant figures.

A. 19.5169

B. 9.516

C. 19.5

D. 19.51

Answer: C

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8. The length , breath and thickness of a metal sheet are $4.234m$, $1.005m$, and $2.01cm$ respectively then the volume of the sheet is

A. $0.08m^3$

B. $0.0855m^3$

C. $0.085m^3$

D. $0.087m^3$

Answer: B

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9. The sides of a rectangle are $(10.5 \pm 0.2) cm$ and $(5.2 \pm 0.1) cm$. Calculate its perimeter with error limits .

A. $(31.4 \pm 0.6) cm$

B. $(31.4 \pm 0.2) cm$

C. $(31.4 \pm 0.1) cm$

D. $(31.4 \pm 0.9) cm$

Answer: A

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10. If the ratio of fundamental units in two systems are $2:3$ the ratio of force in these two systems is

A. $1:3$

B. $1:1$

C. $3:1$

D. $1:27$

Answer: B

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11. If $L, R, C,$ and V, respectively , represent inductance , resistance , capacitance and potential difference , then the dimensions of L/RCV are the same as those of

A. Charge

B. 1/Charge

C. Current

D. 1/Current

Answer: D

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12. Hydrostatic pressure 'P' varies with displacement 'x' as $P = \frac{A}{B}\log(Bx^2 + C)$ where A,B, and C are constants. The dimensional formula for 'A' is

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

B. $MLT^{-2}]$

C. $[ML^{-2}T^{-2}]$

D. $ML^{-3}T^{-2}]$

Answer: D

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13. The units of force, velocity and energy are 100dyne, $10cms^{-1}$ and $500erg$ respectively. The units of mass, length and time are

A. 5g, 5 cm, 5 S

B. 5 g, 5 cm , 0.5 S

C. 0.5 g, 5 cm, 5 S

D. 5 g , 0.5 cm , 5 S

Answer: B

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14. The ratio of SI unit to CGS unti of gravitational constant of

A. $1:10^3$

B. $10^3:1$

C. $1:1$

D. $1:10^7$

Answer: A

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15. The frequency f of vibrations of a mass m suspended from a spring of spring constant k is given by $f = Cm^x k^y$, where C is a dimensionnless constant. The values of x and y are, respectively,

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

B. $-\frac{1}{2}, -\frac{1}{2}$

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

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

Answer: D

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16. If the period $'T'$ of a drop under surface tension $'s'$ is given by $T = \sqrt{d^a r^b S^c}$ where d is the density , r is the radius of the drop. If $a = 1, c = -1$ then the value of b is

A. 1

B. 2

C. 3

D. -1

Answer: C

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17. If the velocity (V) , acceleration (A) , and force (F) are taken as fundamental quantities instead of mass (M) , length (L), and $time(T)$, the dimensions of young's modulus (Y) would be

A. FA^2V^{-4}

B. FA^2V^{-5}

C. FA^2V^{-3}

D. FA^2V^{-2}

Answer: A

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18. The time dependence of a physical quantity P is given by $P = P_0 e^{-\alpha t^2}$, where α is a constant and t is time . Then constant α is//has

A. is dimensionless

B. has dimensions of T^{-2}

C. has dimensions of P

D. has dimensions of T^2

Answer: B

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19. The value fo x in the formula $Y=\frac{2mgl^x}{5bt^3e}$ where m is the mass, $'g'$ is acceleration due to gravity, l is length , $'b'$ is the breath, $'t'$ is the thickness and e is the extension and Y is Young's Modulus is

A. 3

B. 2

C. 1

D. 4

Answer: A

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20. The velocity of sound in air (V) pressure (P) and density of air (d) are related as $V\alpha p^x d^y$. The values of x and y respectively are

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

B. $-\frac{1}{2}, -\frac{1}{2}$

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

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

Answer: D

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21.

A. Vernier capillers

B. May be -ve or +ve

C. Error in screw gauge

D. Due to loose fittings

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22. There are four scales, whose specification are given in column -I and the least count is given in column -II (S=value of main scale division , n= number of marks on vernier)

Column-I	Column-II
a) S=1 mm ,n=10	p) 0.05 mm
b) S=0.5mm,n=10	q) 0.01 mm
c) S=0.5 mm,n=20	r) 0.1 mm
d) S=1 mm , n=100	s) 0.025 mm

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23. Using signification figures, match the following

Column-I	Column-II
a) 0.12345	p) 5
b) 0.1210 cm	q) 4
c) 47.23/2.3	r) 3
d) 3×10^{8}	s) 2
	t) 1

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24. Match List I with List II and select the correct answer using the codes given below the Lists.

