PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

UNIT, DIMENSION AND ERROR ANALYSIS

Basic Concept Of Unit

1. Which of the following following is smallest unit?

A. Millimeter

B. Angstrom

C. Fermi

D. Metre

Answer: C

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

A. Calorie

B. Joule

C. Electron volt

D. Watt

Answer: D

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3. A watt is

A. kgm/s^2

B. kgm^2/s^2

C. kgm/s

D. kgm^2/s^2

Answer: b

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4. Which of the following following is not equal to watt?

A. Joule/second

B. $\text{Ampere} \times \text{volt}$

C. $(\text{Ampere})^2 \times \text{ohm}$

D. Ampere/volt

Answer: d

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5. If the acceleration due to gravity is represented by unity in a system of unit and one second is the unit of time , the unit length is

A. $9.8m$

B. $1m$

C. $98m$

D. $0.98m$

Answer: A

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6. Newton - second is the unit of

A. Velocity

B. Angular momentum

C. Momentum

D. Energy

Answer: C

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7. Which of the following following is not a unit of energy?

A. $W - s$

B. $kg - m/\sec$

C. $N - m$

D. Joule

Answer: B

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8. A suitable unit for gravitational constant is

A. $kgm\sec^{-1}$

B. $Nm^{-1}\sec$

C. Nm^2kg^{-2}

D. $kgm\sec$

Answer: C

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9. The unit of acceleration in the SI system is

A. Nkg^{-1}

B. ms^{-2}

C. $rads^{-2}$

D. $mkg^{-1}K$

Answer: B

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

A. Length and mass

B. mass and time

C. Length , mass and time

D. None of these

Answer: D

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11. $Erg - m^{-1}$ can be the unit of measure for

A. Force

B. Momentum

C. Power

D. Acceleration

Answer: A

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12. The unit of potential energy is

A. $g\left(cm/\sec^2\right)$

B. $g(cm/\sec)^2$

C. $g\left(cm^2/\sec\right)$

D. $g(cm/\sec)$

Answer: b

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13. Which of the following represents a volt?

A. Joule/second

B. watt/ampere

C. watt/columb

D. coulomb/joule

Answer: B

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14. If the unit of length and force each becomes four times, then the unit of energy becomes

A. 4times

B. 8times

C. 16times

D. 1/16times

Answer: C

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15. Ampere-hour is a unit of

A. Quantity of electricity

B. Strength of electric current

C. Power

D. Energy

Answer: A

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16. If u_1 and u_2 are the selected in two system of measurement and n_1 and n_2 their nomerical values, then

A. $n_1u_1 = n_2u_2$

B. $n_1u_1 + n_2u_2 = 0$

C. $n_1n_2 = u_1u_2$

D. $(n_1 + u_1) = (n_2 + u_2)$

Answer: a

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

A. 1

B. 10

C. 0.1

D. 0.01

Answer: C

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18. Young's modules of a material has the same unit as

A. Pressure

B. Strain

C. Compressibility

D. Force

Answer: a

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19. In CGS system the magnitude of the force is 100 dynes. In another system where the fundamental physical quantities are kilogram, meter and minute, Find the magnitude of the force.

A. 0.036

B. 0.36

C. 3.6

D. 36

Answer: C

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20. A physical quantity is measured and the result is expressed as nu where u is the unit used and n is the numberical value. If the result is expressed in various units then

A. $n \propto u^2$

B. $n \propto u$

C. $n \propto \sqrt{u}$

D. $n \propto \frac{1}{u}$

Answer: D

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21. If $x = at + bt^2$, where x is the distance travelled by the body in kilometer while t is the time in seconds , then find the units of b.

A. km/s

B. $km - s$

C. km/s^2

D. $km - s^2$

Answer: C

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22. In $S = a + bt + ct^2$. S is measured in metres and t in seconds. The unit of c is

A. ms^2

B. m

C. ms^{-1}

D. ms^{-2}

Answer: D

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23. Find out the unit and dimensions of the constants a and b in the van der Waal's equation $\left(P+\frac{a}{V^2}\right)(V-b)=Rt$, where P is pressure , v is volume , R is gas constant , and T is temperature.

A. $\text{dyne} \times cm^5$

B. $\text{dyne} \times cm^4$

C. $\text{dyne} \times cm^3$

D. $\text{dyne} \times cm^2$

Answer: B

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24. If in a system the force of attraction between two point masses of $1kg$ each situated $1km$ apart is taken as a unit force and is called notwen (newton written in reverse order) If $G = 6.67 \times 10^{-11} N - m^2 kg^{-2}$ in SI units, the relation of newton and nowton is

A. $1\text{notwen} = 6.67 \times 10^{-11}\text{newton}$

B. $1\text{newton} = 6.67 \times 10^{-17}\text{notwen}$

C. $1\text{notwen} = 6.67 \times 10^{-17}\text{newton}$

D. $1\text{newton} = 6.67 \times 10^{-12}\text{notwen}$

Answer: c

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Concept Of Dimensional Formula

1. Select the pair whose dimensions are same

A. Pressure and stress

B. Stress and strain

C. Pressure and force

D. Power and force

Answer: A

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2. The dimensional formula for magnetic flux is

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

B. $ML^2T^2A^{-2}$

C. $M^0L^{-2}T^2A^{-3}$

D. $ML^2T^2A^3$

Answer: A

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3. Inductance L can be dimensional represented as

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

B. $ML^2T^{-4}A^{-3}$

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

D. $ML^2T^4A^3$

Answer: a

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4. Dimensional formula for latent heat is_____

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

B. MLT^{-2}

C. ML^2T^2

D. ML^2T^1

Answer: A

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5. the dimensional formula for planck's constant and angular momentum are

A. ML^2T^2

B. ML^2T^{-1}

C. MLT^{-1}

D. $M^0L^2T^{-2}$

Answer: B

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6. Dimensional formula of capacitance is

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

B. $ML^2T^2A^{-2}$

C. $MLT^{-4}A^2$

D. $M^{-1}L^{-2}T^{-4}A^{-2}$

Answer: A

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7. Dimensional formula $ML^{-1}T^2$ does not represent the physical quantity

A. Young's modus of elasticity

B. Stress

C. Strain

D. Pressure

Answer: C

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8. Two quantities A and B have different dimensions. Which mathematical operation given below is physically meaningful?

A. A/B

B. $A+B$

C. $A-B$

D. None

Answer: a

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

A. MLT^{-3} and ML^2T^{-4}

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

C. MLT^{-1} and MLT^{0}

D. MLT^{-4} and MLT^{4}

Answer: B

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10. Which pair has the same dimensions?

A. Work and power

B. Density andrelative density

C. Momentum and impulse

D. Stress and strain

Answer: c

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

A. Momentum

B. Force

C. Rate of change of momentum

D. Torque

Answer: a

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12. Which of the following is dimensionally correct?

