PHYSICS

BOOKS - DC PANDEY PHYSICS (HINGLISH)

UNITS, DIMENSIONS & ERROR ANALYSIS

Examples

1. The acceleration due to gravity is $9.8ms^{-2}$. Give its value in ft s^{-2}

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2. If the value of universal gravitational constant is $6.67 \times 10^{11} Nm^2 kg^{-2}$, then find its value in CGS system.

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3. The wavelength of a light is of the order of 6400Å. Express this in micron and metre.

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4. How many microns are there in 1 light in 1 light year ?

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5. How many microseconds are there in 10 minutes?

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6. Calculate the angle 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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7. 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 .

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8. If force (F), velocity (V) and time (T) are taken as

fundamental units, then the dimensions of mass are

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

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10. For which of the following quantities does ratios are dimensionless?

(i) $\frac{\text{work}}{\text{Energy}}$ (ii) $\sin\theta$ (iii) $\frac{Momentum}{Time}$

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11. 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 ....., ...

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12. Show that the expression of the time period T of a simple pendulum of length l given by $T = 2\pi\sqrt{\frac{l}{g}}$ is dimensionally correct

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13. Check the correctness of following equation by the method of dimensions :

$S = ut + \frac{1}{2}at^2$.

where S is the distance covered bu a body in time t, having initial velocity u and acceleration a.

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14. Write the dimensions of a and b in the relation , $P = \frac{b - x^2}{at}$, where P is power ,x is distance and t is time

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15. The velocity v of a particle depends upon time t, according to the equation $v = a + bt + \frac{c}{d+t}$ Write the dimensions of a,b,c, and d.

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16. The following equation gives a relation between the mass m_1 kept on a surface of area A and the pressure p exerted on this area.

$p\frac{(m_1 + m_2 x)}{A}$

What must be the dimensions of the quatities x and m_2?

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17. Find the value of 100 J on a system which has 20 cm, 250g and half minute as fundamental units of length, mass and time.

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18. The value of gravitation is $G = 6.67 \times 10^{-11} N - \frac{m^2}{kg^2}$ in SI units . Convert it into CGS system of units .

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19. The frequency (f) of a stretched string depends upon the tension F (dimensions of form) of the string and the

mass per unit length μ of string .Derive the formula for frequency

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20. 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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21. How many significant figures are there in the measured values.

A. 227.2 g

B. 3600 g

C. 0.00602 g

D. $2.50 \times 10^{10} g$

Answer:

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22. Add $6.75 \times 10^{3} cm \rightarrow 4.52 \times 10^{2} cm.$

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23. Two sticks of lengths 12.132 cm and 10.2 cm are placed end to end. Find their total length with due regard to decimal places.

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

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25. The time taken by a pendulum to complete 25 vibrations is 88.0 s. Find the time period of the pendulum

in second upto appropriate significant figures.

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26. The voltage across a lamp, is 6.32V when the current passing through it is 3.4 A. Find the power consumed to appropriate significant figures.

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27. A substance weight 5.74 g occupies a volume of $1.2cm^3$. Caluclate its density with due regard to significant digits.

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28. Round off the following numbers upto three significant figures

A. 2.520

B. 4.645

C. 22.78

D. 36.35

Answer:

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29. The length and the radius of a cylinder measured with a slide cllipers re found to be 4.54 cm and 1.75 cm respectively. Calculate the volume of the cylinder.

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30. What is the order of magnitude of the distance of the sun from the earth in SI unit?

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31. The length of a rod as measured in an experiment was found to be 2.48m, 2.46 m, 2.49 m, 2.50 m and 2.48m. Find

the average length, absolute arror in each observation and the percentage error.

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32. The diameter of a wire as measured by screw gauge was found to be 2.620, 2.625, 2.630, 2.628 and 2.626 cm. Calculate

(a) mean value of diameter (b) absolute error in each measurement

(c) mean absolute error (d) fractional error

(e) percentage error (f) Express the result in terms of percentage error

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33. The refractive index (n) of glass is found to have the values 1.49,1.50,1.52,1.54 and 1.48. Calculate

(i) the mean value of refractive index,

(ii) absolute error in each measurement,

(iii) mean absolute error,

(iv) fractional error and

(v) percentage error

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34. The volumes of two bodies are measured to be $V_1 = (10.2 \pm 0.02)cm^3$ and $V_2 = (6.4 \pm 0.01)cm^3$. Calculate sum and difference in volumes with error limits.

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35. Calculate focal length of a spherical mirror from the following observations : object distance, $u = (50.1 \pm 0.5)cm$ and image distance , $v = (20.1 \pm 0.2)cm.$

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36. The radius of a sphere is measured to be (2.1 ± 0.5) cm. Calculate its surface area with error limits .