	List - I	List - II
a)	Distance between earth and stars	I) Micron
b)	Inter atomic distance in a solid	II) angstrom
c)	Size of the nucleus	III) Light year
d)	Wave length of infrared laser	IV) fermi
		V) kilometre

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25. Some physical constants are given in List -I and their dimensional formulae are given in List-2. Match the following

List - I	List - II
a) Planck's constant	e) $\left[ML^{-1}T^{-2}\right]$
b) Gravitational constant (h)	f) $\left[ML^{-1}T^{-1}\right]$
c) Bulk modulus	g) $\left[ML^{2}T^{-1}\right]$
d) Coefficient of Viscosity	h) $\left[M^{-1}L^{3}T^{-2}\right]$

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26. Names of units of some physical quantities are given in List-I and their dimensional formulae are given in List-II . Match the correct pair of the lists.

List - I	List - II
a) Pa s	e) $[L^2T^{-2}K^{-1}]$
b) NmK^{-1}	f) $[MLT^{-3}K^{-1}]$
c) $J\,kg^{-1}\,K^{-1}$	g) $[ML^{-1}T^{-1}]$
d) $Wm^{-1}K^{-1}$	h) $[ML^2T^{-2}K^{-1}]$

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27. Match List I with List II and select the correct answer using the codes given below the Lists.

List - I	List - II
a) joule	e) henry amp/s
b) watt	f) farad volt
c) volt	g) coulomb volt
d) coulomb	h) oersted cm
	i) ampere gauss
	j) $(\text{ampere})^2$ ohm

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28. Match List I with List II and select the correct answer using the codes given below the Lists.

List - I	List - II
a) Same negative dimensions of mass	I) pressure, Rydberg's constant
b) same negative dimensions of length	II) Magnetic induction field,potential
c) same dimensions of time	III) Capacity, universal gravitational constant
d) Same dimension of current	IV) Energy density, surface tension

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EXERCISE-III

1. Planck's constant has the dimension (unit) of

A. Energy

B. Linear moment

C. Work

D. Angular momentum

Answer: D

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2. Unit of Stefan's constant is

A. $Wm^{-2}K^{-1}$

B. $Wm^{2}K^{-4}$

C. $Wm^{-2}K^{-4}$

D. $Wm^{-2}K^{4}$

Answer: C

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3. The dimensions of emf in MKS is

A. $ML^{-1}T^{2}Q^{-2}$

B. $ML^{-2}T^{-2}Q^{-2}$

C. $MLT^{-2}Q^{-1}$

D. $ML^{2}T^{-2}Q^{-1}$

Answer: D

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4. Candela is the unit of

A. Electric intensity

B. Luminous intensity

C. Sound intensity

D. none of the above

Answer: B

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5. The dimensional formula of relative density is

A. ML^{-3}

B. LT^{-1}

C. MLT^{-2}

D. Dimensionless

Answer: D

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6. The dimensional formula for young's modulus is

A. $ML^{-1}T^{-2}$

B. M^0LT^{-2}

C. MLT^{-2}

D. ML^2T^{-2}

Answer: A

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7. 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 / $(\text{newton metre})^2$

Answer: C

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8. The dimensions of universal gravitational constant are :-

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

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

C. $[M^{-2}L^3T^{-2}]$

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

Answer: A

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

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

C. LT^{-2}, LT and L

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

Answer: A

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10. Dimension of resistance in an elecatrical circuit, in terms of dimension of mass M, of length L, of time T, and of current I, would be

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

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

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

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

Answer: D

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11. If the error in the measurement of radius of a sphere in 2% then the error in the determination of volume of the spahere will be

A. 4%

B. 6%

C. 8%

D. 2%

Answer: B

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12. Which two of the following five physical parameters have the same dimensions?`

Energy density

Refractive index

Dielectric constant

Young's modulus

Magnetic field

A. energy density

B. Refractive index

C. Eielectric constant

D. Young's modulus

Answer: C

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13. If the dimensions of a physical quantity are given by $M^a L^b T^c$, then the physical quantity will be :

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

B. velocity if a =1, b = 0 , c=-1

C. acceleration if a=0, b = -1, c=-2

D. for if a =0, b =-1, c =-2

Answer: A

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

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

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

D. $MLT^{-1}]$

Answer: B

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15. In CGS system of units, the density of a material is $4gcm^{-3}$.