A. Pressure = Energy per unit area

B. Pressure = Energy per unit volume

C. Pressure = Force per unit volume

D. Pressure = Momentum per unit volume per unit time

Answer: B

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13. The equation of state for real gas is given by $P + \frac{a}{V^2}(V - b) = RT$. The dimension of the constant a is ..... .

A. ML^5T^{-2}

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

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

D. $M^0L^6T^0$

Answer: A

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14. 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 dimensionless constant. The values of x and y are, respectively,

A. $x = \frac{1}{2}, y = \frac{1}{2}$

B. $x = -\frac{1}{2}, y = -\frac{1}{2}$

C. $x = \frac{1}{2}, y = -\frac{1}{2}$

D. $x = -\frac{1}{2}, y = \frac{1}{2}$

Answer: D

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

A. Pressure

B. Work

C. Latent heat

D. None of these

Answer: C

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16. The velocity of a freely falling body changes as $g^p h^q$where g is acceleration due to gravity and h is the height. The values of p and q are

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

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

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

D. $1, 1$

Answer: b

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17. Which one of the following pairs does have the same dimension?

A. Work and energy

B. Angule and strain

C. Relative density and refractive index

D. Plank constant and energy

Answer: d

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18. An athlletic coach told his team that muscle times speed equals power. What dimesions does he view for muscle?

A. MLT^{-2}

B. ML^2T^{-2}

C. MLT^2

D. L

Answer: a

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19. If P represents radiation pressure , C represents the speed of light , and Q represents radiation energy striking a unit area per second , then non - zero integers x, y, z such that $P^x Q^y C^z$ is dimensionless , find the values of $x, y,$ and z.

A. $x = 1, y = 1, z = -1$

B. $x = 1, y = -1, z = 1$

C. $x = -1, y = 1, z = 1$

D. $x = 1, y = 1, z = 1$

Answer: b

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20. Force F and density d are related as $F = \frac{\alpha}{\beta + \sqrt{d}}$, Then find the dimensions of α and β

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

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

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

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

Answer: A

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21. The frequency (n) of vibration of a string is given as $n = \frac{1}{2l}\sqrt{\frac{T}{m}}$, where T is tension and l is the length of vibrating string , then the dimensional formula is

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

B. $[ML'(0)T^{-1}]$

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

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

Answer: c

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22. 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 .

A. $[M^2LT^{-3}]$

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

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

D. $\left[ML^3T^{-1}\right]$

Answer: B

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23. If the time period $(T)$of vibration of a liquid drop depends on surface tension (S) , radius(r) of the drop , and density (ρ) of the liquid , then find the expression of T.

A. $T = k\sqrt{\rho r^3 / S}$

B. $T = k\sqrt{\rho^{1/2} r^3 / S}$

C. $T = k\sqrt{\rho r^3 / S^{1/2}}$

D. None of these

Answer: A

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24. Position of a body with acceleration a is given by $x = Ka^m t^n$, here t is time Find demension of m and n.

A. $m = 1, n = 1$

B. $m = 1, n = 2$

C. $m = 2, n = 1$

D. $m = 2, n = 2$

Answer: b

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25. Density of a liquid in CGS system is $0.625(g) / \left(cm^3\right)$. What is it's magnitude is SI system?

A. 0.625

B. 0.0625

C. 0.00625

D. 625

Answer: D

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26. The velocity of a body is given by the equation

$v = \frac{b}{t} + ct^2 + dt^3.$

The dimensional formula of b is

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

B. $\left[ML^0T^0\right]$

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

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

Answer: A

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

A. Energy per unit volume

B. Force per unit area

C. Product of volume and change per unit volume

D. Angular momentum per unit mass

Answer: d

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28. A sperical body of mass m and radius r is allowed to fall in a medium of viscosity η. The time in which the velocity of the body increases from zero to 0.63 times the terminal velocity (v) is called constant (τ). Dimensionally , τ can be represented by

A. $\frac{mr}{6\pi\eta}$

B. $\sqrt{\left(\frac{6\pi mr\eta}{g^2}\right)}$

C. $\frac{m}{6\pi\eta rv}$

D. None of these

Answer: d

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29. Find the dimensional formula of

(a) coefficient of viscosity η (b)charge q

(c) potention V (d) capacitance C and

(e) resistance R

Some of the equations containing these quantities are

$F = -\eta A\left[\frac{\Delta v}{\Delta l}\right], q = It. U = VIt, q = CV \text{ and } V = IR$

where A denotes Area, the v the velocity , I is the length ,I the electric current, t the time and U the energy .

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

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

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

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

Answer: b

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30. A physical quantity P is given by $P = \frac{A^3 B^{1/2}}{C^{-4} D^{3/2}}$. Which quantity among $A, B, C,$ and D brings in the maximum percentage error in P?

A. A

B. B

C. C

D. D

Answer: c

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31. 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. 360000

B. 72000

C. 36000

D. 129600

Answer: D

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32. 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'

$isthe \to tale \neq rgyofthe\exp losion.\ F \in dthevaluesofa,$ b

and, c`.

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

B. $\frac{1}{3}$

C. $-\frac{1}{4}$

D. $-\frac{5}{6}$

Answer: d

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33. 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 $I = e \leq ctriccurrent$

,

A. $[\varepsilon_0]$= [M^(-1)L^(-3)T^(3)I]`

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

C. $[\mu_0] = [MLT^{-2}l^{-2}]$

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

Answer: c

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34. If area (A) velocity (v) and density (ρ) are base units, then the dimensional formula of force can be represented

A. $Av\rho$

B. $Av^2\rho$

C. $Av\rho^2$

D. $A^2v\rho$

Answer: B

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35. If velocity , time and force were chosen as basic quantities , find the dimensions of mass and energy .

A. FVT

B. FVT^2

C. F^0VT^{-1}

D. FV^2T^{-1}

Answer: a

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

A. PV^2T^2

B. $P^{-1}V^2T^2$

C. PVT^2

D. $P^{-1}VT^2$

Answer: a

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37. If velocity v acceleration A and force F are chosen as fundamental quantities, then the dimensional formula of angular momentum is terms of v,A and F would be

A. $FA^{-1}v$

B. FV^3A^{-2}

C. FV^2A^{-1}

D. $F^2V^2A^{-1}$

Answer: b

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

A. $c^2g^0\rho^{-2}$

B. $c^0g^2\rho^{-1}$

C. $cg^3\rho^{-2}$

D. $c^{-1}g^{0}\rho^{-1}$

Answer: b

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39. If energy E, length L, and time T are taken as fundamental quantities .The dimensional formula of gravitational constant is

A. $\left[FL^{6}E^{-2}\right]$

B. $\left[FL^{5}T^{-1}\right]$

C. $\left[E^{2}FL^{6}T^{0}\right]$

D. $\left[E^{2}F^{-1}L^{6}T^{5}\right]$

Answer: a

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40. In the formula $X = 3YZ^2$, X and Z have dimensions of capacitance and magnetic induction respectively. The dimensions of Y in MKSQ system are ....., ...