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37. The mass and density of a solid sphere are measured to be $(12.4 \pm 0.1)kg$ and $(4.6 \pm 0.2)kg/m^3$. Calculate the volume of the sphere with error limits .

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38. A thin copper wire of length L increase in length by 2 % when heated from T_1 to T_2. If a copper cube having side 10 L is heated from T_1 to T_2 when will be the percentage change in

(i) area of one face of the cube

(ii) volume of the cube

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39. Calculate percentage error in determination of time period of a pendulum.

$$T = 2\pi\sqrt{\frac{l}{g}}$$

where, l and g are measured with $\pm 1\,\%$ and $\pm 2\,\%$.

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40. Find the relative error in Z, if $Z = \frac{A^4 B^{1/3}}{CD^{3/2}}$ and the percentage error in the measurements of A,B,C and D are 4%,2%,3% and 1%, respectively.

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Check Point 1 1

1. The SI unit of temperature is :

A. degress centigrade

B. kelvin

C. degree celsius

D. degress Fahrenheit

Answer: B

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2. The dimensions of surface tension are

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

B. $\left[M^2LT^2\right]$

C. $\left[MT^2\right]$

D. $\left[MLT^2\right]$

Answer: C

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3. The dimensions of impulse are equal to that of

A. Force

B. linear momentum

C. Pressure

D. angular momentum

Answer: B

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

A. joule/second

B. $ampere \times volt$

C. $(ampere)^2 \times ohm$

D. $ampere / volt$

Answer: D

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5. Which of the following does not possess the same dimensions as that of pressure?

A. Stress

B. Bulk modulus

C. Thrust

D. Energy density

Answer: C

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6. What is the dimensional formula of gravitational constant ?

A. $[ML^2T^2]$

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

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

D. None of these

Answer: C

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7. If c and R denote capacity and resistance the dimensions of CR are :

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

B. $[ML^0T]$

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

D. not expressible in terms of M,L and T

Answer: A

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8. Which one of the following have same dimensions?

A. Torque and force

B. Potential energy and force

C. Torgue and potential energy

D. Planck's constant and linear momentum.

Answer: C

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9. Which of the following is a dimensional constant?

A. Poission's ratio

B. Refractive index

C. Relative density

D. Gravitational constant

Answer: D

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10. The force F on a sphere of radius r moving in a medium with velocity v is given by $F = 6\pi\eta rv$. The dimensions of η are

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

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

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

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

Answer: D

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11. Density of a liquid in CGS system is $0.625 \frac{g}{cm^3}$. What is its magnitude is SI system?

A. 0.625

B. 0.0625

C. 0.00625

D. 625

Answer: D

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12. $Joe \times \sec ond$ is the unit of

A. Energy

B. momentum

C. angular momentum

D. power

Answer: C

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13. $\left[ML^2T^{-3}A^{-1}\right]$ is the dimensional formula for

A. Capacitance

B. Resistance

C. Resistivity

D. Potential difference

Answer: D

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

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

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

Answer: A

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

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

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

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

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

Answer: B

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16. Which of the following pairs have the same units?

A. Wavelength and Rydberg constant

B. Relative velocity and relative density

C. Thermal capacity and Boltzmann constant

D. Time period and acceleration gradient

Answer: B

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17. Which one of the following is not the dimensionless quantity?

A. Plank's constant

B. Dielectric constant

C. Solid engle

D. Strain

Answer: A

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18. Given that $y = a\cos\left(\frac{t}{P} - qx\right)$, where t represents distance is metre. Which of the following statements is true ?

A. The unit of x is same as that of q

B. The unit of x is same as that of p

C. The unit of t is ame as that of q

D. The unit of t is ame as that of p

Answer: D

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

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

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

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

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

Answer: B

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20. The equation of a wave is given by

$$y = a\sin\omega\left[\frac{x}{v} - k\right]$$

where ω is angular velocity and v is the linear velocity .

The dimensions of k will be

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

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

C. [T]

D. [LT]

Answer: C

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21. If 'muscle times speed equals power', then what is the ratio of the SI unit and the CGS unit of muscle?

A. 10^5

B. 10^3

C. 10^7

D. 10^{-5}

Answer: A

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22. The dimensions of $\frac{1}{2} \in_0 E^2$ ($\in_0$: permittivity of free space, E: electric field) is-

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

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

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

D. [MLT^(-1)]`

Answer: B

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23. 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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24. The units of length, velocity and force are doubled. Which of the following is the correct change in th other units?

