PHYSICS

BOOKS - DHANPAT RAI & CO PHYSICS (HINGLISH)

Units and Measurements

Example

1. Explain the need for measurement in physics.

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2. What are physical quantities? Distinguish between fundamental and derived quantities.

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3. What is meant by the term measurement of a physical quantity? How is the result of measurement of a physcial quantity expressed?

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4. What is a physical unit? Write the essential requirments that a physical unit/standard must meet.

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5. Although the number of physical quantities which we measure is very large, yet we do not need a very large number of units for this measurement. Why?

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6. What are fundamental and derived units? Give some examples.

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7. SYSTEM OF UNITS

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8. Name and define all the basic and supplementary units of SI.

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9. what is a coherent system of units?

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10. State advantages of SI over other systems of units.

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11. State the rules that are followed in writing SI units in symbolic form.

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12. Make a list of various prefixes used for powers of 10. Give some examples.

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13. Make a list of some commonly used practical units. How these units are related to SI units?

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14. How make light years are there in one metre?

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15. What is the number of electrons that would weight 1 kg? Mass of an electron is $9.11 \times 10^{-31} kg$.

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16. The radius of gold nucleus is 41.3. fermi. Express its volume in m^3

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17. Convert an acceleration of $2kmh^{-2}$ into cms^{-2}

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18. The Young's modulus of steel is $1.9 \times 10^{11} Nm^{-2}$. Calculate its value in dyne cm^{-2}.

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19. The density of a material is $0.8 g cm^{-3}$. Express it in SI units.

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20. How many amu would make up 1 kg?

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21. Express the average distance of the earth from the sun in light year.

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22. Express the average distance of the earth from the sun in parsec.

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23. The magnitude of any physical quantity

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24. Write the order of magnitude of the following measurements:

(i) 25,710,000 m

(ii) 0. 00000521 kg

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25. Write the order of magnitude of the following measurements:

(i) 25,710,000 m

(ii) 0. 00000521 kg

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26. Express 1 light year in terms of metre. What is its order of magnitude?

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27. Define length. Name the device used for measuring directly the lengths from $10^{-3}m$ to $10^{2}m$.

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28. Define length. Name the device used for measuring directly the lengths to an accuracy of $10^{-4}m$.

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29. Define length. Name the device used for measuring directly the lengths to an accuracy of $10^{-5}m$.

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30. INDIRECT METHOD

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31. Describe a method to measure the height of an inaccessible object like a mountain.

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32. How will measure the diameter of the Moon using parallax method?

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

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34. Where do superior and inferior vena cava open into?

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35. Describe a method to measure the diameter of the moon or any planet.

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36. Describe a method to measure distance of a hill.

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

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

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39. How is a sonar used in finding the depth of the sea-bed?

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

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41. Calculate the angle of

(ii) 1' (minute of arc or arc min) in radians.

Use $360^\circ = 2\pi$ rad, $1^\circ = 60'$ and $1' = 60''$

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

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43. The shadow of a tower standing on a level plane is found to be 50m longer when sun's altitude is 30° then when it is 60°. Find the height of tower.

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

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

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46. Assuming that the orbit of the planet Mercury around the sun to be a circle, Copernicus detrmined the orbital radius to be $0.38AU$. From this determine the angle of maximum elongation for Mercury and its distance from the earth when the elongation is maximum .

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47. In case of venus, the angle of maximum elongation is found to be approximately 47°. Determine the distance between venus and sun $(r_{ve}$. and the distance between venus and earth $(r_{ve}$.

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48. Suppose there existed a planet that went around the sun twice as fast as the earth. What would by its orbital size?

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49. The radius of a muonic hydrogen atom is $2.5 \times 10^{-13} m$. What is the total atomic volume in m^3 of a mole of such hydrogen atom.

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50. A drop of olive oil of radius 0.25 mm spreads into a circular film of radius 5 cm on the water surface. Estimate the molecular size of the olive oil

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

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52. A 35 mm wide slide with 24 mm $\times$ 36 mm picture is projected ona screen placed 12 cm from the slide. The image of the slide picture on the screen measures $1.0m \times 1.5m$. What is the linear magnification of the arrangement ?

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53. Define weight . State its SI and CGs units .

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54. Distinguish between mass and weight.

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55. COMPARISION OF INERTIAL MASS AND GRAVITATIONAL MASS

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56. Assertion: The ratio of intertial mass to gravitational mass is equal to one.

Reason: The inertial mass and gravitational mass of a body are equivalent.

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57. Assertion: The ratio of intertial mass to gravitational mass is equal to one.

Reason: The inertial mass and gravitational mass of a body are equivalent.

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58. How can a spring balance be used to emasure the gravitational mass of a body?

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59. Consider a white dwarf and a neutron star each of one solar mass. The radius of the white dwarf is same as that of the earth (=6400km) and the radius of the neutron star is 10 km. Determine the densities of the two types of the stars. Take mass of the sun $= 2.0 \times 10^{30}$kg.

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60. Assume that trhe mass of the nucleus is given by M=Am_p, where A in the mass number and radius of a nuclear r=$r_0 A^{1/3}$, where r_0=1.2 f. Estimate the density of the nuclear matter in kg m^{-3}. Given $m_p = 1.67 \times 10^{-27}$kg.

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61. What do you mean by seven dimensions of the world?

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62. What do you mean by dimensions of a physical quantity? Explain with the help of an example.

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63. What is meant by dimensional formula and dimensional equation? Give examples.

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64. Name the physical quantities whose dimensional formulae are as follows: ML^2T^{-2}.

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65. Name the physical quantities whose dimensional formulae are as follows:ML^2T^{-3}

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66. Name the physical quantities whose dimensional formulae are as follows: MT^{-2}

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67. Name the physical quantites whose dimensional formula are as follows:

(i) $ML^2T^{-2}(ii)ML^2T^{-3}(iii)MT^{-2}(iv)ML^{-1}T^{-1}(v)ML^{-1}T^{-2}$,

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68. Name the physical quantites whose dimensional formula are as follows:

(i) $ML^2T^{-2}(ii)ML^2T^{-3}(iii)MT^{-2}(iv)ML^{-1}T^{-1}(v)ML^{-1}T^{-2}$,

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69. Deduce the dimensional formulae for the following physical quantities: Gravitational constant

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70. Deduce the dimensional formulae for the following physical quantities: Power

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71. Deduce the dimensional formulae for the following physical quantities: Young's modulus

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72. Deduce the dimensional formulae for the following physical quantities: Coefficeint of viscosity

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73. Deduce the dimensional formulae for the following physical quantities: Surface tension

Watch Video Solution

74. Deduce the dimensional formulae for the following physical quantities: Plank's constant.

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75. Deduce the dimensional formulae of the following physical quantities.

(i) Heat

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76. Deduce the dimensional formulae of the following physical quantities.

(ii) specific heat

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77. Deduce the dimensional formulae of the following physical quantities.

(iii) latent heat

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78. Deduce the dimensional formulae of the following physical quantities.

(iv) gas constant

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79. Deduce the dimensional formulae for the following physical quantities: Boltzmann's constant

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80. Deduce the dimensional formulae for the following physical quantities: Coefficient of thermal conductivity

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81. Deduce the dimensional formulae for the following physical quantities: Mechanical equivalent of heat.

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82. Find the dimensional formulae of charge.

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83. Find the dimensional formulae of potential.

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84. Find the dimensional formulae of resistance.

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85. Dimensional formula of capacitance is

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86. Taking velocity , time and force as the fundamental quantities , find the dimension of mass .

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87. If density (D), acceleration due to gravity (g) and frequency (v) are taken as base quantities , find the dimensions of force.

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88. If the velocity of light denoted by 'c', acceleration due to gravity 'g' and atmospheric pressure 'p' are taken as fundamental units, then the dimensional formula of length will be :

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89. 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.

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90. How can we classify variables and constants on the basis of dimensions? Give examples of each type.

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91. APPLICATION OF DIMENSIONAL ANALYSIS

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92. How can a physical quantity be converted for one system of units to another? Explain it with the help of a suitable example.

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93. Convert an energy of 1 joule into ergs.

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

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95. Find the value of 60 J per min on a system that has 100g, cm and 1 min. as the base units.

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96. The value of Stefan's constant is $\sigma = 5.76 \times 10^{-8} Js^{-1} m^{-2} K^{-4}$. Find its value in cgs system.

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97. Using the principle of homogeneity of dimensions, which of the following is correct?

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98. How can we check the dimensional correctness of a physical equation? Explain it with a suitable example.

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99. 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.

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100. Check the correctness of the equation,

$$FS = \frac{1}{2}mv^2 - \frac{1}{2}\mu^2$$

where F is the force acting on a body of mass m and S is the distacne moved by the body when its velocity changes from u to v.

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101. Check the correctness of the relation $\pi = I\alpha$ whare π is torque acting on the body, I is moment of inertia and α is angular acceleration.

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102. Check the dimensional consistency of the equation, force = $\frac{(\text{Change in Momentum})}{\text{Time}}$

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103. Check the dimensional consistency of the following equations.

(ii) Escape velocity, $v = \sqrt{\frac{2GM}{R}}$

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104. Check by the method of dimension whether the following equations are correct: $E = mc^2$.

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105. Check whether the following equations are quadratic or not.

$7x = 2x^2$

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106. Check by the method of dimensions whether the following relations are true.

(i)$t = 2\pi\sqrt{\frac{l}{g}}$, (ii)$v = \sqrt{\frac{P}{D}}$ where v= velocity of sound P=pressure D=density of medium .

(iii)$n = \frac{1}{2l} = \sqrt{\frac{F}{m}}$ where n= frequency of vibration l=length of the string, F=stretching force m=mass per unit length of the string .

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107. Check the accuracy of the relation $v = \frac{1}{2l} sqert\left(\frac{T}{m}\right)$,where v is the frequency, l is legth, T is tension and m is mass per unit legth of the string.

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108. By the method of dimensions, test the accuracy of the equation : $\delta = \frac{mgl^3}{4bd^3Y}$ where δ is depression in the middle of a bar of length l, breadth b, depth d, when it is loaded in the middle with mass m. Y is Young's modulus of material of the bar.

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

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110. 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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111. In Vander Wall's equation $\left(P + \frac{a}{V^2}\right)(V - b) = RT$ What are the dimensions of a and b ? Here, P is pressure, V is volume, T is temperature and R is gas constant.

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112. When white light travels through glass, the refractive index of glass (μ=velocity of light in air/velocity of light in glass) is found to vary with wavelength as $\mu = A + \frac{B}{\lambda^2}$. Using the principle of homogeneity of dimensions, Find the SI units in which the constants A and B expressed.

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113. In the equation y= a sin (ωt+ kx) where t and x stand for time and distance respectively. What are the dimensions of ω/k?

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114. Rule out or accept the following formulae for kinetic energy on the basis of diemensional arguments: $\left(\frac{3}{16}\right)mv^2$

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115. Rule out or accept the following formulae for kinetic energy on the basis of diemensional arguments: $\left(\frac{1}{2}\right)mv^2 + ma$

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116. Consider a simple pendulum having a bob attached to a string that oscillates under the action of a force of gracity. Suppose that the period of oscillation of the simple pendulum depends on its length (I), mass of the bob (m) and acc. Due to gravity (g). Derive the expression for its time period using method of dimensions.

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117. The velocity of water wave v may depend on their wavelength λ, the density of water ρ and the acceleration due to gravity g. The method of dimensions gives the relation between these quantities as

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118. Assuming that the largest mass that can be moved by a flowing river depends on the velocity of flow, density of river water and acceleration due to gravity , show that the mass varies as the sixth power of velocity of flow.

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119. The velocity of sound waves 'v' through a medium may be assumed to depend on :

(i) the density of the medium 'd' and (ii) the modulus of elasticity 'E' .

Deduce by the method of dimensions the formula for the velocity of sound . Take dimensional constant K=1.

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120. The frequency of vibration (v) of a string may depend upon length (I) of the string, tension (T) in the string and mass per unit length (m) of the

string. Using the method of dimensions, derive the formula for v.

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121. A planet moves around the sun in nearly circular orbit. Its period of revolution 'T' depends upon :

(i) radius 'r' or orbit (ii) mass 'M' of the sum and

(iii) the gravitational constant G.

Show dimensionally that $T^2 \propto r^2$.

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122. Reynold number N_R a dimensionless quantity determines the condition of laminar flow of a viscous liquied through a pipe. N_R is a function of density ρ of liquid, average speed v and coeff. Of viscosity η. Given that $N_R \propto D$, diameter of pipe. Show by the method of dimensions that $N_R \propto \frac{\rho v D}{\eta}$

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123. Derive by the method of dimensions, an expression for the volume of a liquid flowing out per second through a narrow pipe. Asssume that the rate of flow of liwquid depends on

(i) the coeffeicient of viscosity η of the liquid

(ii) the radius 'r' of the pipe and

(iii) the pressure gradient $\frac{P}{l}$ along the pipte. Take $K = \frac{\pi}{8}$.