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

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

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

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

Answer: b

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41. If L,R, C denote inductance, resistance and capacitance, respectively .Then dimensions of $\frac{1}{R^2C}$ are

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

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

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

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

Answer: d

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Significant Figures

1. What is the number of significant figure is 0.310×10^3?

A. 2

B. 3

C. 4

D. 6

Answer: B

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2. The number of significant figures in 0.06900 is

A. 5

B. 4

C. 2

D. 3

Answer: b

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3. 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: C

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4. 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. $1.6048 gcm^{-3}$

B. $1.69 gcm^{-3}$

C. $1.7 gcm^{-3}$

D. $1.695 gcm^{-3}$

Answer: C

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

A. $2.75 \text{ and } 2.74$

B. $2.74 \text{ and } 2.73$

C. $2.75 \text{ and } 2.73$

D. $2.74 \text{ and } 2.74$

Answer: D

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6. The decimal equivalent of $\frac{1}{20}$ up to three significant figures is

A. 0.0500

B. 0.05000

C. 0.0050

D. 5.0×10^{-2}

Answer: a

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7. In the context of accuracy of measurement and significant figures in expressing result of experiment, which of the following is /are correct

(1) Out of the two measurements 50.14 cm and 0.00025 ampere, the first one has greater accuracy

(2) If one travels 478 km by rail and 397 m by road,, the total distance travelled is 478 km

A. Only (1) is correct

B. Only (2) is correct

C. Both are correct

D. None of these is correct

Answer: c

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8. If $L = 2.331cm, B = 2.1cm$, then `L+B=

A. $4.431cm$

B. $4.43cm$

C. $4.4cm$

D. $4cm$

Answer: C

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9. Two numbers $a = 0.92$ and $b = 0.08$ are given. The number of significant figure present in the result after the following operation $a + b$, $a - b$, $a \times b$ and a / b respectively are

A. 2, 2, 2, 2

B. $3, 3, 2, 2$

C. $3, 2, 1, 1$

D. $3, 2, 2, 2$

Answer: C

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10. The length, breadth and thickness of a block are given by l=12 cm , b=6cm and t=2.45 cm. The volume of the block according to the idea of significant figures should be

A. $1 \times 10^2 cm^3$

B. $2 \times 10^2 cm^3$

C. $1.763 \times 10^2 cm^3$

D. None of these

Answer: b

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11. The value of resistance is 10.845Ω and the current is $3.23A$. On multiplying them , we get the potential difference in terms of significant figures?

A. $35V$

B. $35.0V$

C. $3.0295V$

D. $35.03V$

Answer: b

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12. The radius of a sphere is 1.41 cm . its volume to an appropriate number of significant figure is

A. $11.73cm^3$

B. $11.736cm^3$

C. $11.7cm^3$

D. $117cm^3$

Answer: C

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13. The mass of a box measured by a grocer's balance is 2.300kg. Two gold pieces of masses 20.15 g and 20.17 g are added to the box. What is (a) the total mass of the box, (b) the difference in the masses of the pieces to correct significant figures?

A. $2.3kg$

B. $2.34kg$

C. $2.340kg$

D. $2.3403kg$

Answer: a

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14. A cube has a side of length $1.2 \times 10^{-2}m$. Calculate its volume. (upto correct significant figure)

A. $1.7 \times 10^{-6}m^3$

B. $1.73 \times 10^{-6}m^3$

C. $1.70 \times 10^{-6}m^3$

D. $1.732 \times 10^{-6}m^3$

Answer: A

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Erros Of Measurement

1. 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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2. The mean length of an object is 5 cm. Which of the following measurements is most accurate?

A. $4.9cm$

B. $4.805cm$

C. $5.25cm$

D. $5.4cm$

Answer: A

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3. The period of oscillation of a simple pendulum in the experiment is recorded as $2.63s, 2.56s, 2.42s, 2.71s,$ and $2.80s$. Find the average absolute error.

A. $0.1s$

B. $0.11s$

C. $0.01s$

D. $1.0s$

Answer: b

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4. The mean time period of second's pendulum is 2.00 s and mean absolute error in the time period is 0.05s. To express maximum estimate of error, the time period should be written as

A. $(2.00 \pm 0.01)s$

B. $(2.00 \pm 0.025)s$

C. $(2.00 \pm 0.05)s$

D. $(2.00 \pm 0.10)s$

Answer: C

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5. If $X = A \times B$ and $\Delta X \Delta A$ and ΔB are maximum absolute error in X ,A and B respectively , then the maximum relative in X is given by

A. $\Delta X = \Delta A + \Delta B$

B. $\Delta X = \Delta A - \Delta B$

C. $\frac{\Delta X}{X} = \frac{\Delta A}{A} - \frac{\Delta B}{B}$

D. $\frac{\Delta X}{X} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$

Answer: d

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6. If $X = A \times B$ and $\Delta X, \Delta A$ and ΔB are maximum absolute error in X ,A and B respectively , then the maximum relative in X is given by

A. $\Delta X = \Delta A + \Delta B$

B. $\Delta X = \Delta A - \Delta B$

C. $\frac{\Delta X}{X} = \frac{\Delta A}{A} - \frac{\Delta B}{B}$

D. $\frac{\Delta X}{X} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$

Answer: D

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7. The internal and external diameters of a hollow cylinder are measured with the help of a Vernier calipers . Their values are $4.23 \pm 0.01cm$ and $3.87 \pm 0.01cm$, respectively . The thickness of the wall of the cylinder is

A. $(0.34 \pm 0.02)cm$

B. $(0.17 \pm 0.02)cm$

C. $(0.17 \pm 0.01)cm$

D. $(0.34 \pm 0.01)cm$

Answer: C

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8. Two resistor $R_1 = (24 \pm 0.5)\Omega$ and $R_2 = (8 \pm 0.3)\Omega$are joined in series, The equivalent resistance is

A. $32 \pm 0.33\Omega$

B. $32 \pm 0.8\Omega$

C. $32 \pm 0.2\Omega$

D. $32 \pm 0.5\Omega$

Answer: B

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9. A physical quantity X is represented by $X = \left(M^x L^{-y} T^{-z}\right.$. 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

A. $(\alpha a + \beta b - \gamma c)$

B. $(\alpha a + \beta b + \gamma c)$

C. $(\alpha a - \beta b + \gamma c)$

D. Zero

Answer: b

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10. The resistance of a metal is given by $R = V/I$, where V is potential difference and I is current . In a circuit , the potential difference across resistance is $V = (8 \pm 0.5)V$ and current in resistance , $I = (4 \pm 0.2)A$. What is the value of resistance with its percentage error?