A. Unit of time is doubled

B. Unit of mass is doubled

C. Unit of momentum is doubled

D. Unit of energy is doubled

Answer: C

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25. Assuming that the mass m of the largest stone that can be moved by a flowing river depends upon the velocity v, of water, its density ρ and acceleration due to gravity g, then m is directly proportional to

A. v^3

B. v^4

C. v^5

D. v^6

Answer: D

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Check Point 1 2

1. What is the number of significant figures in 0.0310×10^3?

A. 2

B. 3

C. 4

D. 6

Answer: B

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2. The number of significant figures in 11.118×10^{-6} V is

A. 3

B. 4

C. 5

D. 6

Answer: C

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3. In which of the following numerical values, all zeros are significant?

A. 0.2020

B. 20.2

C. 2020

D. None of these

Answer: B

4. What is the number of significant figure in (3.20 + 4.80) $\times 10^5$?

A. 5

B. 4

C. 3

D. 2

Answer: C

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5. Subtract 0.2 J from 7.26 and express the result with correct number of significant figures

A. 7.1

B. 7.06

C. 7

D. None of these

Answer: C

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6. The length , breadth , and thickness of a metal sheet are $4.234m, 1.005m,$ and $2.01cm$, respectively. Give the area and volume of the sheet to the correct number of significant figures.

A. $0.0855\mathrm{m}^3$

B. $0.086\mathrm{m}^3$

C. $0.08556\mathrm{m}^3$

D. $0.08\mathrm{m}^3$

Answer: A

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7. Multiply 107.88 by 0.610 and express the result with correct number of significant figures.

A. 65.8068

B. 64.807

C. 65.81

D. 65.8

Answer: D

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8. The radius of a thin wire is $0.16mm$. The area of cross section taking significant figures into consideration in square millimeter is

A. 0.08

B. 0.080

C. 0.0804

D. 0.080384

Answer: B

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9. What is the value of $\left(5.0 \times 10^{-6}\right)\left(5.0 \times 10^{-8}\right)$ with due regards to significant figures ?

A. 25×10^{-14}

B. 25.0×10^{-14}

C. 2.50×10^{-13}

D. 250×10^{-15}

Answer: A

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10. If 97.52 is divided by 2.54, the correct result in terms of significant figures is

A. 38.3937

B. 38.394

C. 65.81

D. 38.4

Answer: D

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Check Point 1 3

1. If error in measuring diameter of a circle is 4 %, the error in the radius of the circle would be

A. 0.02

B. 0.08

C. 0.04

D. 0.01

Answer: C

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2. 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

A. 0.08

B. 0.06

C. 0.18

D. 0.12

Answer: B

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3. A force F is applied on a square plate of side L. If the percentage error in the determination of L is 2% and that in F is 4%. What is the permissible error in pressure?

A. 0.08

B. 0.06

C. 0.04

D. 0.02

Answer: A

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4. A cuboid has volume $V = l \times 2l \times 3l$, where l is the length of one side. If the relative percentage error in the measurment of l is 1%, then the relative percentage error in measurement of V is

A. 0.18

B. 0.06

C. 0.03

D. 0.01

Answer: C

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

A. (22.1 ± 0.05) cm

B. (22.1 ± 0.1) cm

C. (22.10 ± 0.05) cm

D. (22.10 ± 0.2) cm

Answer: D

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6. Three measurements are made as 18.425 cm, 7.21 cm and 5.00 cm. The addition should be written as

A. 30.635 cm

B. 30.64 cm

C. 30.63 cm

D. 30.6 cm

Answer: D

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7. If the error in the measurement of momentum of a particle is (+ 100%), then the error in the measurement of kinetic energy is

A. 1

B. 2

C. 3

D. 4

Answer: C

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8. A body travels uniformly a distance of (13.8 ± 0.2) m in a time (4.0 ± 0.3) S. The velocity of the body within error limit is

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

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

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

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

Answer: B

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9. The radius of a ball is (5.2 ± 0.2) cm. The percentage error in the volume of the ball is (approximately).

A. 0.11

B. 0.04

C. 0.07

D. 0.09

Answer: A

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10. The values of two resistors are $(5.2 \pm 0.2)\ \mathrm{k}\Omega$ and $(10.0 \pm 0.1)\ \mathrm{k}\Omega$. What is the percentage error in the

equivalent resistance when they are connected in parallel?

