



PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MEASUREMENTS

Example

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

A. $31fts^{-2}$

B. 32fts^2

C. 31fts^{-2}

D. 32fts^2

Answer: B



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2. The wavelength of a light is of the order of 6400\AA .

Express this in micron and metre.

A. 0.64 micron

B. 0.84 micron

C. 0.24 micron

D. 0.34 micron

Answer: A



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3. Calculate the angle of 1" (second of arc or arc sec) in radian. (Use $360^\circ = 2\pi$ rad, $1^\circ = 60'$ and $1' = 60''$)

A. 4.85×10^{-6} rad

B. 4.85×10^6 rad

C. 4.85×10^5 rad

D. 4.85×10^{-5} rad

Answer: A



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4. IF C and denote capacitance and resistance, then find the dimesion of CR

A. $\frac{\text{ampere}^2 - \text{sec}}{\text{Kg} - \text{metre}^2 / \text{sec}^2}$

B. $\frac{\text{ampere-sec}^2}{\text{Kg-metre/sec}}$

C. $\frac{\text{ampere}^2 - \text{sec}^2}{\text{Kg-metre}^2 / \text{sec}^2}$

D. $\frac{\text{ampere}^2 - \text{sec}^2}{\text{Kg-metre}^2 \text{sec}^2}$

Answer: C



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5. 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

- A. Right
- B. Wrong
- C. Information incomplete
- D. None of these

Answer: A



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6. 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 .

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

B. $[LT], [T]$

C. $[L], [L]$

D. $[T], [T]$

Answer: A



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7. 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 .

A. 6.67×10^8

B. 6.67×10^{-8}

C. 5.67×10^{-8}

D. 5.67×10^8

Answer: B



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8. 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.

A. $f = \frac{mv}{r}$

B. $F = \frac{(mv)^2}{r}$

C. $F = \frac{(mv)^2}{(r)^2}$

D. None of these

Answer: B



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9. How many significant figures are there in the measured values.

(i) $227.2g$,

(ii) $3600g$

(iii) $0.00602g$

(iv) $250 \times 10^{10}g$

A. 4, 2, 3, 3

B. 3, 4, 3, 2

C. 4, 2, 5, 2

D. 3, 2, 2, 1

Answer: A



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

A. 4cm^3

B. 0.14cm^3

C. 0.14cm^3

D. 0.001cm^3

Answer: B



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

A. 4.8cm^{-3}

B. 4.2cm^{-3}

C. 4.1cm^{-3}

D. 4.5cm^{-3}

Answer: A



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12. Round off the following numbers upto three significant figures.

(i)2.520 , (ii)4.645 , (iii)22.78 , (iv)36.25

A. 2. $\sqrt{2}$, 4.65, 22.7, 36.3

B. 2. $\sqrt{2}$, 4.64, 22.8, 36.4

C. 2.50, 4.64, 22.7, 36.3

D. None of the above

Answer: B



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

A. 12

B. 11

C. 13

D. None of these

Answer: B



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14. 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 error in each observation and the percentage error.

A. $(2.48 \pm 0.01)m$, 0.40 %

B. $(3.48 \pm 0.02)m$, 0.45 %

C. $(2.48 \pm 0.01)m$, 0.45 %

D. $(3.48 \pm 0.02)m$, 0.45 %

Answer: A



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15. The volumes of two bodies are measured to be

$$V_1 = (10.2 \pm 0.02)cm^3 \text{ and } V_2 = (6.4 \pm 0.01)cm^3.$$

Calculate sum and difference in volumes with error limits.

A. $(16.6 \pm 0.03)(3.8 \pm 0.03)$

B. $(0.03 \pm 3.8)(0.03 \pm 16.6)$

C. $(16.6 \pm 3.8)(16.6 \pm 0.03)$

D. $(3.8 \pm 0.05)(16.6 \pm 0.03)$

Answer: A



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16. Calculate focal length of a spherical mirror from the following observations : object distance,

$u = (50.1 \pm 0.5) \text{ cm}$ and image distance ,

$v = (20.1 \pm 0.2) \text{ cm}$.

A. (0.04 ± 14.3)

B. (14.3 ± 0.4)

C. (14.3 ± 0.04)

D. None of these

Answer: B



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17. 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 $\pm 2\%$.

A. $\pm 1.05\%$

B. $\pm 1.15\%$

C. $\pm 1.5\%$

D. $\pm 0.05\%$

Answer: C



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Practice Exercise Exercise 1

1. In the SI system, unit of temperature is

A. degree centigrade

B. Kelvin

C. degree celsius

D. degree Fahrenheit

Answer: B



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2. Joule-second is the unit of

A. energy

B. momentum

C. angular momentum

D. power

Answer: C



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

A. 0.625

B. 0.0625

C. 0.00625

D. 625

Answer: D



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4. Which of the following pairs has the same unit?