A. $4 \pm 16.25\,\%$

B. $4 \pm 6.25\,\%$

C. $4 \pm 10\,\%$

D. $4 \pm 8\%$

Answer: a

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11. Given Resistance $R_1 = (8 \pm 0.4)\Omega$and Resistence, $R_2 = (8 \pm 0.6)\Omega$ What is the net resistence when R_1 and R_2 are connected in series?

A. $(16 \pm 0.4\Omega)$

B. $(3.45 \pm 0.3)\Omega$

C. $(3.45 \pm 0.4)\Omega$

D. $(3.45 \pm 0.5)\Omega$

Answer: C

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12. 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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13. A body travels uniformly a distance of $(13.8 \pm 0.2)m$ in a time $(4.0 \pm 0.3)s$ so The percentage errors in the problem is

A. $7\,\%$

B. $5.95\,\%$

C. $8.95\,\%$

D. $9.85\,\%$

Answer: C

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14. 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?

A. 11%

B. 8%

C. 5%

D. 1%

Answer: B

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

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

B. $3 \times \frac{0.1}{5.3} \times 100$

C. $\frac{0.1 \times 100}{3.53}$

D. $3 + \frac{0.1}{5.3} \times 100$

Answer: B

Watch Video Solution

16. Errror in the measurement of radius of a sphere is 1% .The error in the calculated value of its volume is

A. 1%

B. 3%

C. 5%

D. 7%

Answer: B

Watch Video Solution

17. 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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18. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$ where l is about 100 cm and is known to have 1 mm

accuracy. The period is about 2 s. The time of 100 oscillation is measrued by a stop watch of least count 0.1 s. The percentage error is g is

A. 0.1%

B. 1%

C. 0.2%

D. 0.8%`

Answer: C

Watch Video Solution

19. 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. $5.0 \pm 11\,\%$

B. $5.0 \pm 1\,\%$

C. $5.0 \pm 6\,\%$

D. $1.25 \pm 5\,\%$

Answer: a

Watch Video Solution

20. The length of a cylinder is measured with a meter rod having least count $0.1cm$. Its diameter is measured with Vernier calipers having least count $0.01cm$. Given that length is $5.0cm$ and radius is $2cm$. Find the percentage error in the calculated value of the volume.

A. 1%

B. 2%

C. 3%

D. 4%

Answer: C

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21. In an experiment , the following observations were recorded:

$L = 2.820m, M = 3.00kg, l = 0.087cm, diameter, D = 0.041cm$

. Taking $g = 9.81ms^{-2}$ and using the formula , $Y = \frac{4MgL}{\pi D^2 l}$,

find the maximum permissible error in Y.

A. 7.96%

B. 4.56%

C. $6.50\ \%$

D. $8.42\ \%$

Answer: C

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22. If there is a positive error of $50\ \%$ in the measurement of velocity of a body , find the error in the measurement of kinetic energy.

A. $25\ \%$

B. $50\ \%$

C. $100\ \%$

D. $125\ \%$

Answer: C

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23. A physical quantity A is related to four observable a,b,c and d as follows, $A = \frac{a^2 b^3}{c\sqrt{d}}$, the percentage errors of measurement is a,b,c and d,are $1\,\%$,$3\,\%$,$2\,\%$ and $2\,\%$ respectively. What is the percentage error in the quantity A?

A. $12\,\%$

B. $7\,\%$

C. $5\,\%$

D. $14\,\%$

Answer: D

Watch Video Solution

24. A wire has a mass $0.3 \pm 0.003g$, radius $0.5 \pm 0.005mm$ and length $6 \pm 0.06cm$. The maximum percentage error in the measurement of its density is

A. 1

B. 2

C. 3

D. 4

Answer: d

Watch Video Solution

25. 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. $163 \pm 2.6cm^2$

D. $163.62 \pm 3cm^2$

Answer: a

Watch Video Solution

26. A wire has a mass $0.4 \pm 0.004g$ and length $8 \pm 0.08(cm)$ The maximum percentage error in the measurement of it density is 4% The radius of the wire is $r \pm \Delta r$ find Δr

A. $0.02r$

B. $0.01r$

C. $0.03r$

D. $0.1r$

Answer: B

Watch Video Solution

27. In a circuit potential difference across resistence $V = (4 \pm 0.25)V$ and curent in resistence ,$f = (1 \pm 0.1)$ what is the value of resistence with its percentage error

A. $(4 \pm 0.4)\Omega$

B. $4\Omega + 16.25\ \%$

C. $4\Omega + 18.25\ \%$

D. $4\Omega + 22.25\ \%$

Answer: b

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28. The focal f to a mirror is given by $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ where u and v represent object and image distance respectively then

A. $\frac{\Delta f}{f} = \frac{\Delta u}{u} + \frac{\Delta v}{v}$

B. $\frac{\Delta f}{f} = \frac{\Delta u}{v} + \frac{\Delta v}{u}$

C. $\frac{\Delta f}{f} = \frac{\Delta u}{u} + \frac{\Delta v}{v} - \frac{\Delta(u+v)}{u+v}$

D. $\frac{\Delta f}{f} = \frac{\Delta u}{u} + \frac{\Delta v}{v} + \frac{\Delta u}{u+v} + \frac{\Delta v}{u+v}$

Answer: D

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29. For a cubical block, error in measurement of sides is $\pm 1\,\%$ and error in measurement of mass is $\pm 2\,\%$ then maximum possible error in density is

A. $1\,\%$

B. $5\,\%$

C. $3\,\%$

D. $7\,\%$

Answer: B

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30. To estimate g (from $g = 4\pi^2 \frac{L}{T^2}$), error in measurement of L is $\pm 2\,\%$ and error in measurement of $Tis \pm 3\,\%$ The error in estimated g will be

A. $\pm 8\,\%$

B. $\pm 6\,\%$

C. $\pm 3\,\%$

D. $\pm 5\,\%$

Answer: a

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31. An experiment measure quantities x,y,z and then t is in calculate from the data as $t = \frac{xy^2}{z^2}$ if percentage error in x,y,z and are respectively $1\,\%, 3\,\%, 2\,\%$ then percentage error in t is

A. $10\,\%$

B. $4\,\%$

C. 7%

D. 13%

Answer: D

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Problems Based On Mixed Concepts

1. The equation of stationary wave is $y = A\sin kt\cos\omega$,where y and x in second choose the correct option

A. the dimensions of A and k are same

B. the dimensions of A, k and $\omega$are same

C. the dimensions of k and ω are same

D. the dimensions of (kx) and (ω) are same

Answer: d

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2. A physical quantity x depends on quantities y and z as follows : $x = Ay + B\tan(Cz)$, where A, B and C are constants. Which of the followings do not have the same dimensions?