A. 0.02

B. 0.05

C. 0.07

D. 0.1

Answer: B

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Chapter Exercises Taking It Together

1. If dimensions of A and B are different, then which of the following operaion is valid ?

A. $\frac{A}{B}$

B. $e^{-A/B}$

C. A-B

D. A+B

Answer: A

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2. The diameter of a wire is measured to be 0.0250×10^{-4} m. The number of significant figures in the

measurement is

A. five

B. four

C. three

D. nine

Answer: C

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3. Dimensional formula for electromotive force is same as that for

A. potential

B. current

C. force

D. energy

Answer: A

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4. The number of significant figures in 0.06900 is

A. 5

B. 4

C. 2

D. 3

Answer: B

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5. 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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6. The dimensional formula for magnetic flux is

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

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

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

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

Answer: A

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

A. $\left[MLT^{-3}\right]$ and $\left[MLT^{-4}\right]$

B. $\left[MLT^{-4}\right]$ and $\left[MLT^{-3}\right.$

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

D. $\left[MLT^{-2}\right]$ and $\left[MLT^{0}\right]$

Answer: A

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8. If the dimension of a physical quantity are given by $M^aL^bT^c$, then the physical quantity will be

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

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

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

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

Answer: B

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9. Three measurements are made as 18.425 cm, 7.21 cm and 5.0 cm. The addition should be written as

A. 30.635 cm

B. 30.64 cm

C. 30.63 cm

D. 30.6 cm

Answer: D

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

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

B. Nm^2C^{-2}

C. Nm^2C^2

D. Unitless

Answer: B

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11. The radius of a circle is 21.2 m. Its area according to the rule of significant figures is

A. 14.1124 m^2

B. 14.112 m^2

C. 14.11 m^2

D. 14.1 m^2

Answer: D

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12. If the value of resistance is 10.845 ohm and the value of current is 3.23 amp, the value of potential with

significant numbers would be

A. 35.0 V

B. 3.50 V

C. 35.029 V

D. 35.030 V

Answer: A

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13. The position of the particle moving along Y-axis is given as $y = At^2 - Bt^3$, where y is measured in metre and t in second. Then, the dimensions of B are

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

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

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

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

Answer: C

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14. 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. $1 \times 10^2 \quad cm^3$

B. $2 \times 10^2 \quad \mathrm{cm}^3$

C. $1.764 \times 10^2 \quad \mathrm{cm}^3$

D. None of these

Answer: B

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15. Out of following four dimensional quantities, which one quantity is to be called a dimensional constant

A. Acceleration due to gravity

B. Surface tension of water

C. Weight of a standaard kilogram mass

D. The velocity of light in vaccum

Answer: D

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16. The random error in the arithmetic mean of 100 observations is x, then random error in the arithmetic mean of 400 observations would be

A. 4x

B. $\frac{1}{4}x$

C. 2x

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

Answer: B

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17. A physical quantity Q is calculated according to the expression

$$Q = \frac{A^3 B^3}{C\sqrt{D}}$$

If percentage errors in A, B, C, D are 2%, 1%, 3% and 4% respectively. What is the percentage error in Q?

A. $\pm 8\ \%$

B. $\pm 10\ \%$

C. $\pm 14\ \%$

D. $\pm 12\ \%$

Answer: C

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18. With usual notation, the following equation, said to give the distance covered in the $n\text{th}$ second. $i.e.$, S_(n)=u+a((2n-1))/2` is

A. only numerically correct

B. only dimensionally correct

C. Both dimensionally and numerically

D. Neither numerically nor dimensionally correct

Answer: C

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

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

C. LT^2, LT and L

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

Answer: A

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20. if the randon error in the arithmetic mean of 50 observations is α, then the random error in the arithmetic mean of 150 observations would be

A. α

B. 3α

C. $\frac{\alpha}{3}$

D. 2α

Answer: C

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21. Velocity v is given by $v = at^2 + bt + c$, where t is time. What are the dimensions of a, b and c respectively?

A. $\left[LT^{-3}\right], \left[LT^{-2}\right]$ and $\left[LT^{-1}\right]$

B. $\left[LT^{-1}\right], \left[LT^{-2}\right]$ and $\left[LT^{-3}\right]$

C. $\left[LT^{-2}\right], \left[LT^{-3}\right]$ and $\left[LT^{-1}\right]$

D. $\left[LT^{-1}\right], \left[LT^{-3}\right]$ and $\left[LT^{-2}\right]$

Answer: A

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22. The square root of the product of inductance and capacitance has the dimension of

A. length

B. time

C. mass

D. no dimension

Answer: B

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23. The frequency of vibration of string is given by $v = \frac{p}{2l}\left[\frac{F}{m}\right]^{1/2}$. Here p is number of segments in the

string and l is the length. The dimensional formula for m will be

A. $\left[\mathrm{M}^{0}\mathrm{LT}^{-1}\right]$

B. $\left[\mathrm{ML}^{0}\mathrm{T}^{-1}\right]$

C. $\left[\mathrm{ML}^{-1}\mathrm{T}^{0}\right]$

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

Answer: C

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24. 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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25. 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. $1.6048 \ \mathrm{g} \ \mathrm{cm}^{-3}$

B. $1.69 \ \mathrm{g} \ \mathrm{cm}^{-3}$

C. $1.7 \ \mathrm{g} \ \mathrm{cm}^{-3}$

D. $1.695 \ \mathrm{g} \ \mathrm{cm}^{-3}$

Answer: C

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26. 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. $164 \pm 3 \ \mathrm{cm}^2$

B. $163.62 \pm 2.6 \ \mathrm{cm}^2$

C. $163.6 \pm 2.6 \quad \mathrm{cm}^2$

D. $163.62 \pm 3 \quad \mathrm{cm}^2$

Answer: A

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27. 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 mementum

Answer: C

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28. 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 ± 0.08) m

B.

