Unit-1
Important Formula

SUMMARY

- Measurement of large distance (Parallax Method)

  equation $D = \frac{b}{\theta}$ where D = distance of the planet from the earth.

  where θ = parallax angle.
  b = distance between two place of observation.

- Measurement of the size of a planet or a star.

  equation $\alpha = \frac{d}{D}$ where D = distance of planet from the earth,

  d = diameter of planet.
  α = angular diameter of planet.

- Measurement of mass
  The gravitational force on an object, of mass m, is called the weight of the object.
  1 amu = 1.66×10^{27} kg = 1u

- Estimation of Error
  Absolute Error - Suppose the values obtained in several measurement of physical quantity a are a_1, a_2, ... a_n If their arithmetic mean is $\bar{a}$

  then $\bar{a} = \frac{a_1 + a_2 + ... + a_n}{n} = \frac{1}{n}\sum_{i=1}^{n} a_i$

  $\Delta a_1 = \bar{a} - a_1$, $\Delta a_2 = \bar{a} - a_2$,---------- $\Delta a_n = \bar{a} - a_n$

  Δa_2, Δa_2 ------- Δa_n are called absolute error

- Average absolute error

  $$\Delta a = \frac{|\Delta a_1| + |\Delta a_2| + ... + |\Delta a_n|}{n} = \frac{1}{n}\sum_{i=1}^{n} a_i$$

- Fractional Error $\delta_a = \frac{\Delta \bar{a}}{a}$

- Percentage Error

  Percentage error = $\delta a \times 100\ \% = \frac{\Delta \bar{a}}{a} \times 100\,\%$

- Combination of errors
  Addition $Z = A + B \Rightarrow \Delta Z = \Delta A + \Delta B$
  Substraction $Z = A - B \Rightarrow \Delta Z = \Delta A + \Delta B$

  Division $Z = \frac{A}{B} \Rightarrow \frac{\Delta Z}{Z} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$

  Multiplication $Z = A \bullet B \Rightarrow \frac{\Delta Z}{Z} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$

  Power $Z = A^n \Rightarrow \frac{\Delta Z}{Z} = n\frac{\Delta A}{A}$

- Rule for determining number of significant figures
  - All the non - zero digits are significant
  - All the zeros between two non zero digits are significant no matter where the decimal point is it at all.
  - If the number is less then 1 then zeros on the right of decimal point but to the left of the first non - zero digit are not significant.
  - In a number without decimal point the zeros on the right side of the last non zero digit are not significant.
- Dimensions and Dimensional formulas.
  - The expression of a physical quantity with appropriate powers of M, L, T, K, A etc is called the dimensional formula of that physical quantity.
  - The power of exponents of M, L, T, K, A are called dimensions of that quantity.
- - Some important units of distance

  $1 \text{ fermi (fm)} = 10^{-15} \text{ m}$

  $1 \text{ Å} = 10^{-10} \text{ m}$

  $1 \text{ AU} = 1.496 \times 10^{11} \text{ m}$

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

  $1 \text{ par sec} = 3.08 \times 10^{16} \text{ m}$

MCQ Questions

For the answer of the following questions choose the correct alternative from among the given ones.

Physics - scope and Excitement
- Physics, Technology and society.
- Fundamental sources of nature.
- Nature of Physical laws