A. x and B

B. C and z^{-1}

C. y and B//A`

D. x and A

Answer: d

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3. If the speed v of a particle of mass m as function of time t is given by $v = \omega A \sin\left[\left(\frac{\sqrt{k}}{m}\right)t\right]$, where A has dimension of length.

A. The argement of trigonometric function must be a dimensionless quantity

B. Dimensional formula of ω is LT^{-1}

C. Dimensional formula of k is MLT^{-1}

D. Dimensional formula of $\frac{\sqrt{k}}{m}$ is T

Answer: a

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4. Dimensions of an unknown quantity ,$\phi = \frac{ma}{\alpha}\log\left(1+\frac{\alpha l}{ma}\right)$ where $m =$ mass, $a =$ acceleration and $l = \text{length}$ are

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

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

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

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

Answer: C

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5. $\int \frac{dt}{\sqrt{2at-t^2}} = a^2\sin^{-1}\left[\frac{1}{a}-1\right]$ The value of x is

A. 1

B. -1

C. 0

D. 2

Answer: c

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6. If $\frac{A}{\mu_0}$ has the dimensions $\left[MLT^{-4}\right]$ what is A?

A. square of electric flux

B. square of magnitic flux

C. square of electric field

D. square of energy

Answer: c

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7. In a direct impact loss in kinetic energy is given by

$$\Delta K = \frac{M_1 M_2}{2(M_1 + M_2)} (V_1 - V_2)^2 (1 - k^2)$$

with usual notations (except k) The quantity k will have dimensional formula

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

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

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

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

Answer: c

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8. The dimensions of $\frac{CV^2}{LI^2}$ is

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

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

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

D. $\left[MLT^{-3}\right]$

Answer: B

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9. A has travels x_1 when accelerates from rest at constant rate a_2 for some time and after that travels a distance x_2 when declelertes at a constant rate a_2 to come to rest A student established a reletion $x_1 + x_2 = \frac{a_1 a_2 t^2}{2(a_1 + a_2)}$ choose the correct option (s)

A. The relation is dimensionally correct

B. The relation is dimensionally incorrect

C. The relation may be dimensionally correct

D. None of the above

Answer: a

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10. If $q = q_0\left(1 - \varepsilon^{\frac{-\square}{RC}}\right]$ here q = electron change R = electric resistence ,C = electric capacitance , The dimensional formula for $\square$ are

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

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

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

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

Answer: c

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11. a quantity X is given by $\varepsilon_0 L \frac{\Delta V}{\Delta t}$ where $\in_0$ is the permittivity of the free space, L is a length, ΔV is a potential difference and Δt is a time interval. The dimensinal formula for X is the same as that of

A. resistence

B. charge

C. voltage

D. current

Answer: d

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12. v, T, ρ and λ denote ,surface tension, mass density and wavelength, respectively In an experiment v depends on T, p and λ respectively .The value of v is proportional to

A. `sqrt((T)/(lambda))

B. $\sqrt{\frac{T}{p\lambda}}$

C. $\sqrt{\frac{\lambda}{pT}}$

D. `sqrt((T)/(p lambda))

Answer: b

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13. If $F = \frac{v}{C\text{in}(xb)}$ then

A. F and v denote force and velocity ,the dimensions of C are

$[MT]$

B. x denote distance, the dimensions of b are $\left[L^{-1}\right]$

C. the dimensions of $\frac{v}{C}$ can never be same as F

D. the demensions of x must be same as $\frac{v}{cb}$

Answer: b

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14. If m, e, $\varepsilon_0 h$ and c denote mass ,electron , change of electron, plank 's constant and speed of light , respectively , then the dimensions of $\frac{me^4}{\varepsilon_0^2 h^2 c}$ are

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

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

C. $\left[M^2LT^{-3}\right]$

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

Answer: d

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15. 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^0LT^2

B. $M^0L^2T^{-4}$

C. M^0LT^{-3}

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

Answer: d

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16. The relation $\tan\theta = v^2/rg$ gives the angle of banking of the cyclist going round the curve . Here v is the speed of the cyclist , r is the radius of the curve , and g is the acceleration due to gravity . Which of the following statements about the relation is true ?

A. both dimensionally and numerically correct

B. neithen numerically not dimensionally correct

C. dimensionally correct only

D. numerically correct only

Answer: c

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17. The position of a particle at time t is given by the relation $x(t) = \left(\frac{v_0}{\alpha}\right)\left(1 - c^{-at}\right)$, where v_0 is a constant and $\alpha > 0$. Find the dimensions of v_0 and α.

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

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

C. $M^0L^1T^{-1}$ and LT^{-2}

D. $M^0L^1T^{-1}$ and T

Answer: a

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18. The equation of state of some gases can be expressed as $\left(P+\frac{a}{V^2}\right)=\frac{R\theta}{V}$ where P is the pressure V the volume,θThe temperature and a and b are constant .The dimensional formula of a is

A. $\left[ML^5T^{-2}\right]$

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

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

D. $\left[ML^{-5}T^2\right]$

Answer: a

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19. A highly rigid cubical block A of small mass M and side L is fixed rigidly on the other cubical block of same dimensions and

of modulus of rigidity η such that the lower face of A completely covers the upper face of B. The lower face of B is rigidly held on a horizontal surface . A small force F is applied perpendicular to one of the side faces of A. After the force is withdrawn , block A executes faces of A. After the force is withdrawn , block A exceutes small oscillations , the time period of which is given by

A. $2\pi\sqrt{M\eta L}$

B. $2\pi\sqrt{(M\eta/L)}$

C. $2\pi\sqrt{(ML/\eta)}$

D. $2\pi\sqrt{(M/\eta L)}$

Answer: d

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20. Experiment shows that two perfectly neutral parallel metal plates separated by a small distance d sttract eachother via a very weak force, known as the Casimir force. The force per unit area of the plates, F, depends only on the Planck constant h, on the speed of light c, and on d. Which of the following has the best chance of being correct for F?

A. $F = \frac{hc}{d^2}$

B. $F = \frac{hc}{d^4}$

C. $F = \frac{hd^2}{c}$

D. $F = \frac{d^4}{hc}$

Answer: b

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21. 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. $1.4m + 0.3m$

D. $1.4m \pm 0.2m$

Answer: D

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22. A student measures the time period of 100 ocillations of a simple pendulum four times. The data set is $90s$, 91 s, 95 s, and

92 s. $If the \min i\mu m \div ision \in the measur \in gclockis 1$ s`,

then the reported men time should be:

A. $92 \pm 2s$

B. $92 \pm 5.0s$

C. $92 \pm 1.8s$

D. $92 \pm 3s$

Answer: a

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23. 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?