C. (0.25 ± 0.5) m

D. (0.25 ± 0.05) m

Answer: A

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29. Which of the following measurement is most precise?

A. 5.00 mm

B. 5.00 cm

C. 5.00 m

D. 5.00 km

Answer: A

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

A. 4.9 cm

B. 4.805 cm

C. 5.25 cm

D. 5.4 cm

Answer: A

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31. 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

$\left(1N = 10^5 dyne, 1m^2 = 10^4 cm^2\right)$

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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32. If the energy (E) ,velocity (v) and force (F) be taken as fundamental quantities,then the dimension of mass will be

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

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

C. $\left[\mathrm{Ev}^{-2}\right]$

D. $\left[\mathrm{Ev}^{2}\right]$

Answer: C

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33. If "force" F, "length" L and "time T" are taken as fundamental units , the dimensional formula of mass will be

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

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

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

D. $\left[\mathrm{FL}^{5}\mathrm{T}^{2}\right]$

Answer: A

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34. From the dimensional consideration, which of the following equation is correct

A. $T = 2\pi\sqrt{\frac{R^3}{GM}}$

B. $T = 2\pi\sqrt{\frac{GM}{R^3}}$

C. $T = 2\pi\sqrt{\frac{GM}{R^2}}$

D. $T = 2\pi\sqrt{\frac{R^2}{GM}}$

Answer: A

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35. If voltage $V = (100 \pm 5)$ V and current $I = (10 \pm 0.2)$ A, the percentage error in resistance R is

A. 5.2%

B. 0.25

C. 0.07

D. 0.1

Answer: C

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36. A wire has a mass $(0.3 \pm 0.003)g$, radius $(0.5 \pm 0.005)mm$ and length $(6 \pm 0.06)cm$. 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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37. If $x = 10.0 \pm 0.1$ and $y = 10.0 \pm 0.1$, then 2x-2y is equal to

A. (0.0 ± 0.1)

B. Zero

C. (0.0 ± 0.4)

D. (20 ± 0.2)

Answer: C

Watch Video Solution

38. The dimensional formula for molar thermal capacity is same as that of

A. gas constant

B. specific heat

C. Boltzmann's constant

D. Stefan's constant

Answer: A

Watch Video Solution

39. Dimensions of ohm are same as that of (where h is Planck's constant and e is charge)

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

C. $\left[L^3\right]$

D. $\left[L^6\right]$

Answer: A

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41. Using mass (M), length (L), time (T) and current (A) as fundamental quantities, the dimensions of permeability are :

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

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

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

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

Answer: C

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42. Let g be the acceleration due to gravity at the earth's surface and K the rotational kinetic energy of the earth. Suppose the earth's radius decreases by 2%. Keeping all other quantities constant, then

A. g increases by 2% and K increases by 2%

B. g increases by 4% and K increases by 4%

C. g increases by 4% and K increases by 2%

D. g increases by 2% and K increases by 4%

Answer: B

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43. In a system of units, the units of mass, length and time are 1 quintal, 1 km and 1h, respectively. In this system 1 N force will be equal to

A. 1 new unit

B. 129.6 new unit

C. 427.6 new unit

D. 60 new unit

Answer: B

View Text Solution

44. Given that $\int \frac{dx}{\sqrt{2ax - x^2}} = a^n \sin^{-1}\left(\frac{x-a}{a}\right)$ where a is a constant. Using dimensional analysis. The value of n is

A. 1

B. Zero

C. -1

D. None of these

Answer: B

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45. If momentum of an object is increased by 10%, then is kinetic energy will increase by

A. 0.2

B. 0.21

C. 0.4

D. 0.19

Answer: B

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46. The magnetic force on a point moving charge is $F = q(v \times B)$.

Here $q =$ electric charge

$v =$ velocity of the point charge

$B =$ magnetic field

The dimensions of B is

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

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

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

D. None of these

Answer: C

Watch Video Solution

47. A capillary tube is attached horizontally to a constant pressure head arrangement. If the radius of the capillary tube is increased by $10\,\%$, then the rate of flow of the liquid shall change nearly by

A. $+10\,\%$

B. $+46\,\%$

C. $-10\,\%$

D. $-40\,\%$

Answer: B

Watch Video Solution

48. By what percentage should the pressure of a given mass of a gas be increased so as to decrease its volume by 10% at a constant temperature?