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124. The period of vibration of a tunign fork depends on the length I of its prong, density d and Young's modulus Y of the meterial. Deduce an expression for the period of vibration (T) using dimensional analysis.

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125. The frequency (V) of an oscillating drop may depends upon radius (r) of the drop density (ρ) of liquid and the surface tension (S) of the liquid.

Deduce of formula dimensionally.

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126. The escape vleocity v of a body depends upo (i) the acceleration due to gravity of the planet and (ii) the radius of the planet R. Establish dimesionally the releaitonship betweeeen v, g and R.

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127. A large fluid star oscillates in shape under the influence of its own gravitational field. Using dimensional analysis, find the expression for period of oscillation (T) in terms of radius of star (R), mean density of fluid (ρ) and universal gravitational constant (G).

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128. Distinguish between the terms precision and accuracy of a measurement.

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129. What do you mean by error in a measurement? Briefly explain the differenct types of erros and their causes. How can these erros by minimised?

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130. How is random error eliminated? What do you mean by absolute error?

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131. How is random error eliminated? What do you mean by mean absolute error?

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132. How is random error eliminated? What do you mean by relative error?

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133. How is random error eliminated? What do you mean by percentage error?

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134. The length of a rod as measured in an experiment is found to be 2.48 m, 2.46 m , 2.49 m , 2.49 m and 2.46 m. Find the average length , the

absolute error in each observation and the percentage error.

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135. In successive measurement, the reading of the period of oscillation of a simple pendulum were found to be 2.63s, 2.56s, 2.71s and 2.80s in an experiment. Calculate (i) mean value of the period oscillation (ii) absolute errer in each measurement (iii) mean absolute error (iv) releative error (v) percentage error and (vi) express the result in proper form.

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140. In an experiment refractive index of glass was observed to be 1.45, 1.56, 1.54, 1.44, 1.54 and 1.53. The mean absolute error in the experiement is

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144. How can we estimate the error in the sum. Deduce the general rule for evaluating the error in a combined calculation.

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145. How can we estimate the error in the difference. Define the general rule for evaluating the error in a combined calculation.

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146. How can we estimate the error in the product. Deduce the general rule for evaluating the error in a combined calculation.

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147. 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.

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148. Two differences masses are determined as (23.7 ± 0.5) g and $(17.6 \pm 0.3)g$. What is the sum of their masses?

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149. The initial and final temperatures of a water bath are $(18 \pm 0.5).^{\circ} C$ and $(40 \pm 0.3).^{\circ} C$. What is the rise in temperature of the path

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150. The resistance $R = \frac{V}{I}$, where $V = 100 \pm 5V$ and $I = 10 \pm 0.2A$. Find the percentage error in R.

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151. 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 meterail of the cube?

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152. The error in the measurement of radius of a shpere if 2%. What would be the error in the volume of the sphere?

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153. The percentage of error in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimating kinetic energy obtained by measuring mass and speed?

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

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

Determine the percentage error in the volume of the block .

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

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156. 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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157. 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?

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158. 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.

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159. The specific resistance ρ of a thin wire of radius r cm, resistance R ohm and length L is given by $\rho = \frac{\pi r^2 R}{L}. IfL = 78 \pm 0.01cm$ $r = 0.26 \pm 0.02$ and $R = 32 \pm 1\Omega,$ What is the percentage error in ρ?

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160. 108 . If two resistors of resistances $R_1 = (4 \pm 0.5)\Omega$ and $R_2 = (16 \pm 0.5)\Omega$ are connected (i) in series and (ii) in parallel, find the equivalent resistance in each case with limits of percentage error.

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161. Fill in the blanks: The volume of a cube of side 1cm is equal to _____ m^3.

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162. Fill in the blanks: The surface area of a solid cylinder of radius 2 cm and height 10 cm is qual to _____m^2.

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163. The volume of a cube of side 10 cm. is ... m^3.

(ii) A vehicle moving with a speed of $36kmh^{-1}$ covers .... M in 1 sec.

(iii) The density of water at $4^\circ Cis.....g/$ or $.....kg/m^3$.

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164. Fill in the blanks: The relative density of lead is 11.3. Its density is _____ gcm^3 or _____ kgm^{-3}.

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165. Fill in the blanks by suitable conversion of units: $1kgm^2s^{-2} =$ _ _ _ gcm^2s^{-2}.

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166. Fill in the blanks by suitable conversion of units :

(a) $1kgm^2s^{-2} = gcm^2s^{-2}$ (b) 1m = ... Light year (c) $3ms^{-2} = \ldots.. Kmh^{-2}$

(d) $G = 6.67 \times 10^{-11} Nm^2kg^{-2} = \ldots..cm^3s^{-2}g^{-1}$

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167. Fill in the blanks by suitable conversion of units :

(a) $1kgm^2s^{-2} = gcm^2s^{-2}$ (b) 1m = ... Light year (c) $3ms^{-2} = ...Kmh^{-2}$

(d) $G = 6.67 \times 10^{-11}Nm^2kg^{-2} = ...cm^3s^{-2}g^{-1}$

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168. Fill in the blanks by suitable conversion of units :

(a) $1kgm^2s^{-2} = gcm^2s^{-2}$ (b) 1m = ... Light year (c) $3ms^{-2} = ...Kmh^{-2}$

(d) $G = 6.67 \times 10^{-11}Nm^2kg^{-2} = ...cm^3s^{-2}g^{-1}$

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169. A calorie is a unit of heat or energy and it equals about $4.2J, where 1J = 1kgm^2s^{-2}$. Suppose we employ a system of units in which the unit of mass equals αkg, the unit of length equals is βm , the

unit of time is γs. Show tthat a calorie has a magnitude $4.2\alpha^{-1}\beta^{-1}\gamma^{2}$ in terms of the new units.

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170. Explain this statement clearly :

"To call a dimensional quantity 'large' or 'small' is meaningless without specifying a standard for comparison". In view of this, reframe the following statement wherever necessary :

(a) atoms are very small objects

(b) a jet plane moves with great speed

(c) the mass of Jupiter is very large

(d) the air inside this room contains a large number of molecules

(e) a proton is much more massive than an electron

(f) the speed of sound is much smaller than the speed of light.

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173. Explain this statement clearly :

"To call a dimensional quantity 'large' or 'small' is meaningless without specifying a standard for comparison". In view of this, reframe the following statement wherever necessary :

(a) atoms are very small objects

(b) a jet plane moves with great speed

(c) the mass of Jupiter is very large

(d) the air inside this room contains a large number of molecules

(e) a proton is much more massive than an electron

(f) the speed of sound is much smaller than the speed of light.

Watch Video Solution

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175. The number of bonds possible between a molecules of cytocine and a molecule of guanine in DNA molecule is

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178. A new unit of length is chosen such that the speed of light in vecuum is unity. What is the distance between the sun and the earth in terms of the new unit, if light takes 8 min and 20 sec. to cover the distance ?

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179. Which of the following is the most precise devise for measuring length ? (a) a Vernier callipers with 20 divisions on the sliding scals, coindiing with 19 main scale divions (b) a screw gauge of pitch 1mm and 100 divisions on the circular scale (c) an optical instrument that can measure length to within a wave length of light.

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180. A student measures the thickness of a human hair by looking at it through a microscope of magnification 100. He makes 20 observations and findsd that the average width of the hair in the field of view of the microscope is 3.5mm. What is his estimate on the thickness of hair?

Watch Video Solution

181. Answer the following :

(a) You are given a tread and a metre scale. How will you estimate the diameter of the thread ?

(b) A screw gauge has a pitch of 1.0 mm and 200 divisions on the circular scale. Do you think it is possible to increase the accuracy of the screw gauge arbitrarily by increasing the number of divisions on the circular scale ?

(c) The mean diameter of a thin brass rod is to be measured by vernier

callipers. Why is a set of 100 measurements of the diameter expected to yield a more reliable estimate than a set of 5 measurement only ?

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184. The photograph fo a house occupies an area of $1.7cm^2$ on a 35 slide. The slide is projected on to a screen, and the area of the house on the screen is $1.55m^2$ What is the liner magnification of the projector screen arrangement?

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185. State the number of significant figures in the following : $0.007m^2$

Watch Video Solution

186. State the number of significant figures in the following : $2.64 \times 10^{24} kg$

Watch Video Solution

187. State the number of significant figures in the following :$0.2370 gcm^{-3}$

Watch Video Solution

188. State the number of significant figures in the following : $6.320 j$

Watch Video Solution

189. State the number of significant figures in the following :$6.032 Nm^{-2}$

Watch Video Solution

190. State the number of significant figures in the following :$0.0006032 m^2$

Watch Video Solution

191. The length breadth and thickness of a metal sheet are 4.234 m 1.005 m and 2.01 cm respectively. Given the area and volume of the sheet to correct number of significant figure.

Watch Video Solution

192. 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?

Watch Video Solution

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Watch Video Solution

194. The percentage errors of measurement in a, b, c and d are 1%. 3%, 4% and respectively. What is the percentage error in the quantity P? If the value of P calculated using the above relation turns out to be 3.763, to what value should you round off 2% the result? e resuuiit

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195. A book with many printing errors contains four different formulae for the displacement y of a particle undergoing a certain periodic motion : $y = a\sin vt$ (a = maximum displacement of the particle, v= speed of the

particle, T = time-period of motion). Rule out the wrong formula on dimensional grounds.

Watch Video Solution

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

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particle, v is speed of particle, T is time period of motion. Rule out the wrong forumlae on dimensinal grounds.

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198. A famous relation in Physics relates moving mass m to the rest mass m_0 of a particle in terms of its speed v and the sped of light c. (This relaiton first arose as a consequence of special theory of relativity due to Albert Einstein). A boy recalls the relation almost correctly but forgets where to put the constant c. He writes $m = \frac{m_0}{(1 - v^2)^{1/2}}$ Guess where to put the missing c?

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199. The radius of a hydrogen atom is about 0.5Å . What is the total atomic volume in m^3 of a mole of hydrogen atoms ?

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200. One mole of an ideal gas at NTP occupies 22.4 liters (molar volume). What is the ratio of molar volume to atomic volume to atomic volume of a mole of hydrogen ? Take size of hydrogen molecule to be 1 Å. Why is this ratio so large?

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201. Explain this common observation clearly : If you look out of the window of a fast moving train, the nearby tress, houses etc. seem to move rapidly in a direction opposite to the train's motion, but the distant objects (hill tops, the Moon, the starts etc.) seem to be stationary. (In fact, since you are aware that you are moving, these distant objects seem to move with you).

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202. A parsec is a convenient unit of length on the astronomical scale. It is the distance of an object that will show a parallax of 1 (second) of arc

from opposite ends of a baseline equal to the distance from the earth to the sun. How much is parsec in terms of metres ?

Watch Video Solution

203. The nearest star to our solar system is 4.29 light years away. How mcuh is this distance in terms of par sec ? How mcuh parallax would this star show when viewed from two locations of the earth six months apart in its orbit around the sun?

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204. Precise measurements of physical quantities are a need of science. For example to ascertain the speed of an aircraft, one must have an accurate method to find its positions at closely separated instants of time. This was the actual motivation behind the discovery of radar in World War II. think of different examples in modern science where precise measurements of length, time, mass etc, arc needed. Also, where ever you can, give a quantitative idea of the precision needed.

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205. Just as precise measurements are necessary in science, it is equally important to be able to make rough estimates of quantities using rudimentary ideas and common observations. Think of ways by which you can estimate the following (where an estimate is difficult to obtain. try to get upper bound on the quantity) :

(a) the total mass of rain-bearing clouds over India during the Monsoon

(b) the mass of an elephant

(c) the wind speed during a storm

(d) the number of strands of hair on your head

(e) the number of air molecules in your classroom.

Watch Video Solution

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209. The sun is a hot plasma (ionised matter) with its linner core at a temperature excedding 10^7 K, and its outer surface at a temperature of about 6000K. At such high temps, no substance remains in a solid or liquid phase. In what range do you expect the mass density of the sun to be? In the range of densities of solids, liquieds or gases ? Check if your guess is correct from the following data : mass of sun $= 2.0 \times 10^{30} kg$, radius of the sun $= 7.0 \times 10^8 m$

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Watch Video Solution

211. When the planet Jupiter is at a distance of 824.7 million kilometers from the earth, its angular diameter is measured to be 35.72 of arc. Calculate the diameter of Jupier.

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212. A man wlaking briskly in rain with speed v must slant his umbrella forward making an angle θ with the vertical . A student derives the following relation between θ and v :

$\tan\theta = v$

and checks that the relations has a correct limit : as $v \to 0, \theta \to 0$, as expected . (We are assuming there is no string wing and that the rains falls vertically for a stationary man). Do you think this relation can be correct ? If not, guess at the correct relation .

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213. It is claimed that two cesium clocks, if allowed to run for 100 years, free from any disturbance, may differ by only about 0.02s. What does this imply for the accuracy of the standard cesium clock in measuring a time interval of 1s ?