A. 2%

B. 3%

C. 1%

D. 5%

Answer: b

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24. The currect voltage relation of a diode is given by $1 = \left(e^{vanv/T} - 1\right)mA$ where the applied volied V is in volts and the tempetature T is in degree kelvin if a student make an error meassurting $\pm 01V$ while measuring the current of $5mAat300K$ what be the error in the value of current in mA

A. $0.5mA$

B. $0.05mA$

C. $0.2mA$

D. $0.02mA$

Answer: c

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Assertion Reasoning

1. Assertion: if two physical quantities have same dimension, then they can be certainly added or subtracted because

Reason: if the dimension of both the quantities are same then both the physical quantities should be similar .

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: a

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2. Assertion: Angle and angular displacement a dimensionless quantities.

Reason: Angle is equal in are length divided by radius.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: a

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3. Assertion: Force can be added to pressure.

Reason: Force and pressure have same dimensions.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: d

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4. Assertion: Angle and angular displacement a dimensionless quantities.

Reason: Angle is equal in arc length divided by radius.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: c

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5. Assersion : Out of three meansurements $l = 0.7m, l = 0.70m$ and $l = 0.700m$ the last one is most accurate.

Reason: In every meansurements only the last significant digit is not accurately known.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: b

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6. Assertion: The number 1.202has four significant figure and the number 0.0024 has two significant figure.

Reason: All the non zero digits are significant.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: b

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7. Assertion: In $y = A\sin(\omega t - kx)$, $(\omega t - kx)$ is dimensionless.

Reason: Because dimension of $\omega = \left[M^0 L^0 T\right]$.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: c

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8. Assertion: When we change the unit of measurerment of a quantity its numerical value changes.

Reason: Smaller the unit of measurement smaller is its numerical value.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: c

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9. Assertion: The given equation $x = x_0 + u_0 t + \frac{1}{2} a t^2$ is dimensionsally correct, where x is the distance travelled by a particle in time t , initial position x_0 initial velocity u_0 and uniform acceleration a is along the direction of motion.

Reason: Dimensional analysis can be used for cheking the dimensional consistency or homogenetly of the equation.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: a

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10. Assertion: The dimensional formula of surface energy is $\left[M^0L^2T^{-2}\right]$.

Reason: surface energy has same dimensions as that of potential energy.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: d

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11. Assertion: When percentage error in the meansurement of mass and velocity are 1% and 2% respectively the percentagwe error in K.E. is 5%.

Reason: $\frac{\Delta K}{K} = \frac{\Delta m}{m} = \frac{2\Delta v}{v}$.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: a

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12. Assertion: A dimensionally wrong or inconsistaent equation must be wrong.

Reason: A dimensionally consistent equation is a exact or a correct equation.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: c

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13. Assertion: Dimensional constant are the quantities whose value are constant.

Reason: Dimensional constant are dimensionless.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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14. Assertion: Pressure can not be subtracted from pressure gradient.

Reason: Pressure and pressure gradient have different dimensions.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: a

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15. Assertion: In the relation $f = \frac{1}{2l}\sqrt{\frac{T}{m}}$, where symbols have standard meaning , m represent linear mass density.

Reason: The frequency has the dimensions linear of time.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: b

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16. Assertion: the quantity $\left(1/\sqrt{\mu_0\varepsilon_0}\right)$ is dimensionally equal to velocity and numerical equal to velocity of light.

Reason : μ_0 is permeability of free space and ε_0 is the permitivity of free space.

A. If both assertion and reason are true and reason is the correct explation of assertion.

B. If both assertion but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: b

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Neet Questions

1. Planck's constant has the dimension (unit) of

A. Energy

B. Linear momentum

C. Work

D. Angular momentum

Answer: d

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2. The unit of Stefan's constant σ 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 dimesions of emf in MKS is

A. $ML^{-1}T^{-2}Q^{-2}$

B. $ML^{2}T^{-1}Q^{-1}$

C. $MLT^{-1}Q^{-1}$

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 these

Answer: b

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5. The dimensional formula of relative density is

A. ML^{-3}

B. LT^{-1}

C. MLT^{-2}

D. Dimensionaless

Answer: d

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6. The dimenational 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. $\text{coulomb}/\text{newton}-\text{metre}$

B. $\text{newton}-metre^2/\text{coulomb}^2$

C. $\text{coulomb}^2/\text{newton}-\text{metre}^2$

D. $\text{coulomb}^2 / (\text{newton} - \text{metre})^2$

Answer: c

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8. The dimension of universal gravitational constant are

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

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

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

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

Answer: A

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9. 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. $\left[LT^{-2}\right], [L]$ and $[T]$

B. $\left[L^2\right], [T]$ and $\left[LT^2\right]$

C. $\left[LT^2\right], [LT]$ and $[L]$

D. $[L], [LT]$ and $\left[T^2\right]$

Answer: a

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10. Dimensions of resistence in an electrical circuit , in terms of dinestion of mass M of length l, of time T and of curent L would be

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

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

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

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

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 dimension?

(1) Energy density

(2) refractive index

(3) dielectric constant

(4) Young's modulus

(5) magnitic field

A. $2 \text{ and } 4$

B. $3 \text{ and } 5$

C. $21 \text{ and } 4$

D. 1 and 5

Answer: c

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13. In the dimension of a physical quantities are given by $M^0L^1T^0$, 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 $a = 1, b = 1, c = -2$

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

Answer: a

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14. The dimension of $\left(\frac{1}{2}\right)\varepsilon_0 E^2$ (ε_0 : permittivity of free space, E electric field

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

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

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

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

Answer: b

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15. The dimesions of $\left(\mu_0\varepsilon_0\right)^{-1/2}$ are

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

B. $\left[LT^{-1}\right]$

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

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

Answer: b

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16. The density of material in CGS system of units is $4gcm^{-3}$. In a system of units in which unit of length is 10 cm and unit of mass is 100 gm, then the value of density of material will be

A. 0.4

B. 40

C. 400

D. 0.04

Answer: b

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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

$P = \frac{a^3 b^2}{cd}$ $\%$ 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. $[EV^{-2}T^{-1}]$

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 $\eta, \rho \text{ and } r$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. $\sqrt{\frac{hc}{G}}$

B. $\sqrt{\frac{Gc}{h^{3/2}}}$

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

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

Answer: c

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

A. $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

B. $\frac{1}{c^2}\left[G\frac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$

C. $\frac{1}{c}G\frac{e^2}{4\pi\varepsilon_0}$

D. $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

Answer: d

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23. A student measured the diameter of a small steel ball using a screw gauge of least count $1.001cm$. The main scale reading is $5mm$ and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of $-0.004cm$, the correct diameter of the ball is

A. $0.529cm$

B. $0.521cm$

C. $0.503cm$

D. $0.525cm$

Answer: A

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Aiims Questions

1. Which of the following pairs does not have similar dimensions?

A. Stress and pressure

B. Tension and surface tension

C. Plank 's constant and angular momentum

D. Angle and strain

Answer: B

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2. The length and breadth of a metal sheet are $1.124m \text{ and } 0.002m$ respectively .The area of the sheet up in four currect significant figure is