A. 0.05

B. 7.2%

C. 12.5%

D. 11.1%

Answer: D

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49. In measuring electric energy, 1 kWh is equal to

A. 3.6×10^4 J

B. 3.6×10^6 J

C. 7.3×10^6 J

D. None of these

Answer: B

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

A. resistance

B. charge

C. voltage

D. current

Answer: D

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51. The length of a strip measured with a meter rod is $10.0cm$. Its width measured with a vernier callipers is $1.00cm$. The least count of the meter rod is $0.1cm$ and that of vernier callipers is $0.01cm$. What will be the error in its area?

A. $\pm 13\ \%$

B. $\pm 7\ \%$

C. $\pm 4\ \%$

D. $\pm 2\ \%$

Answer: D

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52. The length of a cylinder is measured with a meter rod having least count 0.1 cm. Its diameter is measured with vernier calipers having least count 0.01 cm. Given that length is 5.0 cm. and radius is 2.0 cm. The percentage error in the calculated value of the volume will be

A. 0.015

B. 0.025

C. 0.035

D. 0.04

Answer: B

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53. The length of a uniform rod is 100.0 cm. If length is measured with a meter rod having least count 1 mm and radius is measured with vernier callipers having least count 0.1 mm, the percentage error in calculated volume of cylinder is

A. 0.021

B. 0.03

C. 0.0201

D. 0.032

Answer: A

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54. 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. $1.4\text{m} \pm 0.4\text{m}$

B. $1.41\text{m} \pm 0.15\text{m}$

C. $1.4\text{m} \pm 0.3\text{m}$

D. $1.4\text{m} \pm 0.2\text{m}$

Answer: D

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

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

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

C. $\left[\mathrm{p\,A}^{-1/2}\mathrm{T}\right]$

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

Answer: D

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56. If E = energy , G= gravitational constant, I=impulse and M=mass, then dimensions of $\frac{GIM^2}{E^2}$ are same as that of

A. time

B. mass

C. length

D. force

Answer: A

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

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

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

C. $\left[\mathrm{ML}^0\mathrm{T}^{-1}\right]$

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

Answer: A

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

A. angle

B. length

C. mass

D. None of these

Answer: D

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59. A uniform wire of length L, diameter D and density ρ is stretched under a tension T. The correct relation between its fundamental frequency f, the length L and the diameter D is

A. $f \propto \frac{1}{LD}$

B. $f \propto \frac{1}{L\sqrt{D}}$

C. $f \propto \frac{1}{D^2}$

D. $f \propto \frac{1}{LD^2}$

Answer: A

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60. 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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61. A gas bubble from an explosion under water oscillates with a period T proportional to $P^a d^b E^c$, where P is the pressure, d is density of water and E is the total energy of the explosion. Find the value of a,b and c`.

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

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

C. $a = \frac{5}{6}, b = \frac{1}{2}, c = \frac{1}{3}$

D. $a = -\frac{5}{6}, b = \frac{1}{2}, c = \frac{1}{3}$

Answer: D

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Assertion And Reason

1. Assertion : Method of dimension cannot be used for deriving formulae containing trigonometrical ratios.

Reason: This is because trigonometrical ratios have no dimensions.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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2. 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 correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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3. 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 correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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4. Assertion : Pressure has the dimensions of energy density.

Reason : Energy density = $\frac{\text{energy}}{\text{volume}} = \frac{\left[ML^2T^{-2}\right]}{\left[L^3\right]}$

$= \left[ML^{-1}T^{-2}\right] = \text{pressure}$

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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5. 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 correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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6. 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 Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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7. Assertion : The light year and wavelength consist of dimensions of length.

Reason : Both light year and wavelength represent time.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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8. 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 correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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9. Assertion : A screw gauge having a smaller value of pitch has greater accuracy.

Reason : The least count of screw gauge is directly proportional to the number of divisions on circular scale.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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10. 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 correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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11. Assertion : If $x = \frac{a^n}{b^m}$ the $\frac{\Delta x}{x} = n\left(\frac{\pm \Delta a}{a}\right) - m\left(\frac{\pm \Delta b}{b}\right)$

The change in a or b i.e., Δa or Δb may be comparable to a and b.

Reason : The above relation is valid when $\Delta a << a$ and $\Delta b << b$.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

12. Assertion : Systematic errors and random errors fall in the same group of errors.

Reason : Both systematic and random errors are based on the cause of error.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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13. Assertion : Absolute error may be negative or positive.