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214. Estimate the averaage atomic mass density of a sodium atom, assuming its size ot be 2.5 Å. Compare it with density of sodium in its crystalline phase $\left(970kgm^{-3}\right)$. Are the two denities of the same order of magnitude ? If so, why ?

Watch Video Solution

215. The unit of length convenient on nuclear scale is a fermi, $1f = 10^{9} - 15)$m. Nuclear sizes obey rougholy the following empricial relation : $r = r_0 A^{1/3}$, where r is radius of the nucleus and r_0 is a constant equal to 1.2 f. show that the rule implies that nuclear mass

density in nearly constant for different neclei. Estimate the mass density of sodium nucleus. Compare it with avarge mass density of sodium atom is Q. 27 $\left(4.67 \times 10^{3} kg/m^{3}\right)$.

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216. A laser light beamed at the moon the takes $2.56s$ to return after reflection at the moon's surface . How much is the radius of the lunar orbit around the earth ?

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217. A SONAR (sound navigation and ranging) uses ultrasonic waves to detect and locate object under water. In a submarine equaipped with as SONAR, the time delay between genration of a probe wave and the recption of its echo after refection from an enemy submarine is found to be 77.0 s. What is the distance of the enemy submarine ? (speed of sound in water $= 1450ms^{-1}$

Watch Video Solution

218. The farthest objects in out universe discovered by modern astronomeres are so distant that light emitted by them takes billions of year to reach the earth. These object (known as quasers) have may puzzling features, which have yet not been satisfactorily explained. What is the distance in km of a quasar form which light takes 3.0 billion years to reach us?

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219. A great physicist of this century (P. A. M. Dirac) loved playing with numerical values of fundamental constant of nature. This led him to an instreasing observaion. Dirac found that form the basic constant of atomin physice (c,e, mass of electron mass of proton) and the gravitational constant G, he could arrive at a number with the dimension of time. Further, it was a very large number, its magnitude being close to the present estimate on the age of the universe $(\approx 15 billion years)$. Form the table of fundamental constants in this book, try to see if you

too can construct this number (or any other instresting number you can think of). if its coincidence with the age of the universe ware significant, what would this imply for the constancy of fundamental constants ?

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Exercise

1. Calculate the number of astronomical units in one metre.

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2. How many parsec are ther in one metre?

Watch Video Solution

3. How many metre are there in a light year?

Watch Video Solution

4. The density of air is 1.293 kg $/m^3$. Express it in cgs units.

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5. Express an acceleration of $10ms^{-2}$ in km h^{-2}

Watch Video Solution

6. If a mass of a proton is $1.67 \times 10^{-27}kg$, how many protons will be present in 1 kg?

Given data:

Mass of a proton $= 1.67 \times 10^{-27}kg$

$1.67 \times 10^{-27}kg$ is mass of 1 proton.

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7. Write the order of magnitude of the following :

(i) 8 (ii) 49 (iii)52 (iv) 999 (v) 1001 (vi) 753000 (vii) 0.05 (viii) 0.99

Watch Video Solution

8. Write the order of magnitude of the following :

(i) 8 (ii) 49 (iii)52 (iv) 999 (v) 1001 (vi) 753000 (vii) 0.05 (viii) 0.99

Watch Video Solution

9. Write the order of magnitude of the following :

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Watch Video Solution

10. Write the order of magnitude of the following :

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Watch Video Solution

11. Write the order of magnitude of the following :

(i) 8 (ii) 49 (iii)52 (iv) 999 (v) 1001 (vi) 753000 (vii) 0.05 (viii) 0.99

Watch Video Solution

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(i) 8 (ii) 49 (iii)52 (iv) 999 (v) 1001 (vi) 753000 (vii) 0.05 (viii) 0.99

Watch Video Solution

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Watch Video Solution

14. Write the order of magnitude of the following :

(i) 8 (ii) 49 (iii)52 (iv) 999 (v) 1001 (vi) 753000 (vii) 0.05 (viii) 0.99

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15. What is one astronomical unit ? Express it in metres . Write its order of magnitude .

Watch Video Solution

16. What is the order of magnitude of second in a day ?

Watch Video Solution

17. In a submarine fitted with a SONAR, the time between the genretaion of an ultrasonicwave and the reciept of its echo is 200 s. What is the

dsistance of the enemy sun=bmrine ? The speed of the sound in water is $1.450 kms^{-1}$

Watch Video Solution

18. A radar signal is beamed towards a planet and its echo is recived 7 minutes later. If the distance between the planet and earth is $6.3 \times 10^{10} m,$ calculate the speed of the signal.

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19. A rock under water is 1595 m deep. Find the time in which an ultrasonic signal returns after reflection from the rock. Speed of ultrasonic waves in water = $1450 m / s.$

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20. The angle of elevation of the top of a hill is 30° from a point on the ground. On walking 1 km towards the hill, angle is found to be 45°. Calculate the height of the hill.

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

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22. The parallax of a heavenly body measured from two points diametrically opposite on equator of earth is 1.0 minutes. If the radius of the earth is 6400 km, find the distance of the heavenly body from the centre of the earth in AU. Given $1AU = 1.5 \times 10^{11}$m.

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23. Assuming that a planet goes round the sun in a circular orbit of radius $0.5AU$ determine the angle of maximum elongation for the planet and its distance from the earth when elongation is measured.

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24. Compare the period of rotation of planet Mars about the sun with that of the earth. The mean distance of the Mars from the sun is 1.52 AU.

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25. A drop of olive oil of radius 0.3 mm spreads into a rectangular film of $30cm \times 15cm$ on the water surface. Calculate the size of the oil molecule.

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26. IF the size of an atom (= 1Å) were enlarged to the tip of a sharp pin $\left(\cong 10^{-5} m \right)$, how large would the height of mout everest $\left(\cong 10^{4} m \right)$ be?

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27. If an atom of size 10^{-10}m were enlarged to the size of the earth $\left(\cong 10^{7} m \right)$, how large would its nucleus be ? Take size of nucleus $= 10^{-14}$m.

Watch Video Solution

28. if the universe were shrunk to the size, of earth, how large would the earth be on this scale?

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29. A neutron star has a density equal to that of nuclear matter $\left(\cong 2.8X0^{17} kgm^{-3} \right)$. Assuming the star to be spherical, find the radius of the neutron star whose mass is $4.0X10^{30} kg$.

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30. Which type of phenomenon can be used as a measure of time ? Given three examples.

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31. Why has 'second' been defined in terms of periods of radiation from Cesium -133 ?

Watch Video Solution

32. The average life of an Indian is 56 years .Find the number of times the human heart beats in the life of an Indian ,If the heat beats once in 0.8 s.

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33. The mean life of an elementary particle pion is 2×10^{-7} ns. The age of the univers is about 4×10^{9} years. Identify a physically meaning time that is approximately half way between these two on a logarithmic scale.

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

Watch Video Solution

35. Find the number of times the human heart beats in the life of 60 years of a man, assuming that the heart beats once in 0.8 s.

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36. Two atomic clocks allowend to run for a average life of an indian (say 70 years) differ by 0.2 s only. Calculate the accuracy of standard atomic clock in measuring a time interval of 1 sec.

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37. Age of the universe is about 10^{10} years whereas the mankind has existed for 10^{6} years. How many seconds would the man have existed if age of universe were one day.

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38. Deduce dimensional formulae for angle.

Watch Video Solution

39. The dimensional formula of angular velocity is

Watch Video Solution

40. Deduce dimensional formulae for angular accelaration.

Watch Video Solution

41. The dimensional formula of torque is

Watch Video Solution

42. The dimensional formula for angular momentum is

Watch Video Solution

43. Deduce dimensional formulae for moment of inertia.

Watch Video Solution

44. Obtain dimensions of (i) impulse (ii) power (iii) surface energy (iv) cofficent of viscecity (v) bulk modules (vi) force constant.

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45. Give the unit and dimension of power.

Watch Video Solution

46. Dimensions of surface energy are

Watch Video Solution

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

Watch Video Solution

48. Units and dimensions of bulk modulus are those of

Watch Video Solution

49. Dimensions of force constant are

Watch Video Solution

50. By the use of dimensions, show that energy per unit volume is equal to pressure.

Watch Video Solution

51. Show that angular momentum has the same dimensions as the Planck's constant.

Watch Video Solution

52. If force (F), length(L) and time (T) as chosen as the fundamental quantities, then what would be the dimensional formula for the density?

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53. Calculate the dimensions of ther force and impulse taking velocity, density and frequency as basic quantities.

Watch Video Solution

54. Calculate the dimensions of linear momentum and surface tension in terms of velocity (v), density (ρ) and frequency (V) as fundamental

units.

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55. In the expression $P = EI^2m^{-5}G^{-2}$, E, m, I and G denote energy, mass, angular momentum and gravitational constant, respectively. Show that P is a dimensionless quantity.

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56. The unit of force in SI system is newton (N) and in CGS system is dyne. One newton is equal to 1 kg m s^{-2} and 1 dyne is equal to 1 g cm s^{-2}. How many dynes make one newton?

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

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58. The density of mercury is 13.6 g cm^{-3} in CGS system. Find its value in SI units.

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59. The surface tension of water is 72 dyne/cm. Express is in SI units.

Watch Video Solution

60. An electriv bulb has a power of 500 W. Express it in CGS units.

Watch Video Solution

61. If the value of atmospheric pressure is 10^6 dyne cm^{-2}, find its value in SI units.

Watch Video Solution

62. The value of Stefan's constant is $\sigma = 5.76 \times 10^{-8} Js^{-1} m^{-2} K^{-4}$. Find its value in cgs system.

Watch Video Solution

63. 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.

Watch Video Solution

64. If the unit of force energy and velocity are 20 N, 200J and 5m//s, find the units of mass, length and time.

Watch Video Solution

65. When 1m, 1kg and 1min. Are taken as the fundamental units, the magnitude of force is 36 units. What will be the value of this force is CGS system?

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66. Test the dimensional consistency of the following equations: $v = u + at$

Watch Video Solution

67. Test the dimensional consistency of the following equations: $s = ut + \left(\frac{1}{2}\right)at^2$

Watch Video Solution

68. Test the dimensional consistency of the following equations: $v^2 - u^2 - 2as.$

Watch Video Solution

69. The viscous force 'F' acting on a small sphere of rtadius 'r' moving with velocity v through the liquid is gib=ven by F= $6\pi nrv.$ Calculate the dimensions of n , the cofficent of viscosity.

Watch Video Solution

70. The distance covered by a particle in time t is given by $x = a + bt + ct^2 + dt^3$, find the dimensions of a,b,c and d.

Watch Video Solution

71. The critical velocity of the flow of a liquid through a pipe of radius 3 is given by $v_c = \left(K\frac{\eta}{r}p\right)$, where p is the density and η, is the coefficient of viscosity of liquid. Check if this relation is dimentionally correct.

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72. The rate flow (V) of a liquid through a pipe of radius (r) under a pressure gradient (P/L) is given by $V = \frac{\pi}{8}\frac{PR^4}{L\eta}$, Where η is coefficient of visocity of the liquied. Check whether the formula is correct or not.

Watch Video Solution

73. Test if the following equation is dimensionally correct: $h = \left(\frac{sS\cos\theta}{rpg}\right)$ where h= height, S= surface tension, p= density, r=radius, and g= acceleration due to gravity.

Watch Video Solution

74. Find the dimensions of the quantity v in the equation,

$$v = \frac{\pi p\left(a^2 - x^2\right)}{2\eta l}$$

where a is the radius and l is he length of the tube in which the fluid of coefficient of viscosity η is flowing , x is the distacne from the axis of the tube and p is the pressure differnece.

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75. Find the dimensions of the quantity q from the expression $T = 2\pi\sqrt{\frac{ml^3}{3Yq}}$, where T is time period of a bar of length l, mass m and Young's modulus Y.

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76. An artificial satellite of mass m is revolving in a circualr orbit around a planet of mass M and radius R. If the radius of the orbit of satellite be r, then period of satellite is

$$T = \frac{2\pi}{R}\sqrt{\frac{r^3}{g}}$$

Justify the relation using the method of dimensions.

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77. Write the dimensions of $a \times b$in the relation $E = \frac{b - x^2}{at}$, where E is the energy , x is the displacement , and t is the time.

Watch Video Solution

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

Watch Video Solution

79. Time period of an oscillating drop of radius r, density ρ and surface tension S is $t = K\sqrt{\frac{\rho r^3}{S}}$. Check the correctness of this relation

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80. Out of the formulae y =a sin $2\pi t/T$ and y = a sin vt for the displacement y of particle undergoing a periodic motion, rule out the wrong formula on the basis of dimensions. Symbols have standard meaning.

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81. The wavelength λ associated with a moving electron depends on its mass m , its velocity v and Planck's constant h . Prove dimensionally that $\lambda \propto \frac{h}{mv}$.