A. Wavelength and Rydberg constant

B. Relative velocity and relative density

C. Thermal capacity and Boltzmann constant

D. Time period and acceleration gradient

Answer: C



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5. The wrong unit conversation among the following is

A. $1 \text{ angstrom} = 10^{-10} \text{ m}$

B. $1 \text{ fermi} = 10^{-15}$

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

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

Answer: D



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6. The dimensions of surface tension are

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

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

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

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

Answer: C



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7. 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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8. Which of the following is a dimension constant?

A. poisson's ratio

B. refractive index

C. Relative density

D. Gravitational constant

Answer: D



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

- A. Planck's constant
- B. Dielectric constant
- C. Solid angle
- D. Strain

Answer: A



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10. Which one of the following have same dimensions?

A. Torque and force

B. potential energy and force

C. Torque and potential energy

D. Planck's constant and linear momentum

Answer: C



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

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

B. $[ML^0 T]$

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

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

Answer: A



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

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

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

C. $[MT^{-1}]$

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

Answer: D



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13. 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 same as that of q

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

Answer: D



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

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

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

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

Answer: B



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15. 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. $[T^{-2}]$

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

C. $[T]$

D. $[LT]$

Answer: C



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16. 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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17. The dimensions of $\frac{1}{2} \epsilon_0 E^2$ (ϵ_0 : permittivity of free space, E: electric field) is-

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

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

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

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

Answer: B



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18. If P represents radiation pressure, c represents the speed of light and q represents the radiation energy per unit area per second, then calculate non - zero integres such that $p^x q^y c^z$ is dimensionless.

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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19. The units of length, velocity and force are doubled. Which of the following is the correct change in the 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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20. 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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21. 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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22. 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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23. In which of the following numerical values, all zeros are significant?

A. 0.2020

B. 20.0

C. 2020

D. None of these

Answer: B



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24. 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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25. 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: D



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

A. $0.0855m^3$

B. $0.086m^3$

C. $0.08556m^3$

D. $0.08m^3$

Answer: A



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27. 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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28. 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. 0.08

C. 0.0804

D. 0.080384

Answer: B



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29. Which of the following measurement is most precise?

A. 5.00 mm

B. 5.00cm

C. 5.00m

D. 5.00km

Answer: A



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

A. 4.9cm

B. 4.805cm

C. 5.25cm

D. 5.4cm

Answer: A



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31. 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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32. 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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33. 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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34. 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 measurement 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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35. 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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36. 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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37. 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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38. 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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39. 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



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40. The length of a strip measured with a meter rod is 10.0cm. Its width measured with a venier calipers is 1.00cm. The least count of the meter rod is 0.1 cm and

that of vernier calipers 0.01cm. What will be error in its area?

A. $\pm 13\%$

B. $\pm 7\%$

C. $\pm 4\%$

D. $\pm 2\%$

Answer: D



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41. 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. 1.5 %
- B. 2.55
- C. 3.5 %
- D. 4 %

Answer: B



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42. 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. $a \alpha + \eta + c\gamma$

B. $a \alpha + \eta + c\gamma$

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

D. None of these

Answer: A



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Exercise 2 Miscellaneous Problems

1. If dimensions of A and B are different, then which of the following operation 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. none

Answer: C



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

A. potential

B. current

C. forced

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

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

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

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

Answer: A



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7. 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. $[Fv^1T^{-1}]$

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

Answer: D



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8. 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. 1000kg

B. 1kg

C. 10000kg

D. 100kg

Answer: C



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

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

B. $[p^2AT]$

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

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

Answer: D



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

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

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

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

D. $[FL^5T^2]$

Answer: A

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12. From the dimensional consideration, which of the following equations is correct?

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

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

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

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

Answer: A

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

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

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

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

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

Answer: B



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14. If the error involved in the measurement of mass and length of one side of a cube are 4% and 3% respectively. What is the maximum permissible relative error in calculation of density of material of the cube?

A. 0.12

B. 0.13

C. 0.14

D. 0.15

Answer: B



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15. the length , breadth and height of a rectangular block of wood wre measured to be :

$$l = 12.13 \pm 0.02\text{cm}, b = 8.16 \pm .01\text{cm}, h = 3.46 \pm 0.01\text{cm}$$

Determine the percentage error in the volume of the block .

A. 0.0016

B. 0.0012

C. 0.0028

D. 0.0058

Answer: D



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16. A physical quantity X is given by

$$X = \frac{2k^3l^2}{m\sqrt{n}}$$

The percentage error in the measurement of K,l,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: C



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

A. 1.9×10^{10}

B. 1.9×10^{11}

C. 1.9×10^{12}

D. 1.9×10^{13}

Answer: C



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