Reason : Absolute error is the difference between the real value and the measured value of a physical quantity.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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14. Assertion :

$$\sqrt{\frac{\text{Magnetic dipole moment} \times \text{moment induction}}{\text{Moment of inertia}}}$$

Dimensional formula $\left[M^0L^0T\right]$

Reason : The given dimension is that of frequency.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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15. Assertion : $\sqrt{\frac{\text{Modulus of elasticity}}{\text{Density}}}$ has the unit ms^{-1}.

Reason : Acceleration has the dimensions of $\frac{1}{\left(\sqrt{\varepsilon_0 \mu_0}\right) t}$.

A. If both Assertion and Reason are correct and Reason is the correct explaination of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explaination 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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Match The Column

1.

	Column I		Column II
(A)	R/L	(p)	Time
(B)	C/R	(q)	Frequency
(C)	E/B	(r)	Speed
(D)	$\sqrt{\varepsilon_0 \mu_0}$	(s)	None

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2.

	Column I		Column II
(A)	Stress	(p)	Pressure
(B)	Strain	(q)	Energy density
(C)	Modulus of elasticity	(r)	Angle
(D)	Torque	(s)	Energy

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3.

	Column I		Column II
(A)	Work	(p)	$\left[\mathrm{A}^{1/2}\mathrm{T}^{-1}\right]$
(B)	Moment of inertia	(q)	$\left[\mathrm{FA}^{1/2}\right]$
(C)	Velocity	(r)	$\left[\mathrm{FA}^{1/2}\mathrm{T}^{2}\right]$

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4.

	Column I		Column II
(A)	Electrical resistance	(p)	$\left[\mathrm{M}^{-1}\mathrm{L}^{-2}\mathrm{T}^{4}\mathrm{A}^{2}\right]$
(B)	Capacitance	(q)	$\left[\mathrm{ML}^{2}\mathrm{T}^{-2}\mathrm{A}^{-2}\right]$
(C)	Magnetic field	(r)	$\left[\mathrm{ML}^{2}\mathrm{T}^{-3}\mathrm{A}^{-2}\right]$
(D)	Inductance	(s)	$\left[\mathrm{MT}^{-2}\mathrm{A}^{-1}\right]$

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5.

	Column I		Column II
(A)	GM_eM_s	(p)	$\left[M^2L^2T^{-3}\right]$
(B)	$\frac{3RT}{M}$	(q)	$\left[ML^3T^{-2}\right]$
(C)	$\frac{F^2}{q^2}B^2$	(r)	$\left[L^2T^{-2}\right]$
(D)	$G\frac{M_e}{R_e}$	(s)	None

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6.

A.	Spring constant	1.	$\left[M^1L^2T^{-2}\right]$
B.	Pascal	2.	$\left[M^0L^0T^{-1}\right]$
C	Hertz	3.	$\left[M^1L^0T^{-2}\right]$
D.	Joule	4.	$\left[M^1L^{-1}T^{-2}\right]$

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1. Force F is given in terms of time t and distance x by $F = A\sin Ct + B\cos Dx$. Then the dimensions of A/B and C/D are

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

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

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

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

Answer: A

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2. The scalar quantity among the following is

A. weight of body

B. temperature gradient

C. TENSION

D. ELECTRIC POTENTINAL

Answer: D

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3. The wrong units conversion among the following is

A. 1 angstorm = 10^{-10} m

B. 1 fermi = 10^{-15} m

C. 1 light year = 9.46 $\times$ 10^{15} m

D. 1 astronomical unit = 1.496 $\times$ 10^{-11} m

Answer: D

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4. The mass of the liquid flowing per second per unit area of cross-section of the tube is proportional to (pressure difference across the ends)^(n) and (average velocity of the liquid)^(m) . Which of the following relations between m and n is correct?

A. $m = n$

B. $m = -n$

C. $m^2 = n$

D. $m = -n^2$

Answer: B

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5. The ratio of the dimensions of Planck's constant and that of moment of inertia has the dimensions of

A. angular momentum

B. time

C. velocity

D. frequency

Answer: D

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6. In terms of basic units of mass (M), length (L), time (T), and charge (Q), the dimensions of magnetic permeability of vacuum (μ_0) would be

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

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

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

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

Answer: A

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7. The dimensional formula of electric flux is

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

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

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

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

Answer: A

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

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

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

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

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

Answer: C

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9. Match the following two columns.