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82. Obtain an expression for the centripetal force F acting on a particle of mass m moving with velocity v in a circle of radius r . Take dimensionless constant K = 1 .

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83. The orbital velocity v of a satellite may depend on its mass m , the distane r from the centre of the earth and acceleration due to gravity g . Obtain an expression for its orbital velocity .

Watch Video Solution

84. A small spherical ball of radius r falls with velocity v through a liquid having coeffiecinet of viscosity η. find viscous darg F on the wall if it depends or $r, v, \eta. TakeK = 6\pi$

Watch Video Solution

85. The velocity of a freely falling body is a function of the distance fallen through (h) and acceleration due to gravity g . Show by the method of dimensions that $v = K\sqrt{gh}$.

Watch Video Solution

86. Using the method of dimensions , derive an expressions for the energy of a body executing SHM , assuming this energy depends upon its mass m , frequency v and amplitude of vibration r .

Watch Video Solution

87. A body of mass m hung at one end of the spring executes simple harmonic motion . The force constant of a spring is k while its period of vibration is T. Prove by dimensional method that the equation $T = 2\pi m / k$ is correct. Dervive the correct equation , assuming that they are related by a power law.

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88. Assuming that the critical velocity of flow of a liquid through a narrow tube depends on the radius of the tube, density of the liquid and

viscosity of the liquid, find an expression for critical velocity.

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89. By the method of dimensions, obtain an expression for the surface tension S of a liquid rising in a capillary tube. Assume that S depends on mass m of liquied, Pressure p of liquid and radius r of the capillary tube. Take $K = 1/2$.

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90. The depth x to which a bullet penetrates a human body depends on (i) coeffeicint of elasticity, η and (ii) KE (E_k) of the bullet, By the method of dimensions, show that

$x \propto \left(\frac{E_k}{\eta}\right)^{1/3}$

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91. A U - tube of uniform cross section contains mercury upto a height h in either limb. The mercury in one limbe is depressed a little and then relased. Obtain an expression for time period (T) of oscillation, assuming that T depends on h,ρ and g, where ρ is density of mercury.

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92. The cirtical angular velocity ω_c of a cylinder inside another cylinder containing a liquied at which its turbulance occurs depends on visocisity η density ρ and disntac d between wall of the cylinder. Obtain an expression for ω_c using method of dimensios.

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93. A body of mass m is moving in a circle of radius angular velocity ω. Find the expression for centripetal force acting on it by the method of dimensions

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94. Consider a simple pendulum having a bob attached to a string that oscillates under the action of a force of gracity. Suppose that the period of oscillation of the simple pendulum depends on its length (I), mass of the bob (m) and acc. Due to gravity (g). Derive the expression for its time period using method of dimensions.

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95. What are the limitations of dimensional analysis?

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96. State the rules for finding the significant figures in the addition and subtraction of two numbers, with example.

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97. Write the rules of "Rounding off" with example.

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98. State the rules for determining the number of significant digits for addition and multiplication .Give examples?

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99. State the number of significant figures in the following:

(i) $0.007m^2$ (ii) $2.64 \times 10^{24}kg$ (iii) $0.2370cm^{-3}$

(iv) 6.320J (v)$6.032nM^{-2}$ (vi) 0.0006032

(vii) 2.000m (viii) 5100kg (ix) 0.050cm.

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100. State the number of significant figures in the following: 5100 kg

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101. State the number of significant figures in the following numbers :

(i) 62.4

(ii) 0.050

(iii) 8.8674

(iv) 50.0.

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102. Round off the following numbers as indicated:

(i) 18.35 upto 3 digits (ii) 143.45 upto 4 digits

(iii) 18967 upto 3 digits (iv) 12.653 upto3 digits

(v) 248337 upto 3 digits (vi) 321.135 upto 5 digits

(vii) 101.55×10^{6}upto 4 digits (viii) $31.325 \times x10^{-5}$upto 4 digits.

Watch Video Solution

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(vii) 101.55×10^{6}upto 4 digits (viii) $31.325 \times x10^{-5}$upto 4 digits.

Watch Video Solution

108. Round off the following numbers as indicated :

(i) 15.654 upto 3 digits $(ii)15.\ 75$ upto 3 digits $(iii)15.654$ upto 4 digits $(iv)15.65$ upto 3 digits (v) 142667 upto 5 digits (vi) 5.996×10^5 upto 3 digits . (vii) 0.7995 upto 1 digit (viii) 2.5946×10^{-4} upto 2 digits .

Watch Video Solution

109. Round off the following numbers as indicated:

(i) 18.35 upto 3 digits (ii) 143.45 upto 4 digits

(iii) 18967 upto 3 digits (iv) 12.653 upto3 digits

(v) 248337 upto 3 digits (vi) 321.135 upto 5 digits

(vii) $101.55 \times 10^6 \text{upto } 4 \text{ digits}$ (viii) $31.325 \times x10^{-5} \text{upto } 4 \text{ digits.}$

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110. Add 7.21, 12.41 and 0.0028, and express the result the result to an appropriate number of significant figures.

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111. Subtract 4.27153 from 6.807 and express the result to an appropriate number of significant figures.

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

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113. Solve the following and express the result to an appropriate number of significant figures:

(i) Add 6.2g, 4.33g, and 17.456g.

(ii) Subtract 63.54kg, from 187.2kg. (iii) 75.5 x 125.2 x 0.51.

(iv) $\frac{2.13 \times 24.78}{458.2}$ (v) $\frac{2.51 \times 10^{-4} \times 1.81 \times 10^{7}}{0.4463}$

Watch Video Solution

114. Solve the following and express the result to an appropriate number of significant figures.

(ii) Subtract 63.54 kg from 187.2 kg

Watch Video Solution

115. Solve the following and express the result to an appropriate number of significant figures:

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(ii) Subtract 63.54kg, from 187.2kg. (iii) 75.5 x 125.2 x 0.51.

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117. Solve the following and express the result to appropriate number of significant figures : (i) $\frac{2.51 \times 10^{-4} \times 1.81 \times 10^{7}}{0.4463}$

(ii) 1.567 + 0.958 - 0.27

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

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119. The radius of a sphere is 1.41. its volume to an appropring number of significant figure is

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120. 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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121. The mass and radius of the earth are 5.975×10^{24} kg and 6.37×10^{6} m respectively. Calculate the average earth's density to correct significant figures. Take $\pi = 3.142$.

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122. 5.74 g of a substance occupies $1.2cm^3$. Express its density keeping significant figures in view.

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123. State the number of significant figures in the following measurements : $0.009m^2$

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124. State the number of significant figures in the following measurements :

(i)

$0.009m^2 \quad (ii)5.049Nm^{-2} \quad (iii)0.1890gcm^{-3} \quad (iv)1.90 \times 10^{11}kg \quad (v)$

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125. State the number of significant figures in the following measurements :

(i)

$0.009m^2 \quad (ii)5.049Nm^{-2} \quad (iii)0.1890gcm^{-3} \quad (iv)1.90 \times 10^{11}kg \quad (v)$

Watch Video Solution

126. State the number of significant figures in the following measurements :

(i)

$0.009m^2 \quad (ii)5.049Nm^{-2} \quad (iii)0.1890gcm^{-3} \quad (iv)1.90 \times 10^{11}kg \quad (v)$

Watch Video Solution

127. State the number of significant figures in the following measurements :

(i)

$0.009m^2 \quad (ii)5.049Nm^{-2} \quad (iii)0.1890gcm^{-3} \quad (iv)1.90 \times 10^{11}kg \quad (v)$

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128. State the number of significant figures in the following measurements :5.308 J

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129. Subtract $2.5 \times 10^4 \text{from} 3.9 \times 10^5$ with due regard to significant figures.

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130. Round off the following numbers as indicated :

(i) 15.654 upto 3 digits $(ii) 15.75$ upto 3 digits $(iii) 15.654$ upto 4 digits $(iv) 15.65$ upto 3 digits (v) 142667 upto 5 digits (vi) 5.996×10^5 upto 3 digits . (vii) 0.7995 upto 1 digit (viii) 2.5946×10^{-4} upto 2 digits .

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(i) 15.654 upto 3 digits $(ii) 15.75$ upto 3 digits $(iii) 15.654$ upto 4 digits $(iv) 15.65$ upto 3 digits (v) 142667 upto 5 digits (vi) 5.996×10^5 upto 3 digits . (vii) 0.7995 upto 1 digit (viii) 2.5946×10^{-4} upto 2 digits .

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(i) 15.654 upto 3 digits $(ii) 15.75$ upto 3 digits $(iii) 15.654$ upto 4

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137. A jewaller puts a diamond weighing 5.42g in a box weighing 1.2kg. Find the total weight of the box and the diamond to correct number of significant figures.

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138. The diameter of a circle is 1.06 m. Calculate the area to an appropriate number of significant figures, Take $\pi = 3.14$.

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139. The radius of a solid sphere is measured as11.24 cm.What is the surface area of the sphere to appropriate significant figures ?

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140. The mass of a body is 275.32g and its volume $is36.41cm^3$. Express its density up to appropriate significant figures.

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141. 9.74 g of a substance occupies $1.2cm^3$. Express its density by keeping the significant figures in view.

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142. The diameter of a wire as measured by a screw gauge was found to be 0.026 cm, 0.028 cm, 0.029 cm, 0.027cm, 0.024cm and 0.027 cm.

Calculate

(i) mean value of diameter

(ii) mean absoulte error

(iii) relative error (iv) percentage error. Also express the result in terms of absolute error and percentage error.

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143. The diameter of a wire as measured by a screw gauge was found to be 0.026 cm, 0.028 cm, 0.029 cm, 0.027cm, 0.024cm and 0.027 cm. Calculate

(i) mean value of diameter

(ii) mean absoulte error

(iii) relative error (iv) percentage error. Also express the result in terms of absolute error and percentage error.

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144. The values for the diameter of a wire as measured by a screw gauge were found to be 0.026 cm, 0.028 cm, 0.029 cm, 0.027 cm, 0.024 cm and 0.027 cm. Find the mean value and the relative error.

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145. The diameter of a wire as measured by a screw gauge was found to be 0.026 cm, 0.028 cm, 0.029 cm, 0.027cm, 0.024cm and 0.027 cm. Calculate

(i) mean value of diameter

(ii) mean absoulte error

(iii) relative error (iv) percentage error. Also express the result in terms of absolute error and percentage error.

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146. The refractive index of water as measured by the relation `p = (Real depth)/ (Apparent depth) was found to have the values 1.29, 1.33, 1.34, 1.35,

1.32, 1.36, 1.30, 1.33. Calculate mean value of p.

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147. The refractive index of water as measured by the relaion $\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$ was found to have the values $1.29, 1.33, 1.34, 1.35, 1.32, 1.36, 1.30, 1.33.$

Calculate (i) mean value of μ (ii) mean value of absolute error (iii) relative error (iv) percentage error .

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148. The refractive index of water as measured by the relaion $\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$ was found to have the values $1.29, 1.33, 1.34, 1.35, 1.32, 1.36, 1.30, 1.33.$

Calculate (i) mean value of μ (ii) mean value of absolute error (iii) relative error (iv) percentage error .

Watch Video Solution

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Calculate (i) mean value of μ (ii) mean value of absolute error (iii) relative error (iv) percentage error .

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150. In an experiment to measure focal length of a concave mirror , the value of focal length in successive observations turns out to be 17.3 cm , 17.8 cm , 18.3 cm , 18.2 cm , 17.9 cm and 18.0 cm . Calculate the mean absolute error and percentage error . Express the result in a proper way .

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151. If A =12.0 cm $\pm$ 0.1 cm and B 8.5 cm $\pm$ 0.5 cm, find A + B

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152. If $L_1 = (12.0 \pm 0.1)$ cm and $L_2 = (8.5 \pm 0.5)cm$ find $(L_1 + L_2)$ and $(L_1 - L_2)$ with proper error limits.

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153. The temperature of two bodies measured by a thermometer are $t_1 = 20^\circ C \pm 0.5^\circ C$ and $t_2 = 50^\circ C \pm 0.5^\circ C$. Calculate the temperature difference and error there in .

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154. The lengths of two rods are $15.2 \pm 0.2cm$ and $10.7 \pm 0.2cm$ Find difference in lengths of the two rods with the limits of error.

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155. The lengths and breadth of a rectangle are $(5.7 \pm 0.1)cm$ and (2.4 ± 0.2) cm. Calculate area of the rectangle with error limits.

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156. Time taken by a body in (20 ± 0.2) second in undergoing a displacement of (200 ± 5)m. Calculate the percentage error in calculation of velcoity.

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157. The percentage errors in the measurement of length and time period of a simple pendulum are 1% and 2% respectively. Then, the maximum error in the measurement of acceleration due to gravity is

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158. If $l_1 = (10.0 \pm 0.1)$ cm and $l_2 = (9.0 \pm 0.1)$ cm , find the their sum , difference and error in each .