What will be the value of the density of the material in a system of units in which unit of length is 10 cm and unit of mass is 100 g ?

A. 0.4

B. 40

C. 400

D. 0.04

Answer: B

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16. The dimensions of $(\mu_0 \varepsilon_0)^{-1/2}$ are

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

B. $L^{-1}T]$

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

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

Answer: C

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17. 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

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

A. 14%

B. 10%

C. 7%

D. 4%

Answer: A

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

A. $[FVT^{-1}]$

B. $[FVT^{-2}]$

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

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

Answer: D

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

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

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

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

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

Answer: C

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20. In dimension of circal velocity v_0 liquid following through a take are expressed as $(\eta^x \rho^y r^z)$ where η, ρ and $r$are the coefficient of viscosity of liquid density of liquid and radius of the tube respectively then the value of x, y and z are given by

A. 1,1, 1

B. 1, -1, -1,

C. $-1, \ -1, 1$

D. $-1, \ -1, \ -1$

Answer: B

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

A. $\dfrac{\sqrt{hG}}{c^{3/2}}$

B. $\dfrac{\sqrt{hG}}{c^{5/2}}$

C. $\sqrt{\dfrac{hc}{G}}$

D. $\sqrt{\dfrac{Gc}{h^{3/2}}}$

Answer: A

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EXERCISE-IV

1. The measured mass and volume of a body are $53.63g$ and $5.8cm^3$ respectively, with possible errors of $0.01g$ and $0.1cm^3$.

The maximum percentage error in density is about

A. 0.2%

B. 2%

C. 5%

D. 10%

Answer: B

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2. 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 mm

B. 0.05 mm

C. 0.1 mm

D. 0.2 mm

Answer: D

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3. The resistance of metal is given by $V = IR$, The voltage in the resistance is $V = (8 \pm 0.5)V$ and current in the resistance is $I = (2 \pm 0.2)A$, the value fo resistance with its percentage error is

A. $(4 \pm 16.25\,\%\,)\sigma$

B. $(4 \pm 2.5\,\%\,)\sigma$

C. $(4 \pm 0.04\,\%\,)\sigma$

D. $(4 \pm 1\,\%\,)\sigma$

Answer: A

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4. In an experiment, the values of refractive indices of glass were found to be $1.54, 1.53, 1.44, 1.54, 1.56$ and 1.45 in successive measurements (i) mean value of refreactive index of glass (ii) mean absolute error (iii) relative error and (iv) percentage error are respectively.

A. `1.51, 0.04, 0.03, 3%

B. 1.51, 0.4, 0.03, 3%

C. 15.1, 0.04, 0.03, 3%

D. 15.1, 0.04, 0.3, 3%

Answer: A

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5. A student performs an experiment for determination of $g\left[=\frac{4\pi^2 L}{T^2}\right]$, $L \approx 1m$, and he commits an error of ΔL. For T he takes the time of n oscillations with the stop watch of least count ΔT. For which of the following data, the measurement of g will be most accurate ?

A. $\Delta L = 0.5, \Delta T = 0.1, n = 20$

B. $\Delta L = 0.5, \Delta T = 0.1, n = 50$

C. $\Delta L = 0.5, \Delta T = 0.01, n = 20$

D. $\Delta L = 0.5, \Delta T = 0.05, n = 50$

Answer: D

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6. A recantangular metal slab of mass 33.333 has its length $8.0cm$, breath $5.0cm$ and thickness $1mm$. The mass is measured with accuracy up to $1mg$ with a senstive balance. The length and breath are measured with vernier calipers having a least count of $0.01cm$. The thickness is measured with a new a screw gauge of least count $0.01mm$. The percentage accuracy in density calculated from the above measurements is