	Column I		Column II
A.	Electrical resistance	1.	$\left[ML^3T^{-3}A^{-2}\right]$
B.	Electrical potential	2.	$\left[ML^2T^{-3}A^{-2}\right]$
C.	Specific resistance	3.	$\left[ML^2T^{-3}A^{-1}\right]$
D.	Specific conductance	4.	None

A. A-2, B-3, C-1, D-4

B. A-2, B-4, C-3, D-1

C. A-1, B-2, C-4, D-3

D. A-1, B-3, C-2, D-4

Answer: A

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10. The unit of three physical quantities x, y and z are gcm^2s^{-5}, gs^{-1} and cms^{-2} respectively. The relation between x, y and z is

A. $x = yz^2$

B. $x = y^2z$

C. $y^2 = xz$

D. $z = x^2y$

Answer: A

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11. The unit of universal gas constant is

A. watt/K

B. $\text{dyne}/^{\circ}\text{C}$

C. erg/K

D. $\text{newton}/^{\circ}\text{R}$

Answer: C

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12. Unit of emf is

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

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

C. $\dfrac{\text{henry-ampere}}{\text{second}}$

D. joule/coulomb

Answer: C

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13. The dimensional formula for Reynold's number is

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

B. $[LMT]$

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

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

Answer: A

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

The dimension of x is

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

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

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

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

Answer: A

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15. In which of the following pairs, the two physical quantities have different dimensions?

A. Planck's constant and angular momentum

B. Impulse and linear momentum

C. Moment of inertia and moment of a force

D. Energy and torque

Answer: C

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16. 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. $b - a$

B. $a \neq b$

C. $a + b$

D. $a - b$

Answer: C

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

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

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

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

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

Answer: D

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18. If the unit of force is 1 kN, unit of length 1 km and unit of time is 100s, what will be the unit of mass?

A. 1000 kg

B. 1 kg

C. 10000 kg

D. 100 kg

Answer: C

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19. The dimensional formula of magnetic flux density is :

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

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

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

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

Answer: A

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20. The dimensional formula for electric field is

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

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

C. $\left[MLT^{-3}A^{-1}\right]$

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

Answer: C

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21. The quantity $[(nh)/(2\pi qB)]^{1/2}$ where n is a positive integer, h is Planck's constant q is charge and B is magnetic field has the dimensions of

A. area

B. length

C. speed

D. acceleration

Answer: A

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22. 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. 0.14

B. 0.1

C. 0.07

D. 0.04

Answer: A

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23. Which of the following physical quantity unit is not a fundamental unit?

A. Length

B. Mass

C. Magnetic field

D. current

Answer: C

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24. The dimensional formula for rate of doing work is

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

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

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

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

Answer: A

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25. The density of glass is $2.8\,\mathrm{gram/cc}$ in CGS system. The value of density in SI unit is

A. 2.8×10^{-3}

B. 2.8×10^{-2}

C. 2.8×10^{2}

D. 2.8×10^{6}

Answer: A

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26. The dimensional formula of electric potential is

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

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

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

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

Answer: A

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27. In the equation $\left(\frac{1}{p\beta}\right) = \frac{y}{k_BT}$, where p is the pressure, y is the distance, k_B is Boltzmann constant and

T is the tempreture. Dimensions of β are

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

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

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

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

Answer: B

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28. Which one of the following is not correct?

A. Dimension formula of thermal conductivity (K) is

$\left[\mathrm{M}^{1}\mathrm{L}^{1}\mathrm{T}^{-3}\mathrm{K}^{-1}\right]$

B. Dimension formula of potential (V) is $\left[\mathrm{M}^{1}\mathrm{L}^{2}\mathrm{T}^{3}\mathrm{A}^{-1}\right]$

C. Dimension formula of permeability of free space (μ_0) is $\left[\mathrm{M}^{1}\mathrm{L}^{1}\mathrm{T}^{-2}\mathrm{A}^{-2}\right]$

D. Dimensional formula of RC is $\left[\mathrm{M}^{0}\mathrm{L}^{0}\mathrm{T}^{-1}\right]$

Answer: B

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29. A physical quantity X is defined by the formula

$$X = \frac{IFv^2}{WL^3}$$

where I is moment of inertia, F is force, v is velocity, W is work and L is length, the dimensions of X are

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

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

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

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

Answer: B

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30. 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. 0.08

B. 0.1

C. 0.12

D. None of these

Answer: D

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

A. pressure

B. latent heat

C. work

D. None of these

Answer: B

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32. A physical quantity is given by $X = M^a L^b T^c$. The percentage error in measurement of M, L and T are α, β and γ respectively. Then maximum percentage error in the quantity X is

A. $a \quad \alpha + b \quad \beta + c \quad \gamma$

B. $a \quad \alpha + b \quad \beta - c \quad \gamma$

C. $\frac{a}{\alpha} + \frac{b}{\beta} + \frac{c}{\gamma}$

D. None of these

Answer: A

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