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159. The relative density of a material is found by weighing the body first in air and then in water . If the weight in air is $(10.0 \pm 0.1)gf$ and the weight in water is $(5.0 \pm 0.1)gf$, then the maximum permissible percentage error in relative density is

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160. The voltage across a lamp is $(6.0 \pm 0.1)V$ and the current passing through it is (4.0 ± 0.2) ampare. Find the power consumed by the lamp.

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

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163. The measure of the diameter of a cylinder is (1.60 ± 0.01) cm and its length is (5.0 ± 0.1) cm . Calculate the percentage error in its volume .

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164. The measured mass and volume of a body are 2.00 g and $5.0 cm^3$ respectively . With possible errors of 0.01 g and $0.1 cm^3$, what would be

the percent error in density ?

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165. 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.

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166. 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

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167. A physical quantify X is related to three observables a , b, c as $X = \sqrt{a}b^2 / c^2$. The errors of measurement in a ,b and c are 2% , 1% and 3% respectively . What is the percentage error in the quantity X ?

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168. A physical quantity y is given by $y = \frac{P^2 Q^{3/2}}{R^4 S^{1/2}}$

The percentage error in A,B , C and D are 1%,2%, 4% and 2% respectively. Find the percentage error in y.

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

Watch Video Solution

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

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171. If energy (E), velocity (v) and time (T) are fundamental units. What will be the dimension of surface tension?

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172. Assertion : SI system of units is a coherent system of units.

Reason : In this system, all the derived units can be easily obtained from basic and supplementary units.

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173. In defining the standard of length, we have to specify the temperature at which the measurement should be made. Are we justified in calling length a fundamental quantity, if another physical quantity (temperature) has to be specified in choosing a standard?

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174. why is it convenient to express the distancek of stars in terms of light year rather then in metre or kilometre ?

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175. Can there be a physical quantity, which has no units and no dimensions?

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176. Is the measurement of angle dependent on the unit of length?

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177. What is meant by angular diameter of moon ? What is its value?

Watch Video Solution

178. For a given base line, which will show a grater parallax - a distant star or a nearby star?

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179. Assertion : Parallax method cannot be used for measuring distance of stars morer then 100 light year away.

Reason : Because parallax angle reduces so much that it cannot be measured accurately.

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180. What is the difference between nm, mN, Nm ?

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181. Do all physical quantities have dimensions? If no, name three physcial quantities which are dimensionless.

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182. If 'slap' times speed equals power, what is the dimensional formula for 'slap' ?

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183. What is the SI unit of linear momentum?

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184. Using the principle of homogeneity of dimensions, which of the following is correct?

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

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186. What are the dimensions of a and b in the relation F = at + b x, whrer F is force and x is distance ?

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187. Name the physical quantites having dimensions $\left[M^1L^2T^{-2}\right]$.

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188. Write three physical quantities having dimensions $\left[ML^{-1}T^{-2}\right]$.

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189. If the units of force and length are doubled, then the unit of energy will be

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190. The velocity of a body is given by $v = At^2 + Bt + C$. If v and t are expressed in SI, what are the units of A,B and C?

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191. The retadation experienced by a moving motor boat after its, engine is cutoff at the instant t is given by $a = -kv^4$,where k is is a constant. If v_0 is the magnitude of velocity at the cutoff, find the magnitude of velocity at time t after the cutoff.

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192. The SI unit of energy is $J = kgm^2s^{-2}$, that of speed v is ms^{-1} and of acceleration a is ms^{-2} which of the formulae for kinetic energy (K) given below can you rule out on the basis of dimensional arguments (m stands for the mass of the body).

(a) $K = m^2v^3$ (b) $K = \frac{1}{2}mv^2$ (c) K= ma

(d) $K = \frac{3}{16}mv^2$ (e) $K = \frac{1}{2}mv^2 + ma$

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Watch Video Solution

195. The SI unit of energy is $J = kgm^2s^{-2}$, that of speed v is ms^{-1} and of acceleration a is ms^{-2} which of the formulae for kinetic energy (K) given below can you rule out on the basis of dimensional arguments (m

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Watch Video Solution

196. The SI unit of energy is $J = kgm^2s^{-2}$, that of speed v is ms^{-1} and of acceleration a is ms^{-2} which of the formulae for kinetic energy (K) given below can you rule out on the basis of dimensional arguments (m stands for the mass of the body).

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(d) $K = \frac{3}{16}mv^2$ (e) $K = \frac{1}{2}mv^2 + ma$

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197. Use principle of homogenity of dimensions to find which one of the following relations is correct : (i) $T^2 = 4\pi^2r^2$

(ii) $T^2 = \frac{4\pi^2 r^3}{G}$

(iii) $T^2 = \frac{4\pi^2 r^3}{GM}$

Watch Video Solution

198. Use principle of homogenity of dimensions to find which one of the following relations is correct : (i) $T^2 = 4\pi^2 r^2$

(ii) $T^2 = \frac{4\pi^2 r^3}{G}$

(iii) $T^2 = \frac{4\pi^2 r^3}{GM}$

Watch Video Solution

199. Use principle of homogenity of dimensions to find which one of the following relations is correct : (i) $T^2 = 4\pi^2 r^2$

(ii) $T^2 = \frac{4\pi^2 r^3}{G}$

(iii) $T^2 = \frac{4\pi^2 r^3}{GM}$

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200. The mean value of period of oscillation of a simple pendulum in an expreiment is 2.825 s. The arithmetic mean of all the absolute errors is 0.11 s. Round off the period of simple pendulum to approximate number of significant figures. Given resson.

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201. If n^{th} division of main scale coincides with $(n+1)^{th}$ divisions of vernier scale. Given one main scale division is equal to 'a' units. Find the least count of the vernier.

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202. if the velocity of light c, the constant of gravitation G and plank,s constant h be chosen os fundamentad units , find the dimensions of mass , length and time in terms of c , G and h.

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203. The velocity of a body falling freely under acceleration due to gravity g varies as $g^p h^q$ where h is decrease in height of the body. What are the values of p and q?

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

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205. A small steel ball of radius r is allowed to fall under gravity through a column of a viscous liquid of coefficient of viscosity η. After some time the velocity of the ball attains a constant value known as terminal velocity v_T. The terminal velocity depends on (i) the mass of the ball m (ii) η, (iii) r and (iv) acceleration due to gravity g . Which of the following relations is dimensionally correct?

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206. Derive dimensionally the relation :$S = ut + \frac{1}{2}at^2$.

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207. The specific heats of a gas are measured as $C_p = (12.28 \pm 0.2)$ units and C_(upsilon =(3.97 +- 03)` units. Find the value of gas constant R and percentage error in R.

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208. The heat dissipated in a resistance can be obtained by the measurement of resistance, current and time. If the maximum precentage error in the mesurement of these quanties is $\%, 2\%$ and 1% respectively. The maximum percentage error in the determination of the dissipated heat is -

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209. The work done by surface tension on rising water do height of h in a capillary tube of radius r is

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210. The length and breadth of a rectangle are measured as $(a \pm \triangle a)$ and $(b \pm \triangle b)$ respectively. Find relative error.

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211. The length and breadth of a field are measured as : $l = (120 \pm 2)m$ and $b = (100 \pm 5)m$, respectively. What is the area of the field?

Watch Video Solution

212. 1 ns is defined as

A. 10_9s of Kr-clock of 1650763.73 oscillations

B. 10_9s of Kr-clock uf 652189.63 oscillations

C. 10_9s of Cs-clock of 1650763.73 oscillations

D. 10_9s of Cs-clock of 9192631770 oscillations

Answer:

Watch Video Solution

213. Light year is used to measure

A. distance between stars

B. distance between atoms

C. stationary charge

D. none of these.

Answer:

Watch Video Solution

214. The angle subtended by a coin of radius 1 cm held at a distance of 80 cm from your eyes is

A. 1.43°

B. 0.72°

C. 0.0125°

D. 0.025°

Answer:

Watch Video Solution

215. Which of the following is true for the solid angle ?

A. $\delta\omega = \frac{\delta A \cos\theta}{r^2}$

B. $\delta\omega = \frac{\delta A \cos^2\theta}{r^2}$

C. $\delta\omega = \frac{\delta A \cos\theta}{r^3}$

D. $\delta\omega = \frac{\delta A \cos^2\theta}{r^3}$

Answer:

Watch Video Solution

216. 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 standard kilogram mass

D. The velocity of light in vacuum.

Answer:

Watch Video Solution

217. The dimensions of torque are :

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

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

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

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

Answer:

Watch Video Solution

218. $\left[ML^2T^{-2}\right]$ are dimensions of

A. force

B. moment of force

C. momentum

D. power

Answer:

Watch Video Solution

219. The dimension of coefficient of viscosity-

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

B. $\left[ML^{-3}T^{-4}\right]$

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

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

Answer:

Watch Video Solution

220. What is the unit of surface tension ?

A. Nm

B. Nm^2

C. Nm^{-1}

D. $N - s$

Answer:

Watch Video Solution

221. The dimensions of surface tension are

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

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

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

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

Answer:

Watch Video Solution

222. Find the dimensions of stress, strain and modulus of elasticity.

A. L

B. L^2

C. it is dimensionless

D. `ML^-1 T^-2

Answer:

Watch Video Solution

223. Units and dimensions of bulk modulus are those of

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

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

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

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

Answer:

Watch Video Solution

224. The dimensions of Planck's constant are

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

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

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

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

Answer:

Watch Video Solution

225. The dimension of a quantity $\frac{h\gamma}{c}$ where h is the planck's constants, γ is the frequency and c is the velocity of light are :

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

B. $\left[MLT^{01}\right]$

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

D. `[ML^2 T^2]

Answer:

Watch Video Solution

226. Which one of the following pair of quantities has same dimension ?

A. force and work done

B. momentum and impulse

C. pressure and force

D. surface tension and stres

Answer:

Watch Video Solution

227. Which one of the following have same dimensions?

A. torque and force

B. torque and potential energy

C. potential energy and force

D. Planck's constant and momentum

Answer:

Watch Video Solution

228. Dimensions of Hubble's constant are

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

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

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

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

Answer:

Watch Video Solution

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

A. Resistance

B. Inductance

C. Capacitance

D. Magnetic Flux

Answer:

Watch Video Solution

230. Which of the following is not true for solid-liquid equilibrium?

A. $S\infty = 8A\frac{\cos 0}{r^2}$

B. `dco = 8Acos20/r^2

C. $Sco = 8A\frac{\cos 0}{r^3}$

D. $Sco = 8A\cos 2\frac{0}{r^3}$

Answer:

Watch Video Solution

231. 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 standard kilogram mass

D. The velocity of light in vacuum.

Answer:

Watch Video Solution

232. The dimensions of torque are :

A. [ML2T2]

B. [MLV2]

C. [M2L2T“2]

D. [MLT-1]

Answer:

Watch Video Solution

233. The dimension of coefficient of viscosity is :

A. ~[MLT^-1T^-1]`

B. $\left[ML^{-3}T^{-4}\right]$

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

D. $MLT^{2}\right]$

Answer:

Watch Video Solution

234. What is the unit of surface tension ?

A. $\left[ML^{1}T60\right]$

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

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

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

Answer:

Watch Video Solution

235. Dimensional formula for strain is

A. L

B. L^2

C. I is dimensions

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

Answer:

Watch Video Solution

236. Which one of the following pair of quantities has same dimension ?

A. force and work done

B. momentum and impulse

C. pressure and force

D. surface tension and stress

Answer:

Watch Video Solution

237. Which one of the following have same dimensions?

A. torque and force

B. torque and potential energy

C. potential energy and force

D. Planck's constant and momentum

Answer:

Watch Video Solution

238. Dimension's of planck's constant are the same as the dimensions of the product of

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

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

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

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

Answer:

Watch Video Solution

239. Which of the following quantities can be written in SI units in $kgm^{2}A^{-2}s^{-3}$

A. Resistance

B. Inductance

C. Capacitance

D. Magnetic Flux

Answer:

Watch Video Solution

240. The unit of Planck's constant is

A. J/s

B. Js^2

C. Js

D. Js^{-2}

Answer:

Watch Video Solution

241. 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. 1,000 kg

B. 1 kg

C. 10,000 kg

D. 100 kg

Answer:

Watch Video Solution

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

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

B. [MLT^-1] and [MLT^0]`

C. [MLT^-3] and [MLT^4]`

D. [MLT^-4] and [MLT^1]`

Answer:

Watch Video Solution

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

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

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

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

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

Answer:

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244. The equation of state of some gases can be expressed as $\left(P+\frac{a}{V^2}\right)(V-b)=RT$, where P is the pressure, V is the volume, T is the absolute temperature and a, b & R are constants. The dimensions of 'a' are : -

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

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

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

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

Answer:

Watch Video Solution

245. The equation $\left(P+\frac{a}{V^2}\right)(V-b)$ constant. The units of a are

A. $dy \neq \times cm^5$

B. $dy \neq \times cm^4$

C. D$dy \neq cm^{-3}$

D. $dy \neq cm^{-2}$

Answer:

Watch Video Solution

246. In the van der Waals equation

A. $atm^{-2}mol^2$

B. $atmL^2permol$

C. $atmL^{-1}mol - 2$

D. $atmL2mol^{-2}$

Answer:

Watch Video Solution

247. In the relation, y =rsin(w + kx),the dimensional formula for kx or cot is same as

A. r/w

B. r/y

C. wt/r

D. yr/wt

Answer:

Watch Video Solution

248. Given that the displacement of an oscillating particle is given by $y = A\sin(Bx + Ct + D)$. The dimensional formula for $(ABCD)$ is

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

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

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

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

Answer:

Watch Video Solution

249. The significant figures in the number 6.0023 are

A. 1

B. 5

C. 4

D. 2

Answer:

Watch Video Solution

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

A. 4.431 cm

B. 4.43 cm

C. 4.4 cm

D. 2

Answer:

Watch Video Solution

251. If error in radius is 3% whast is error in volume of sphere?

A. 0.03

B. 0.27

C. 0.09

D. 0.06

Answer:

Watch Video Solution

252. The least count of stop watch is 0.5s. The time of 40 oscillation of the pendulum is found to be 40s. The percentage error in the measurement of time period is ..... %

A. 0.0025

B. 0.005

C. 0.0075

D. 0.0125

Answer:

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253. The measurement of a physical quantity is basically the process of _____.