A. $13\,\%$

B. $130\,\%$

C. $1.6\,\%$

D. $16\,\%$

Answer: C

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7. The initial and final temperature are recorded as $(40.6 \pm 0.3)^0 C$ and $(50.7 \pm 0.2)^0 C$. The rise in temperaute is

A. $10.1^\circ C$

B. $(10.1 \pm 0.3)^\circ C$

C. $(10.1 \pm 0.5)^\circ C$

D. $(10.1 \pm 0.1)^\circ C$

Answer: C

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8. In the measurement of a physical quantity $X = \frac{A^2 B}{C^{1/3} D^3}$. The percentage erros introduced in the measurments of the quantities A, B, C and D are $2\%, 2\%, 4\%$ and 5%

respectively. Then the minimum amount of percentage of error in the meaurement fo X is contributed by

A. A

B. B

C. C

D. D

Answer: C

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9. There are atomic (Cesium) clocks capable of measuring time with an accuracy of 1 part in 10^{11}. If two such clocks are operated to precision, then after running for 5000 years, these will record a difference of

A. 1day

B. 1 s

C. $10^{11}s$

D. 1 year

Answer: B

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10. If the length of a simple pendulum is recorded as $(90 \pm 0.2)cm$ and period as $(1.9 \pm 0.02)s$, the percentage fo error in the measurement of acceleration due to gravity is

A. 4.2

B. 2.1

C. 1.5

D. 2.8

Answer: B

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11. In the determination of the Young's modulus of a given wiere, the force, length, radius and extension in the wire are measured as

$(100 \pm 0.01)N$, $(1.25 \pm 0.02)m$

$(0.01 \pm 0.0002)m$ and $(0.01 \pm 0.00002)m$, respectively. The percentage error in teh measurement of Young's modulus is

A. 4.37

B. 2.37

C. 0.77

D. 2.77

Answer: A

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12. The radius (r), length (l) and resistance (x) of a thin wire are

$(0.2 \pm 0.02)cm$, $(80 \pm 0.1)cm$, and $(30 \pm 1)\Omega$ respectively. The percentage error in the specific resistance is

A. 23.4%

B. 25.4%

C. 26%

D. 27.5%

Answer: A

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13. When a current of (2.5 ± 0.5) ampere flows through a wire, it develops a potential difference of (20 ± 1) volt, the resistance of the wire is

A. $(8 \pm 2)\sigma$

B. $(10 \pm 3)\sigma$

C. $(18 \pm 4)\sigma$

D. $(20 \pm 6)\sigma$

Answer: A

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14. Two objects A and B are of lengths $5cm$ and $7cm$ determined with errors $0.1cm$ and $0.2cm$ respecitively. The error in determining (a) the total length and (b) the difference in their lengths are

A. $(12 \pm 0.3), (2 \pm 0.3)$

B. $(7 \pm 0.3), (2 \pm 0.3)$

C. $(12 \pm 0.3), (12 \pm 0.3)$

D. $(12 \pm 0.3), (2 \pm 0.6)$

Answer: A

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15. In a sample pendulum experiment, length is measured as $31.4cm$ with an accuracy of $1mm$. The time for 100 ocscillations of pendulum is $112s$ with an accuracy of $0.01s$. The percentage accuracy in g is

A. 1

B. 2.8

C. 1.3

D. 2.1

Answer: D

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16. Three pieces of silver have masses $2.3kg$, $41.15g$ and $30.19g$. The toal mass of correct significant figures in (in kg)

A. 2.37032

B. 2.37

C. 2.37

D. 2.4

Answer: D

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17. The sum of the given two numbers with regard to significant figures is

$\left(5.0 \times 10^{-8}\right) + \left(4.5 \times 10^{-6}\right) =$

A. 4.55×10^{-6}

B. 4.5×10^{-6}

C. 4.6×10^{-6}

D. 4×10^{-6}

Answer: C

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18. The dimensions of a wooden block are $1.1m \times 2.36m \times 3.1m$. The number of significant figures in its volume should be

A. 1

B. 2

C. 3

D. 4

Answer: B

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19. In the relation $P = \frac{\alpha}{\beta} e^{-\alpha z / k\theta}$, P is preesure, K is Botzmann's constant, Z is distance and θ is temperature. The dimensional formula of β wll be

A. $[M^0 L^2 T^0]$

B. $[M^1 L^2 T^1]$

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

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

Answer: A

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20. The richardson equaction is given by $I = AT^2 e^{-B/kT}$. The dimensional formula for AB^2 is