A. $9.3782m^3$

B. $9.37m^3$

C. $9.378248m^3$

D. $9.378m^3$

Answer: d

Watch Video Solution

3. The dimension of torque is:

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

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

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

D. $\left[MT^{-3}\right]$

Answer: b

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4. Velocity of light of equal to

A. $\sqrt{\frac{\varepsilon_0}{\mu_0}}$

B. $\sqrt{\frac{1}{\varepsilon_0 \mu_0}}$

C. $\frac{\varepsilon_0}{\mu_0}$

D. $\varepsilon_0 \mu_0$

Answer: b

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5. Using $mass(M), \text{length}(L), time(T)$ and current(A)as fundamental quantites the demension of permeability is

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

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

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

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

Answer: c

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6. Using $mass(M), \text{length}(L), time(T)$ and current(A)as fundamental quantites the demension of permeability is

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

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

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

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

Answer: b

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7. $''Parses''$ is the unit of

A. sdistance

B. time

C. frequency

D. angular acceleration

Answer: a

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8. Dimensions of electrical resistence are

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

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

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

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

Answer: b

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9. The magnetic moment has dimensions of

A. $[LA]$

B. $[L^2LA]$

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

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

Answer: b

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10. The speed (v) of ripples on the surface of waterdepends on surface tension (σ), density (ρ) and wavelength (λ). The square of speed (v) is proportional to

A. $\frac{\rho}{\sigma\lambda}$

B. $\frac{\sigma}{\rho\lambda}$

C. $\frac{\lambda}{\sigma\rho}$

D. $rh\lambda\sigma$

Answer: b

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

A. $G^{1/2}h^{1/2}c^{-5/2}$

B. $G^{-1/2}h^{1/2}c^{1/2}$

C. $G^{1/2}h^{1/2}c^{-3/2}$

D. $G^{1/2}h^{1/2}c^{1/2}$

Answer: a

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12. Presure gradient has the ssame dimension as that of

A. Velocity gradient

B. Potential gradient

C. Energy gradient

D. None of these

Answer: d

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13. A physical parameter a can be determined by measuring the parameters $b, c, d, \text{ and } e$ using the relation $a = b^{\alpha}c^{\beta}/d^{\gamma}e^{\delta}$. If the maximum errors in the measurement of $b, c, d, \text{ and } e$ are $b_1\ \%$, $c_1\ \%$, $d_1\ \%$, and $e_1\ \%$, then the maximum error in the value of a determined by the experminent.

A. $(b_1 + c_1 + d_1 + e_1)\ \%$

B. $(b_1 + c_1 - d_1 - e_1)\ \%$

C. $(\alpha b_1 + \beta c_1 - \gamma d_1 - \delta e_1)\ \%$

D. $(\alpha b_1 + \beta c_1 + \gamma d_1 + \delta e_1)\ \%$

Answer: d

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14. A wire has a mass $0.3 \pm 0.003g$, radius $0.5 \pm 0.005mm$ and length $6 \pm 0.06cm$. The maximum percentage error in the measurement of its density is

A. 1

B. 2

C. 3

D. 4

Answer: d

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15. In CGS system the magnitude of the force is 100 dynes. In another system where the fundamental phyical quamtities are kilogram , meter , and minute, find the magnitude of the force.

A. 0.036

B. 0.36

C. 3.6

D. 36

Answer: c

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16. A physical quantity $X$is give by the relation $X = \frac{2h^3I^2}{2\sqrt{n}}$ The percentage error in the meansurement of k ,I,m and n are 1% , 2% , 3% and 4% respectively The value of X is uncertain by

A. 10%

B. 12%

C. 8%

D. none of these

Answer: b

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17. Assertion : Specific gravity of a fluid is a dimensionless quantity.

Reason : It is the ratio of ratio of fluid to the density of water

A. If both the asseration and reason are true and reason is a true explanation of the asseration.

B. If both the asseration and reason are true but the reason is not the correct explanation of asseration.

C. If the asseration is ture but reason is false.

D. If both the asseration and reason are false.

Answer: a

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18. Assertion: The error in the measurement of radius of sphere is 0.3%. The permissible error in its surface area is 0.6%.

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

A. If both the asseration and reason are true and reason is a true explanation of the asseration.

B. If both the asseration and reason are true but the reason is not the correct explanation of asseration.

C. If the asseration is ture but reason is false.

D. If both the asseration and reason are false.

Answer: c

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19. Assertion : The period change in time period is 1.5% if the length of simple pendulum increases by 3%.

Reason : Time period is dinesty proportional to length of pendulum.

A. If both the asseration and reason are true and reason is a true explanation of the asseration.

B. If both the asseration and reason are true but the reason is not the correct explanation of asseration.

C. If the asseration is ture but reason is false.

D. If both the asseration and reason are false.

Answer: c

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20. Assertion : The quantities $\left(1\sqrt{\mu_0\varepsilon_0}\right)$ is dimensionally equal to velocity and numericallyy equal of light.

Reason : μ_0 is permeability of free space and ε_0 is the permittivity of free space.

A. If both the asseration and reason are true and reason is a true explanation of the asseration.

B. If both the asseration and reason are true but the reason is not the correct explanation of asseration.

C. If the asseration is ture but reason is false.

D. If both the asseration and reason are false.

Answer: b

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21. Assertion : When we change the unit of meansurement of a quantities its numerical value change.

Reason : smaller the unit of meansurement smaller is its numerical value.

A. If both the asseration and reason are true and reason is a true explanation of the asseration.

B. If both the asseration and reason are true but the reason is not the correct explanation of asseration.

C. If the asseration is ture but reason is false.

D. If both the asseration and reason are false.

Answer: c

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22. Assertion : The power of an angular depends on mass angular speed torque and angular momentum , then the formula of power is not derived with the help of dimensional method.

Reason: In mechanics if a particular quantity depends on more than three quantities then we cannot dimensions the formula of the quantities by the help of dimensions method.