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254. The physical quantities whose defining operations arebased onother physical quantities are called_____ quantities

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255. The relative density of mercury is 13.6. ILS density is _ gcm^{-3} or $_kgm^{-3}$

Watch Video Solution

256. 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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257. The dimensional formula for Planck's constant (h) is _____

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258. In the followng dimensionally correct equation for force, $F = \frac{x}{D}ensity = Y$ the dimensional formula for X_is __ and hat for Y____.

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259. The number of wavelengths of orange-red radia tion of Kr-86 contained in one metre are____.

Watch Video Solution

260. Imagine a system of units in which the unit of mass is 100 kg, length is 1 km and time is 1 minute Then 1 joule in this system is equal to

Watch Video Solution

261. E, m, L, G denote energy mass, angular momentum & gravitation constant respectively. The dimensions of $\frac{EL^2}{m^5G^2}$ will be that of :

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262. 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.

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263. Give the number of significant figure in $2.64 \times 10^{24} Kg$.

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264. In the simplification of `2.13x24.78 /458.2, the numberof significant figures must be_____.

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265. The diameter of circle is 1.06m. Calculate the area enclosed by the circle in correct number of significant figures.

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266. The errors which tend to occur in one direction,positive or negative, are called errors.

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267. The maximum fractional error in the quotient of two quantities is equal to the _____of their individual fractional errors.

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

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269. A physical quantity $P = a^3 \frac{b^2}{c} d$. If the percentageerrors in the measurement of a, b, c and d are 1%, 2%, 3% and 4% then the percentage error in P_____.

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270. A physical quantity X is given by

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

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

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271. Define length.

Watch Video Solution

272. Define a prototype metre

Watch Video Solution

273. Define standard metre in terms of the wavelength of light.

Watch Video Solution

274. What is the accuracy of the metre defined in terms of wavelength of light radiation ?

Watch Video Solution

275. Define standard metre in terms of velocity of light.

Watch Video Solution

276. How many light years are there in 1 metre?

Watch Video Solution

277. Define Astronomical unit, light year and parscond. Establish relation between them.

Watch Video Solution

278. Give the relation between light year and AU

Watch Video Solution

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

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280. Express 1 parsec in terms of meters . What its order of magnitude .

Watch Video Solution

281. Express 1 parsec in terms of meters . What its order of magnitude .

Watch Video Solution

282. Write in ascending order : light year, astronomical unit, par sec.

Watch Video Solution

283. Name two commonly used units for wavelength of light.

Watch Video Solution

284. Express 1 micro in metre.

Watch Video Solution

285. Name the unit used to measure size of a nucleus and express it in metre

Watch Video Solution

286. Express nanometre in terms of metre and angstrom units.

Watch Video Solution

287. Express the wavelength of yellow light (5893 A) in terms of nm.

Watch Video Solution

288. How many nanometres are there in one metre ?

Watch Video Solution

289. How many Angstrom are there in one metre ?

Watch Video Solution

290. One fermi is

Watch Video Solution

291. How many light years are there in 1 metre?

Watch Video Solution

292. Write the full name of the technique used in locating an under-water obstacle

Watch Video Solution

293. How far away is the nearest star alpha centuri from earth ?

Watch Video Solution

294. What is the size of out galaxy ?

Watch Video Solution

295. Mean free path of a gas molecule is

Watch Video Solution

296. What is the shortest distance measured indirectly so far ?

Watch Video Solution

297. What is the estimated size of observable universe ?

Watch Video Solution

298. Which unit is used for measuring nuclear area of cross-section ?

Watch Video Solution

299. What does the word RADAR stand for ? Also define it.

Watch Video Solution

300. What does the acronym SONAR stand for ?

Watch Video Solution

301. What does the word LASER stand for ?

Watch Video Solution

302. What is a laser ?

Watch Video Solution

303. Express 1 light year in terms of metre. What is its order of magnitude?

Watch Video Solution

304. What types of waves are used in a SONAR ?

Watch Video Solution

305. Define atomic mass unit. Express it in kg.

Watch Video Solution

306. Define international standard of mass.

Watch Video Solution

307. Define atomic mass unit. Express it in g.

Watch Video Solution

308. How many times larger is a kg then an mg ?

Watch Video Solution

309. How may metric tone are there in a teragram?

Watch Video Solution

310. What is the order of mass of an electron ?

Watch Video Solution

311. What is mass of universe ?

Watch Video Solution

312. What is the smallest mass measured indirectly so far?

Watch Video Solution

313. Why has 'second' been defined in terms of periods of radiation from Cesium -133 ?

Watch Video Solution

314. Human heart is an inbuilt clock. Comment

Watch Video Solution

315. Which is the most accurate atomic clock ?

Watch Video Solution

316. Which technique is used for measuring age of rocks, fossils etc.

Watch Video Solution

317. How many times is a millisecond larger then a microsecond ?

Watch Video Solution

318. How many microseconds in a second and How many number of seconds in a year ?

Watch Video Solution

319. What is the order of age of the earth ?

Watch Video Solution

320. Give the order of average life of a human being

Watch Video Solution

321. Wlidt is the shortest time interval measured indirectly so far ?

Watch Video Solution

322. The SI unit of temperature is

Watch Video Solution

323. The SI unit of electric current is

Watch Video Solution

324. The SI unit of luminous intensity is

Watch Video Solution

325. Define the mole fraction of a substance in solution.

Watch Video Solution

326. What is the probability that a leap year has 53 Sundays ?

Watch Video Solution

327. Name the pigment which can absorb solar energy.

Watch Video Solution

328. The density of wood is $0.5g/$ what is its value is SI?

Watch Video Solution

329. The radius of the sun is 696,0000 m. Express it in scientific notation (in power, of 10).

Watch Video Solution

330. Express 0.00000538 in powers of 10.

Watch Video Solution

331. The magnitude of any physical quantity

Watch Video Solution

332. Explain the principle of homogeneity of dimensions. What are its uses? Given example.

Watch Video Solution

333. Which of the following has the same dimension as Planck's constant : Torque, gravitational constant, angular momentum ?

Watch Video Solution

334. What are the dimensions of rate of flow?

Watch Video Solution

335. What is the differecne between the measurements 4.0 cm and 4.000 cm ?

Watch Video Solution

336. What significance is attached to the final zeros in a number without any decimal point ?

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337. How many significant figures are 750

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338. How many significant figures 0.00320

Watch Video Solution

339. If / = x , then relative error in / would be how many times the relative error in x ?

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340. A research worker takes 100 observations in an experiment . If he repeats the same experiment by taking 500 observation , how is the probable error affected?

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341. Give two examples of non dimensional veriables.

Watch Video Solution

Watch Video Solution

342. Name any three dimensional constants.

Watch Video Solution

343. Name any two non dimensional constant.

Watch Video Solution

344. Write the dimensional formula of wavelength and frequency of a wave

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

347. The number of significant figures in 0.007 is

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348. State the number of significant figures in $2.67 \times 10^{-24} kg$

Watch Video Solution

349. How can a systematic error be eliminated ?

Watch Video Solution

350. Name the physical quantity used to express the amount of water vapour presentin air.

Watch Video Solution

351. Write the number of significant figures in each of the measurement :-

$1.67 \times 10^{-27} kg$

Watch Video Solution

352. Write the number of significant figures in each of the measurement:-

0.270 cm

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353. Add 8.2 and 10.163 and round off the sum to proper number of significant figures.

Watch Video Solution

354. Give approximate ratio of 1 AU and 1 light year.

Watch Video Solution

355. How many kilograms are there in 1 amu ?

Watch Video Solution

356. What do you understand by absolute error ?

Watch Video Solution

357. Write the dimensional formula of stress

Watch Video Solution

358. The dimensional formula of coefficient of viscosity is

Watch Video Solution

359. What is meant by the term measurement of a physical quantity? How is the result of measurement of a physcial quantity expressed?

Watch Video Solution

360. Define light year.

Watch Video Solution

361. Define Astronomical unit, light year and parscond. Establish relation between them.

Watch Video Solution

362. Distinguish between mass and weight.

Watch Video Solution

363. Which technique is used for the herd improvement ?

Watch Video Solution

364. In what way is the knowledge of the dimensions of a physical quanntity useful?

Watch Video Solution

365. Distinguish between the dimwnsions and unit of a physical quantity?

Watch Video Solution

366. Define least count error. What is the value of least count error associated with the scale inyour geometry box?

Watch Video Solution

367. State the principle of homogeneity of dimensions.Test the dimensional homogeneity of the following equations:- $h = h_0 + v_0 \cdot t + \frac{1}{2} g \cdot t^2$

Watch Video Solution

368. If $x = 2at - 5bt^2$, where x is in metre and t is in seconds, find the dimensions of a//b.

Watch Video Solution

369. Differentiate between dimensional and non-dimensional variables.

Watch Video Solution

370. Differentiate between dimensional and non-dimensional constants.

Watch Video Solution

371. Name any three physical quantites having the same dimensions and also give their dimensions.

Watch Video Solution

372. Dimensional formula of the physical quantity, resistance is

Watch Video Solution

373. What are the dimensional formulas of the physical quantity ,- angular velocity

Watch Video Solution

Watch Video Solution

374. What are the dimensional formulas of the physical quantity ,- pressure

Watch Video Solution

375. What are the dimensional formulas of the physical quantity ,- Planck's constant

Watch Video Solution

376. Thd dimensional formula of pressure is

Watch Video Solution

377. What are the dimensiona formulae of the power

Watch Video Solution

378. What are the dimensional formula of the density

Watch Video Solution

379. The unit of solid angle is steradian. What is the dimensional formula for steradian?

Watch Video Solution

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

Watch Video Solution

381. In the division of two quantities, the maximum value of fractional error is equal to

Watch Video Solution

382. If $Q = \frac{X^n}{Y^m}$ and ΔX is absolute error in the measurement of X, ΔY is absolute error in the measurement of Y, then absolute error ΔQ in Q is :

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383. Show that the maximum fractional error in the product of two quantities is equal to the sim of the fractional errors in the individual quantities.

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384. Calcualte the fractional error $\left(\frac{\Delta x}{x}\right)$, if $x = a^n$,

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385. Assertion : Parallax method cannot be used for measuring distance of stars morer then 100 light year away.

Reason : Because parallax angle reduces so much that it cannot be measured accurately.

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386. Inferior planets are

Watch Video Solution

387. Write a note on radar method to measure larger distances.

Watch Video Solution

388. COMPARISION OF INERTIAL MASS AND GRAVITATIONAL MASS

Watch Video Solution

389. Statement-I: Dimensional analysis can give us the numerical value of proportionality constants that may appear in an algebraic expression.

Statement-II: Dimensional analysis make use of the fact that dimensions can be treated as algebraic quantities.

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390. What is meant by error in measurements ? Give an example.

Watch Video Solution

391. 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.

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392. How is absolute error different from mean absolute error?

Watch Video Solution

393. If the relative error in measuring the radius of a circular plane is α, find the relative error in measuring its area.

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394. The percentage error in measurement of a physical quantity [m given by $m = \pi \tan\theta$] is minimum when

(Assume that error in θ remain constant)

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395. Show that the percentage error in the nth root of a number is approximately $\frac{1}{n}$ times the percentage error in the number.