A. IT^{-2}

B. kT

C. Ik^2

D. Ik^2/T

Answer: C

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21. The heat generated in a circuit is given by $Q = I^2Rt$, where I is current, R is resistance, and t is time. If the percentage errors in measuring $I, R,$ and $tare 2\%, 1\%,$ and 1%, respectively, then the maximum error in measuring heat will be

A. 2%

B. 3%

C. 4%

D. 6%

Answer: D

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NCERT EXEMPLAR QUESTIONS

1. The number of significant figures in 0.06900 is

A. 5

B. 4

C. 2

D. 3

Answer: B

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2. The sum of the numbers 436.32, 227.2 and 0.301 in appropriate significant figures is

A. 663.821

B. 664

C. 663.8

D. 663.82

Answer: B

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

A. $1.6048 gcm^{-3}$

B. $1.69 gcm^{-3}$

C. $1.7 gcm^{-3}$

D. $1.695 gcm^{-3}$

Answer: C

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4. The numbers 2.745 and 2.735 on rounding off to 3 significant figures will give

A. 2.75 and 2.74

B. 2.74 and 2.73

C. 2.75 and 2.73

D. 2.74 and 2.74

Answer: D

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

A. $164 \pm 3cm^2$

B. $163.62 \pm 2.6cm^2$

C. $163.6 \pm 2.6cm^2$

D. $163.62 \pm 3cm^2$

Answer: A

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6. Which of the following pairs of physical quantites does not have same dimensional formula ?

A. Work and torque

B. Angular momentum and Planck's constant

C. Tension and surface tension

D. Impulse and linear momentum

Answer: C

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7. Measure of two quantites along with the precision of respective measuring instrument is $A = 2.5ms^{-1} \pm 0.5ms^{-1}$ $B = 0.10s \pm 0.01s$ The value of AB will be

A. $(0.25 \pm 0.08)m$

B. $(0.25 \pm 0.5)m$

C. $(0.25 \pm 0.05)m$

D. $(0.25 \pm 0.135)m$

Answer: A

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8. A person measures two quantities as $A = 1.0m \pm 0.2m, B = 2.0m \pm 0.2m$ We should report correct value for $\sqrt{AB}$ as

A. $1.4m \pm 0.4m$

B. $1.41m \pm 0.15m$

C. $1.4m \pm 0.3m$

D. $1.4m \pm 0.2m$

Answer: D

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9. Which of the following measurement is most precise?

A. 5.00 mm

B. 5.00cm

C. 5.00 m

D. 5.00 km

Answer: A

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

A. $4.9cm$

B. 4.805 cm

C. 5.25 cm

D. 5.4 cm

Answer: A

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

A. 1.9×10^{10}

B. 1.9×10^{11}

C. 1.9×10^{12}

D. 1.9×10^{13}

Answer: C

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

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

B. $\left[p^2AT\right]$

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

D. $\left[pA^{1/2}T\right]$

Answer: D

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13. On the basis of dimensions, decide which of the following relation for the displacement of a particle undergoing simple harmonic motion is not correct :

A. $y = a\dfrac{\sin(2\pi t)}{T}$

B. $y = a\sin vt$

C. $y = \frac{a}{T}\sin\left(\frac{t}{a}\right)$

D. $y = a\sqrt{2}\left(\frac{\sin(2\pi t)}{T} - \frac{\cos(2\pi t)}{T}\right)$

Answer: B::C

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14. If P, Q, R are physical quantities, having different dimensions, which of the following combinations can never be a meaningful quantity ?

A. $(P - Q)/R$

B. $PQ - R$

C. PQR

D. $(P + Q)/P$

Answer: A

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15. Photon is quantum of radiation with energy E =hv where v is frequency and h is Planck's constant. The dimensions of h are the same as that of

A. Linear impulse

B. Angular impulse

C. Linear momentum

D. Angular momentum

Answer: B::D

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16. If Planck's constant (h) and speed of light in vacuum (c) are taken as two fundamental quantites, which on of the following can, in addition, be taken to express length, mass and time in terms of the three chosen fundamental quantities ?