A. If both the asseration and reason are true and reason is a true explanation of the asseration.

B. If both the asseration and reason are true but the reason is not the correct explanation of asseration.

C. If the asseration is ture but reason is false.

D. If both the asseration and reason are false.

Answer: c

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Chapter Test

1. The dimensions of shear modulus are

A. MLT^{-1}

B. ML^2T^{-2}

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

D. MLT^2

Answer: c

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2. The dimension of $\left(\frac{1}{2}\right)\varepsilon_0 E^2$ (ε_0 : permittivity of free space, E electric field

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

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

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

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

Answer: c

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3. In a system of units if force (F), acceleration (A) and time (T) are taken as fundamental units, then the dimensional formula of energy is

A. FA^2T

B. FAT^2

C. F^2AT

D. FAT

Answer: B

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4. Unit of $\frac{CV}{\rho\varepsilon_0}$ are of

($C =$ capacitance, $V =$ potential, $\rho =$ specfic resistence and

$\varepsilon_0 =$ permittivity of free space)`

A. Charge

B. current

C. time

D. frequency

Answer: b

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5. The wavelength associated with a moving particle depends upon p^{th} power of its mass m, q^{th} power of its velocity v and power of plank's constant h Then the corrent set of valume of p,q and r is

A. $p = 1, q = -1, r = 1$

B. $p = 1, q = 1, r = 1$

C. $p = -1, q = -1, r = -1$

D. $p = -1, q = -1, r = 1$

Answer: d

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6. The pair (s) of physical quantities that do not have the same dimension

A. volumetric strain and coefficient of friction

B. disintegration constant of a radioactive substance and frequency of light wave

C. heat capacity and gravitational potential

D. Plank's constant and torque

Answer: d

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7. L,C and R represent the physical quantities inductance, capacitance and resistance respectively. Which of the following combinations have dimensions of frequency?

A. $\frac{1}{RC}$

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

C. $\frac{1}{\sqrt{LC}}$

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

Answer: d

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8. A wire has a mass $0.3 \pm 0.003g$, radius $0.5 \pm 0.005mm$ and length $6 \pm 0.06cm$. The maximum percentage error in the measurement of its density is

A. 1

B. 2

C. 3

D. 4

Answer: d

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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. $(3.5 \pm 0.6)ms^{-1}$

B. $(3.5 \pm 0.3)ms^{-1}$

C. $(6.1 \pm 0.6)ms^{-1}$

D. $(6.1 \pm 0.3) ms^{-1}$

Answer: b

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10. The fundamental unit of quantity of metter is

A. kg

B. $gram$

C. mol

D. tonne

Answer: c

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11. If equation $\int \frac{dt}{\sqrt{3a-2t^2}} = a^x \sin^{-1}\left(\frac{r^2}{a^2}-1\right)$, the value of x is

A. $\frac{3}{2}$

B. 0

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

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

Answer: b

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12. Drift speed of electron inside the metallic conductor is $v_A = eE^y m^z \tau$ (here, $e =$ electronic charge, $E =$ electric field, $m =$ mass of electron and $\tau =$ time relaxation). Find the value of y.

A. $\frac{3}{2}$

B. 0

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

D. 1

Answer: d

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13. If unit of mass become 2 times the unit of length becomes 4 time and the unit of time in the unit of Plank's Due to the unit of plank's constant because n time The value of n is

A. 3

B. 5

C. 6

D. 8

Answer: d

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14. A stone lying at rest in a river The minimum mass of stone, $m = k\rho v^x g^{-3}$ is needed for remaining at rest here, $h =$ constant having no unit , $g =$ acceleration due to gravity , $v =$ river flor velocity , $\rho =$ density of water. The value of x is

A. 3

B. 5

C. 6

D. 8

Answer: c

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15. A student writes four different expression for the displacement y in a period motion

$$y = a\sin\frac{2\pi r}{T}$$

$$y = a\sin vt$$

$$y = \frac{a}{t}\sin\frac{t}{a}$$

$$y = \frac{a}{\sqrt{2}}\left[\sin,\frac{2\pi r}{T} + \cos,\frac{2\pi r}{T}\right]$$

where a is maximum displacement , x is the speed and T is the time period then dimensionally.

A. 1 and 2 are wrong

B. 2 and 3 are wrong

C. 3 and 4 are wrong

D. 4 and 1 are wrong

Answer: b

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16. If the unit of velocity is run , the unit of time is second and unit of force is strength in a hyperthetical system of unit in this system of unit the unit of mass is $(\text{strength})/(\text{second})^2(\text{run})^2$

Thus, $x = 1, y = 1$ and $z = -1$

$\frac{y}{x} = 1$

A. 3

B. 5

C. 6

D. 1

Answer: d

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17. If force F velocity V and time T are taken as fundamental units, find the power of dimensions of force in the dimensional formula of pressure

A. 3

B. 5

C. 6

D. 1

Answer: d

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18. A student determins a dimensionless quantities $B = \frac{E^n}{2\varepsilon_0 hc}$ Find the value of n (here, $e =$ electric charge ε_0 electric permittivety of vacume, $b =$ Plank's constant and $c =$ speed of light)`

A. 3

B. 4

C. 2

D. 1

Answer: c

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19. To find the distance d over which a signal can be seen clearly in foggy conditions, a railways-engineer uses dimensions and

assumes that the distance depends on the mass density ρ of the fog, intensity (power/area) S of the light from the signal and its frequency f. the engineer finds that d is proportional to $S^{1/n}$. the value of n is

A. 3

B. 5

C. 6

D. 1

Answer: a

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20. Acceleration due to gravity on the surface of the earth is $g = \frac{GM}{R^2}$. The gravitational constant G is exacity known. But

percentage error in measurement of the mass of earth M and radius of the earth R are 1% and 2%, respectively. The maximum percentage error in measurement of acceleration due to gravity on the surface of the earth is

A. 2%

B. 5%

C. 3%

D. 7%

Answer: b

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21. During measurement of kinetic energy T , The percentage error in meansurment of mass of particle and momentum of

particle are 2% and 3% respectively .The percentage error in measurement of kinetic energy is

A. 2%

B. 5%

C. 3%

D. 7%

Answer: d

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22. A physical quantity x depends on quantities y and z as follows : $x = Ay + B\tan(Cz)$, where A, B and C are constants. Which of the followings do not have the same dimensions?

A. x and y

B. C and z^{-1}

C. y and B/A

D. x and A

Answer: d

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23. Which of the following statement is incorrect regarding significant figure?

A. All the none -zero are signifiicant.

B. All the zero between two none zero digit are significant.

C. The power is the counted while counting the number of significant figure.

D. None of these

Answer: d

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

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

B. $\left[p^2 A^1 t^1\right]$

C. $\left[p^1 A^{1/2} t^1\right]$

D. $\left[p^1 A^{1/2} t^{-1}\right]$

Answer: D

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25. 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. $(66.7 \pm 1.8)\Omega$

B. $(66.7 \pm 4.0)\Omega$

C. $(66.7 \pm 3.0)\Omega$

D. $(66.7 \pm 7.0)\Omega$

Answer: a

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26. Assertion : Number of significant figure in 0.005 is one and that is 0.500 is three

Reason : This is became zeros are not significant

A. If both assertion and reason are true and reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: c

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27. Assertion : L/R and CR both have same dimensions

Reason L/R and CR both have dimensions of time

A. If both assertion and reason are true and reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: a

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28. Assertion : Velocity , cannot be added to speed

Reason : Both velocity and speed have same dimensions

A. If both assertion and reason are true and reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: b

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