Watch Video Solution

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

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

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

C. $\left[ML^{-5}T^{-1}\right]$

D. $\left[ML^5T^{-1}\right]$

Answer:

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397. Pressure depends on distance as, $P=\frac{\alpha}{\beta}\exp\left(\frac{-\alpha z}{k\theta}\right)$, where α, β are constants, z is distance, k is Boltzmann's constant and θ is temperature. The dimensions of β are :

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

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

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

D. [M^-1L^-1T^2]`

Answer:

Watch Video Solution

398. The dimensions of $\frac{1}{2}\varepsilon_0 E^2 (\varepsilon_0 =$ permittivity of free space, $E =$ electric field) is

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

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

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

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

Answer:

Watch Video Solution

399. (a) In the formula $X = 3YZ^2$, X and Z have dimensions of capcitnce and magnetic inlduction, respectively. What are the dimensions of Y in $MKSQ$ system?

(b) A qunatity X is given by $\varepsilon_0 \, L \, \dfrac{(\Delta)V}{(\Delta)r}$, where ε_0 is the permittivity of free space, L is a lenght, ΔV is a potential difference and Δt is a time interval. Find the dimensions of X.

(c) If E, M, J and G denote energy , mass , angular momentum and gravitational constant, respectively. find dimensons of $\dfrac{EJ^2}{M^5G^2}$

(d) If e, h, c and ε_0 are electronic charge, Planck 's constant speed of light and permittivity of free space. Find the dimensions of $\dfrac{e^2}{2\varepsilon_0 hc}$.

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

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

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

D.

Answer:

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400. 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. Resistance

B. charge

C. voltage

D. current

Answer:

Watch Video Solution

401. Which of the following sets have different dimensions ?

A. Pressure, Young's modulus, stress

B. Emf, potential difference, electric potential

C. Heat, work done, energy

D. Dipole moment, electric flux, electric field

Answer:

Watch Video Solution

402. A cube has a side of length $1.2 \times 10^{-2} m$. Calculate its volume

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

B. $1.73x10^{-6} m^3$

C. $1.0 \times 10^{-6} m^3$

D. 1.732xx10^-6m^3`

Answer:

Watch Video Solution

403. A student performs an experiment an for determination of $g\left(=\frac{4\pi^2 l}{T^2}\right)$. The error in length l is Δl and in time T is ΔT and n is number of times the reading is taken. The measurment of g is most accurate for

A. 5mm

B. 5mm

C. 5mm

D. 1mm

Answer:

Watch Video Solution

404. A student performs an experiment to determine the Young's modulus of a wire, exactly$2m$ long, by Searle's method. In a partcular reading, the student measures the extension in the length of the wire to be $0.8mmwithanuncerta\int yof$+- 0.05mm$ataloadofexactly$1.0kg

, $thestudentalsomeasuresthediameterofthewire \rightarrow be$04mm $withanuncerta \int yof$+-0.01mm. $Take$g=9.8m//s^(2)` (exact). the Young's modulus obtained from the reading is

A. 1

B. 2

C. 3

D. 4

Answer:

Watch Video Solution

405. 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. $(2.0 \pm 03)x10^{11} \frac{N}{m^2}$

B. $(2.0 \pm 02)x10^{11} \frac{N}{m^2}$

C. $(2.0 \pm 0.1)x10^{11} \frac{N}{m^2}$

D. $(2.0 \pm 0.05)x10^{11} \frac{N}{m^2}$

Answer:

Watch Video Solution

406. A vernier calipers has $1mm$marks on the main scale. It has 20 equal divisions on the Verier scale which match with 16 main scale divisions. For this Vernier calipers, the least count is

A. 0.02mm

B. 0.05mm

C. 0.1mm

D. 0.2mm

Answer:

Watch Video Solution

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

A. 5.112cm

B. 5.124cm

C. 5.136cm

D. 5.148cm

Answer:

Watch Video Solution

408. In a screw gauge, the zero of mainscale coincides with fifth division of circular scale in figure (i). The circular division of screw gauge are 50. It moves $0.5mm$ on main scale In one rotation. The diameter of the ball in

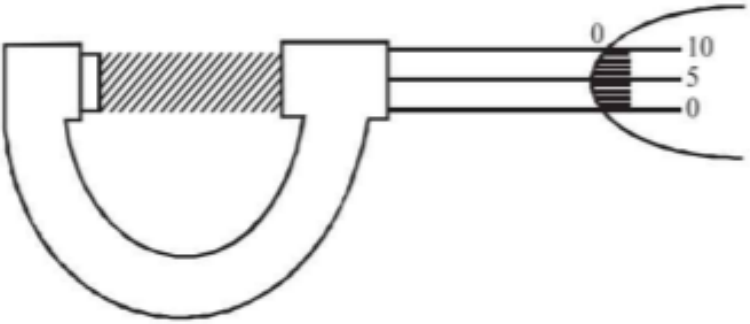
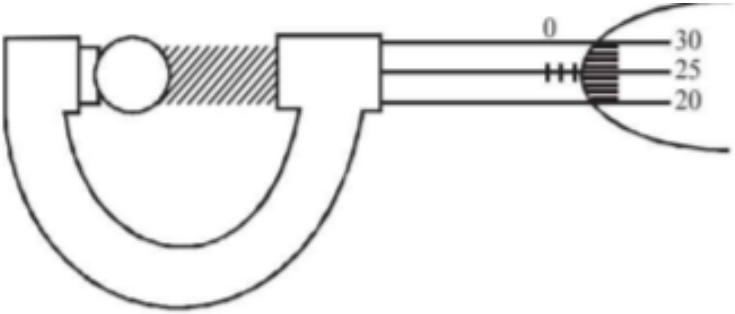


Figure (i)

figure (ii) is



A. 2.25mm

B. 2.20mm

C. 1.20mm

D. 1.25mm

Answer:

Watch Video Solution

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

A. 0.009

B. 0.024

C. 0.031

D. 0.042

Answer:

Watch Video Solution

410. In the determination of Young's modulus $\left(Y = \frac{4MLg}{\pi / d^2}\right)$ by using Searle's method, a wire of length L= 2 m and diameter d = 0.5 mm is used. For a load M = 2.5 kg, an extension l = 0.25 mm in the length of the wire is observed. Quantities d and l are measured using a screw gauge and a micrometer, respectively. The have the same pitch of 0.5 mm. The number of divisions on their circular scale is 100. The contributions to the maximum probable error of the Y measurement

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

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

C. due to the rror in the measrement of l is twice that due to the error in the measurement of d

D. due to the error in the measurement of disfour times that due to the errors in the measurement of l

Answer:

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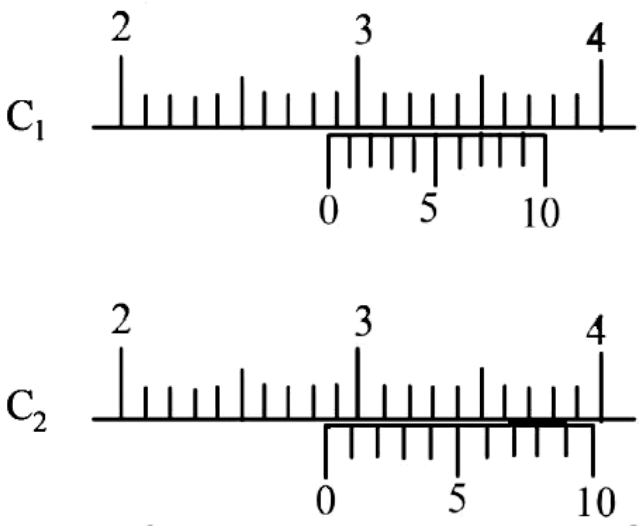
411. There are two Vernier calipers both of which have $1cm$ divided into 10 equal divisions on the main scale. The vernier scale of the calipers (c_1) has 10 equal divisions that correspond to 9 main scale divisions. The Vernier scale of the other calipers (C_2) has 10 equal divisions tgat correspond to 11 main scale divisions. the reading of the two calipers are shown in the figure. the measured values (in cm) by calipers C_1 and C_2 respectively, are



A. 2.87 and2.86

B. 2.85 and 2.82

C. 2.87 and 2.8

D. 2.87 and 2.83

Answer:

Watch Video Solution

412. A person measures the depth of a well by measuring the time interval between dropping a stone and receiving the sound of impact with the bottom of the well. The error in his measurement of time is $e < aT = 0.01$ seconds and he measures the depth of the well to be $L = 20$ meters. Take the acceleration due to gravity $g = 10ms^{-2}$ and the velocity of sound is $300ms^{-1}$. Then the fractional error in the measurement, $\delta L / L$, is closest to

A. 0.002

B. 0.03

C. 0.05

D. 0.01

Answer:

Watch Video Solution

413. The dimensions of the quantities in one (or more) of the following pairs are the same . Identify the pair(s)

A. Torque and work

B. Angular momentum and work

C. Energy and Young's modulus

D. Light year and wavelength

Answer:

Watch Video Solution

414. The pairs of physical quantities that have the same dimensions are :

A. Reynold number and coefficient of friction

B. Curie and frequency of a light wave

C. Latent heat and gravitational potential

D. Planck's constant and torque

Answer:

Watch Video Solution

415. The dimensions of length are expressed as $G^x c^y h^z$, where G, c and h are the universal gravitational constant, speed of light and Planck's constant respectively, then :

A. x=(1/2), y=(1/2)

B. x=(1/2), z=(1/2)

C. y=(-3/2), z=(1/2)

D. y=(1/2), z=(3/2)

Answer:

Watch Video Solution

416. Planck's constant h, speed of light c and gravitational constant G are used to from a unit of length L and a unit of mass M. Then the correct option (s) is / (are)

A. $M \propto \sqrt{c}$

B. $M \propto \sqrt{G}$

C. $L \propto \sqrt{h}$

D. $L \propto \sqrt{G}$

Answer:

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

A. $weber / ampere$

B. $vo < -\sec / amp$

C. $joe / (ampere)^2$

D. ohm-second

Answer:

Watch Video Solution

418. L, C and R represent the physical quantities, inductance, capacitance and resistance respectively. The combination(s) which have the dimensions of frequency are

A. $\frac{1}{\sqrt{C}} L$

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

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

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

Answer:

Watch Video Solution

419. Which of the followin combinations have the dimensions of time? L, C, R represent inductance, capacitance and resistance, respectively. Choose the incorrect option.

A. RC

B. $\sqrt{L}C$

C. R/L

D. C/L

Answer:

Watch Video Solution

420. If M = mass, L = length, T = time and I = electric current, then the demensional formula of resistance R will be given by

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

B. $[\varepsilon_0]$ =M^-1 L^-3 T^4 I^2`

C. $[\mu_0]$ =M L T^-2 I^-2`

D. $[\mu_0]$ =M L^2 T^-1 I`

Answer:

Watch Video Solution

421. In terms of potential difference V, electric current I, permitivity ε_0, permeability μ_0 and speed of light c, the dimensionally correct equations (s) is (are) :

A. $\mu_0 I^2 = \varepsilon_0 V^2$

B. $\varepsilon_0 I = \mu_0 V$

C. $I = \varepsilon_0 cV$

D. $\mu_0 cI = \varepsilon_0 V$

Answer:

Watch Video Solution

422. A student uses a simple pendulum of exactly $1m$ length to determine g, the acceleration due ti gravity. He uses a stop watch with the least count of $1\sec$ for this and record $40\sec onds$ for 20 oscillations for this observation, which of the following statement $(s)is(are)$ true?

A. Error $\triangle T$ in measuring T, the time period, is 0. 05 second

B. Error $\triangle T$ in measuring T, the time period, is 1 second

C. Percentage error in the determination of g is 5%

D. Percentage error in the determination of g is 2.5%

Answer:

Watch Video Solution

423. Using the expression $2d \sin\theta = \lambda$, one calculates the values of d by measuring the corresponding angles θ in the range $0 \rightarrow 90 \circ$. The wavelength λ is exactly known and error in θ is constant for all values of θ. As θ increases from $0 \circ$

A. the absolute error in d remains constant

B. the absolute error in d increases

C. the fractional error in d remains constant

D. the fractional error in d decreases

Answer:

Watch Video Solution

424. Consider a Vernier callipers in which each $1cm$ on the main scale is divided into 8 equal divisions and a screw gauge 5 divisions of the Vernier

scale coincide with 4 divisions on the main scale and in the screw gauge, one complete rotation of the circular scale moves it by two divisions on the linder scale. Then:

A. If the pitch of the screw gauge is twice the least count of the Vernier callipers, the least cow1t of the screw gauge is 0. 01 mm.

B. If tlie pildrnf lite screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.005 mm.

C. If the least count of the linear scale of the screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.01 mm.

D. If the least count of the linear scale of the screw gauge is twice the least count of the Vernier callipers, the least count of the screw gauge is 0.005 mm.

Answer:

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425. In an experiment to determine the acceleration due to gravity g, the formula used for the time period of a periodic motion is $T = 2\pi\sqrt{\left(7\frac{R-r}{5g}\right.}$. The values of R and r are measured to be $(60 \pm 1)mm$ and $(10 \pm 1)mm$, repectively. In five successive measurment, the time period is found to be $0.52s, 0.56s, 0.57s, 0.54s$ and $0.59s$. the least count of the watch used for the measurement of time period is $0.01s$. Which of the following satement (s) is (are) true?