A. Mass of electron (me)

B. Universal gravitational constant (G)

C. Charge of electron (e)

D. Mass of proton (mp)

Answer: A::B::D

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17. Which of the following ratios express pressure?

A. Force/Area

B. Energy/Volume

C. Energy/Area

D. Force/Volume

Answer: A::B

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18. Which of the following are not a unit of time ?

A. Second

B. Parsec

C. Year

D. Light year

Answer: B::D

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STATEMENT TYPE QUESTION

1. Statement-1 : Plane angle is a dimensionaless quantity.

Statement-2 : All supplementary quantities are dimensionless.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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2. Statement-1 : The size (u) of the unit of physical quantity and its numercial magnitude (n) are related to each other by the relation nu= constant

Statement-2 : The choice of mass, length and time as fundamental quantities is not unique.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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3. Statement-1: The MKS system is coherent system of units.

Statement-2: In SI, joule is the unit for all forms of energy.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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4. Statement-1: Two quantities which are to be added must have the same dimensions .

Statement-2: Two quantities which are to be multiplied may have the same dimensions.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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5. Statement-1:Susceptibility is expressed as Am^{-1}

Statement-2:Magnetic flux is expressed as JA^{-1}.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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6. Statement-1:Electromotive force is expressed in newton.

Statement-2:Electric intensity is expressed in NC^{-1}

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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7. Statement-1: The quantity $\frac{e^2}{\in_0 \ ch}$ is dimensionless

Statement 2: $\frac{1}{\sqrt{\mu_0 \in_0}}$ has the dimensions of velocity and is numerically equal of velocity of light.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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8. Statement-1: Electric current is a scalar

Statement-2: All fundamental physical quantities are scalars

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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9. Statement-1 : Pressure can be subtracted from pressure gradient

Statement-2: Only like quantities can be added or subtracted from each other

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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10. Statement-1 : Energy cannot be divided by volume

Statement-2: Dimensions of energy and volume are different

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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11. Statement-1: Light year is a unit of time

Statement-2: Light year is the distance traveled by light in vacuum in one year.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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12. Statement-I: Dimensional analysis can give us the numerical value of proportionality constants that may appear in an algebraic expression.

Statement-II: Dimensional analysis make use of the fact that dimensions can be treated as algebraic quantities.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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13. Statement-I: The product of the numerical value and unit of physical quantity remains same in every system of unit.

Statement-II: magnitude of a physical quantity remains same in every system of units.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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14. Statement-I: Systematic errors can be removed completely.

Statement-II: the cause of systematic errors can be known.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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15. Statement-I: Random errors can be positive or negative.

Statement-II: Cause of random errors are uncertain.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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16. Statement-I:In the measurement of g using simple pendulum generally we take central position (mean position of the oscillation as reference position for measuring time of oscillation.

Statement-II: This reduces the human error in measurement of time.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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17. Statement-I: When a length of 2.0 mis converted into centimeter, the result is 200cm

Statement-II: The numerical value of a measurement is proportional to reciprocal of the size of unit used.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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18. Statement-I:The length of an object is measured with two instruments as l =4.01cm and l =4.009cm, The second instrument has a better resolution

Statement-II: More value is the least count of an instrument, better is the resolution.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: B

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19. Statement-I: If a physical quantity has a unit, it must not be dimensionless.

Statement-2: A formula derived using dimensional but no unit.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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20. Statement-1: A formula derived using dimensional analysis obeys principle of homogenity .

Statement:-2: A physically correct relation is always in accordance with principle of homogenity

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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21. Assertion : Mass, length and time are fundamental physical quantities.

Reason : They are independent of each other.

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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22. Statement-1: The number of significant figures in 0.001 is 1 while in 0.100 it is 3.

Statement-II: Zeros before a non-zero significant digit are not counted while zeros after a non-zero significant digit are counted .

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: A

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23. Statement-I: If error in measurement of mass is 2% and that in measurement of velocity is 5% than error in measurement of kinetic energy is 6%.

Statement -II: Error in kinetic energy is

$$\frac{\Delta K}{K} = \left(\frac{\Delta m}{m} + 2\frac{\Delta v}{v}\right)$$

A. Statement-1 is true and statement -2 is true

B. Statement -1 is true and statement-2 is false

C. Statement-1 is false and statement -2 is true

D. Statement-1 is false and statement -2 is false

Answer: C

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