A. The error in the measurement of r is 10%

B. The error in the measurement of Tis 3.57%

C. The error in the measurement of Tis 2%

D. The error in the determined value of g is 11 %

Answer:

Watch Video Solution

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

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

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

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

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

Answer:

Watch Video Solution

427. Dimension of $\frac{1}{\mu_0 \varepsilon_0}$, where symbols have usual meaning, are

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

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

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

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

Answer:

Watch Video Solution

428. Identify the pair whose dimensions are equal

A. torque and work

B. stress and energy

C. force and stress

D. force and work

Answer:

Watch Video Solution

429. Out of the following pairs, which one does not have identical dimensions?

A. Moment of inertia and moment of a force

B. Work and torque

C. Ang ular momentum and Planck's constant

D. Impulse and momentum

Answer:

Watch Video Solution

430. The physical quantities not having the same dimensions are

A. torque and work

B. Momentum and Plank's Constant

C. Stress and Young's Modulus

D. speed and $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

Answer:

Watch Video Solution

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

A. henry (H)

B. weber (Wb)

C. Wbm^{-2}

D. Hm^{-2}

Answer:

Watch Video Solution

432. The dimension of magnetic field in M, L, T and C (Coulomb) is given as :

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

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

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

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

Answer:

Watch Video Solution

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

A. 4,4,2

B. 5,1,2

C. 5,1,5

D. 5,5,2

Answer:

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434. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of the wire is

A. 0.06

B. zero

C. 0.01

D. 0.03

Answer:

Watch Video Solution

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

A. 0.02

B. 0.03

C. 0.01

D. 0.05

Answer:

Watch Video Solution

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

A. 0.2 mA

B. 0.02 mA

C. 0.5 mA

D. 0.05 mA

Answer:

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437. Two full turns of the circular scale of a screw gauge cover a distance of 1 mn on its its main scale . The total number of divisions on the circular scale is 50. Further m it is found that the screw gauge has a zero error of - 0.02 mm . While measuring the diameter of a thin wire , a student notes the main scale reading of 4 mm and the number of circular scale divisions in line with the main scale as 37. The diameter of the wire is

A. 3.32 mm

B. 3.73 mm

C. 3.67 mm

D. 3.38 mm

Answer:

Watch Video Solution

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

Main scale reading : $0mm$

Circular scale reading : $52 \div isions$

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

A. 0.52 cm

B. 0.052 cm

C. 0.026 cm

D. 0.005 cm

Answer:

Watch Video Solution

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

A. A meter scale

B. A vernier callipers where the 10 divisions in vernier scale match with 9 divisions in main scale and main scale has 10 divisions in 1 cm.

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

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

Answer:

Watch Video Solution

440. In a experiment the angle are required to be measured using an instrument. 26 divisions of the main scale exactly coincide with the 30

divisions of the vernier scale . If the smallest division of the main scale is half -a-degree ($= 0.5^{\circ}$) then the least count of the instrument is .

A. one minute

B. half minute

C. one degree

D. half degree

Answer:

Watch Video Solution

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

Main scale reading : $58.5 degree$

Vernier scale reading : 09 divisions

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

A. 58.59 degree

B. 58.77 degree

C. 58.65 degree

D. 59 degree

Answer:

Watch Video Solution

442. 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 . $Ifthe \min i\mu m \div ision \in themeasur \in gclockis1$ s`, then the reported men time should be:

A. $92 \pm 5.0s$

B. $92 \pm 1.8s$

C. $92 \pm 3s$

D. $92 \pm 2s$

Answer:

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

A. 0.025

B. 0.035

C. 0.045

D. 0.06

Answer:

Watch Video Solution

444. The following observations were taken for dtermining the surface tension of water by capillary tube method: diameter of capillary , $D = 1.25 \times 10^{-2} m$ and rise of water in capillary , $h = 1.45 \times 10^{-2} m$. Taking $g = 9.80 ms^{-2}$ and using the relation $T = (rgh/2) \times 10^3 Nm^{-1}$, what is the possible error in measurement of surface tension T?

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

A. 0.0015

B. 0.015

C. 0.024

D. 0.1

Answer:

Watch Video Solution

445. A screw gauge with a pitch of $0.5mm$ and a circular scale with 50 divisions is used to measure the thicknes of a thin sheet of Aluminium.

Before starting the measurement, it is found that wen the jaws of the screw gauge are brought in cintact, the 45^{th} division coincide with the main scale line and the zero of the main scale is barely visible. what is the thickness of the sheet if the main scale readind is $0.5mm$ and the $25th$ division coincide with the main scale line?

A. 0.80 mm

B. 0.70 mm

C. 0.50 mm

D. 0.75 mm

Answer:

Watch Video Solution

446. How many Angstrom are there in one metre ?

A. 15,53,164.13

B. 16,50,763.73

C. 23,48,123.73

D. 6,52,189.63

Answer:

Watch Video Solution

447. One nanometre is equal to

A. $10^9 mm$

B. $10^{-6} cm$

C. $10^{-7} cm$

D. $10^{-9} m$

Answer:

Watch Video Solution

448. Light year is the unit of

A. time

B. distance

C. velocity

D. intensity of light

Answer:

Watch Video Solution

449. Parsec' is the unit of :

A. time

B. distance

C. frequency

D. angular momentum

Answer:

Watch Video Solution

450. Length cannot be measured by

A. fermi

B. debye

C. micron

D. light year

Answer:

Watch Video Solution

451. The difference in the lengths of a mean solar day and a sidereal day is about

A. 1 minute

B. 4 minutes

C. 15 minutes

D. 56 minutes

Answer:

Watch Video Solution

452. Gravitational mass is proportional to gravitational

A. field

B. force

C. intensity

D. all of these

Answer:

Watch Video Solution

453. 'SONAR' emits which of the following waves

A. radio

B. light

C. ultrasound

D. none of these

Answer:

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454. The dimension of torque is:

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

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

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

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

Answer:

Watch Video Solution

455. What is the dimensional formula of gravitational constant ?

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

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

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

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

Answer:

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456. Angular velocity

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

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

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

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

Answer:

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457. Which of the following physical quantities has neither dimensions nor unit ?

A. work

B. power

C. pressure

D. impulse

Answer:

Watch Video Solution

458. Modulus of rigidity .

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

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

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

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

Answer:

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459. The dimensions of Planck's constant are

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

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

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

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

Answer:

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460. Dimensions $\left[ML^{-1}T^{-1}\right]$ are related to

A. work

B. torque

C. energy

D. coefficient of viscosity

Answer:

Watch Video Solution

461. Which of the following is dimensionless quantity ?

A. Strain

B. Stress

C. Specific heat

D. Quantity of heat

Answer:

Watch Video Solution

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

A. stress and pressure

B. angle and strain

C. tension and surface tension

D. Planck's constant and angular momentum

Answer:

Watch Video Solution

463. Dimensions of electrical resistence are

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

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

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

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

Answer:

Watch Video Solution

464. The magnetic moment has dimensions of

A. $[LA]$

B. $\left[L^2A\right]$

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

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

Answer:

Watch Video Solution

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

A. impulse and momentum

B. moment of inertia and moment of force

C. angular momentum and Planck's constant

D. work and torque

Answer:

Watch Video Solution

466. 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:

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467. Force is given by the expression F = A cos (Bx) + C cos (Dt), where x is displacement and t is time. The dimension of $\frac{D}{B}$ is same as that of

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

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

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

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

Answer:

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468. The pressure on a square plate is measured by measuring the force on the plate and the length of the sides of the plate by using the formula $p = \frac{F}{l^2}$. If the maximum errors in the measurment of force and length are 4% and 2% respectively. Then the maximum error in the measurment of pressure is

A. 0.01

B. 0.02

C. 0.08

D. 0.1

Answer:

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469. Suppose a quantilty x can be dimensionally represented in terms of M,L and T, that is $[x]$, $M^aL^bT^c$. The quantity mass

A. may be represented in terms of L, T andy if a = 0

B. may be represented in terms of L, T andy if $a \neq 0$

C. can always be dimensionally represented in terms of L, T and y

D. can never be dimensionally represented in terms of L, T andy.

Answer:

Watch Video Solution

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

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

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

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

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

Answer:

Watch Video Solution

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

A. 2.34 kg, 0 g

B. 2.3 kg, 0. 02 g

C. 2.34 kg, 0. 02 g

D. 2.3 kg, 0 g

Answer:

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472. 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:

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473. The percentage error in measuring M, L and T are 1%, 1.5% and 3% respectively. Then the percentage error in measuring the physical quantity with dimensions $ML^{-1}T^{-1}$ is :

A. 0.01

B. 0.035

C. 0.03

D. 0.055

Answer:

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474. The dimensions of impulse are equal to that of

A. pressure

B. linear momentum

C. force

D. angular momentum

Answer:

Watch Video Solution

475. The dimensions of Planck's constant are

A. energy

B. momentum

C. angulur momentum

D. angulur momentum

Answer:

Watch Video Solution

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

A. time

B. frequency

C. angular momentum

D. velocity

Answer:

Watch Video Solution

477. The dimensions of RC is equal to :

A. square of time

B. square of inverse time

C. time

D. inverse time.

Answer:

Watch Video Solution

478. Which of the following dimensions will be the same as that of time?

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

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

C. LC

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

Answer:

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479. The unit of permittivity of free space ε_0 is:

A. coulomb/newton-metre

B. $\neq w \to n - metr\frac{e^2}{c}o\underline{o}mb^2$

C. $co\underline{o}m\frac{b^2}{\neq}w \to n - metre^2$

D. $co\underline{o}m\frac{b^2}{(\neq w \to n - metre)^2}$

Answer:

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480. The dimensional formula for magnetic flux is

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

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

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

D. $ML^2T^{-1}A^3$

Answer:

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481. The dimensional formula for permeability of free space, μ_0 is

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

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

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

D. all of these

Answer:

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482. Which pair do not have equal dimensions?

A. Energy and torque

B. Force and impulse

C. Angular momentum and Planck's constaul

D. Elastic modulus and pressure.

Answer:

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483. 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 voltage and charge per unit volume

D. Angular momentum.

Answer:

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

A. km/s

B. kms

C. km/s^2

D. kms^2

Answer:

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485. An equation is given as $\left(p+\frac{a}{V^2}\right)=b\frac{\theta}{V}$,where $p=$ pressure $V=$ volumen and $\theta=$ absolute temperature. If a and b are constants, then dimensions of a will be

A. $\left[ML^{-5}T^{-1}\right]$

B. $\left[ML^5T^1\right]$

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

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

Answer:

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486. 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. $[LJ], [LT]$ and $[LT^{-2}]$

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

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

D. $[LT^{-2}], [LT]$ and $[L]$

Answer:

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487. The time dependence of a physical quantity P is given by $P = P_0$ exp $(-\alpha t^2)$, where α is a constant and t is time. The constant α

A. is dimensionless

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

C. has dimensions $\left[T^{2}\right]$

D. has dimensions of p

Answer:

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488. 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. 400

B. 0.04

C. 0.4

D. 40

Answer:

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489. Which of the following is a dimensional constant?

A. relative density

B. gravitational constant

C. refractive index

D. poisson ratio

Answer:

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490. The damping force on an oscillator is directly proportional to the velocity. The units of the constant to proportionality are

A. $kgms^{-1}$

B. $kgms^{-2}$

C. kgs^{-1}

D. kgs

Answer:

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

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

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

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

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

Answer:

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

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

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

C. $[E^{-2}V^{-1}T^{-3}]$

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

Answer:

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493. Percentage erros in the measurement of mass and speed are 2% and 3% respectively. The error in the estimation of kinetic energy obtained by measuring mass and speed will be:

A. 0.08

B. 0.02

C. 0.12

D. 0.1

Answer:

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494. The density of a cube is measured by measuring its mass and length of its sides. If the maximum error in the measurement of mass and lengths are 3% and 2% respectively, the maximum error in the measurement of density would be

A. 0.12

B. 0.14

C. 0.07

D. 0.09

Answer:

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495. A certain body weighs $22.42g$ and has a measured volumen of $4.7cc$. The possible error in the measurement of mass and volumen are $0.01g$ and $0.1cc$. Then, maximum error in the density will be

A. 0.22

B. 0.02

C. 0.002

D. 0.0002

Answer:

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496. 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. 0.04

B. 0.06

C. 0.08

D. 0.02

Answer:

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497. If voltage across a bulb rated 220 volt-100 watt drops by 2.5% of its value, the percentage of the rated value by which the power would decrease is

A. 0.2

B. 0.025

C. 0.05

D. 0.1

Answer:

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

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

A. 0.14

B. 0.1

C. 0.07

D. 0.04

Answer:

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499. A student measued 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 erroof $-0.004cm$, the correct diameter of the ball is

A. 0.521 cm

B. 0.529 cm

C. 0.053 cm

D. 0.525 cm

Answer:

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