1. Physics is one of the basic disciplines in the category of ..... sciences.
   (A) Astro (B) Natural (C) Space (D) Genetic
2. 'Physics' comes from a ..... word meaning nature
   (A) Hindi (B) German (C) Greek (D) Sanskrit
3. Mechanics and newton's motion laws as ..... laws dependad.
   (a) liner momentum (b) Energy conservation
   (c) Gravitational (d) Charge conservation
4. What is the approximate value of the Radious of a nucleus ?
   (a) 10^{-14} m (b) 10^{-31} m (c) 10^{-19} m (d) 10^{-15} m
5. The scope for ratio of length is in order to .....
   (a) 10^{-40} (b) 10^{40} (c) 10^{20} (d) 10^{30}
6. The range of time scale is about .....
   (a) 10^{-10} sec to 10^{26} sec (c) 10^{-15} sec to 10^{15} sec
   (b) 10^{-22} sec to 10^{18} sec (d) 10^{20} sec to 10^{25} sec
7. Birth, evolution and death of stars etc. are studid in branch of physics known as .....
   (a) Thermodynamics (c) Astro physics
   (b) Quantam physics (d) Electronics
8. ..... is a branch of physics in wich heat engine and refrigeratior efficiency is studied.
   (a) optics (b) Thermodynamics (c) Mechanics (d) Quantom physics
9. What is full name of LHC
   (a) Large hadron collider (c) Large heavy cullent
   (b) Large hadron cullent (d) Light heavy cullent
10. The range of mass varies from .....
    (a) 10^{-15} kg to 10^{26} kg (b) 10^{-20} kg to 10^{28} kg (c) 10^{-30} kg to 10^{55} kg (d) 10^{-20} kg to 10^{20} kg
11. Length of Galaxies is in order of .....
    (a) 10^{26} m (b) 10^{36} m (c) 10^{28} m (d) 10^{-14} m
12. The approximate value of charge of an electron is .....
    (a) 10^{-18} c (b) 10^{+15} c (c) 10^{-38} c (d) 10^{-19} c
13. The universe is made up of .....
    (a) matter only (b) radiation only (c) vaccum (d) matter and radiation

14. Nucleus of molecule is made up of wich fundamental constituents ?
(a) only Electron (c) Electron and Proton
(b) Proton and neutron (d) Electron and neutron

15. In the development of nenotechnology and biotechnology ..... have played a vital role.
(a) ECG (b) ESR (c) NMR (d) AFM

16. What is full form of AFM ?
(a) Atomatic force mioroscope (c) Atomatic fire microscope
(b) Atomic force mirror (d) Atomic force microscope

17. What is full name of ECG ?
(a) Electron cardiograph (c) Electron colour gram
(b) Electro cardiograph (d) Electric colour graph

18. What is full name of ESR ?
(a) Electric space Radar (c) Electron spin Resonance
(b) Electron space Range (d) Electric spin Resonance

19. What is full name of NMR ?
(a) Nuclear magnetic Resonance (c) Nuclear mega Radar
(b) Neutron mega Resonance (d) Nuclear micro Radar

20. ..... deals with electric charge and magnatic phenomenna
(a) Dynamics (b) Electro dynamic (c) Themodynamic (d) Mechanis

21. At present state, there are ..... fundamental forces in nature.
(a) six (b) four (c) two (d) five

22. When charges are at rest the force is given by ..... law.
(a) coulomb's (b) Newton's (c) Ampere's (d) Faraday's

23. The ..... force is the force of mutual attraction between any two objects by virtue of their masses.
(a) Weak (b) Electromagnetic (c) Nuclear (d) Gravitational

24. The ..... force is the strongest of all fundamental forces.
(a) nuclear (b) Electromagnetic (c) Gravitational (d) Weak nuclear

25. Electromagnetic force is .....
(a) attractive force only (c) repulsive force only
(b) attractive and repulsive force (d) a short range force

26. Which of the following force binds The particle in the nucleons ?
(a) Electromagnetic force (b) Strong force (c) Gravitational force (d) Weak force

27. Electromagnetic force is ..... range force
(a) Short (b) long (c) medium (d) very short

28. Quarks - Quarks force is produced between -
(a) Proton - neutron (b) proton - proton (c) neutron - neutron (d) (a),(b), (c) are true

29. Which partical are emitted during the β decay from the nucleus ?

(a) neutron and proton (c) electron and neutrino

(b) electron and neutron (d) electron and proton

30. ..... and ..... law's are called inverse square law

(a) Gravitation and weak (c) Coulomb's and strong

(b) Gravitation and coulomb's (d) Electromagnetic and coulomb's

31. Which property of object is responsible for the electric force ?

(a) electric charge (b) pressure (c) volume (d) mass

32. Which property of object is responsible for the Gravitational force.

(a) electric charge (b) mass (c) pressure (d) volume

33. How much times is the strong nuclear force stronger then weak nuclear force ?

(a) 10^{13} (b) 10^{2} (c) 10^{-13} (d) 10^{-2}

34. How much times is the strong nuclear force stronger then electro magnatic force ?

(a) 10^{13} (b) 10^{2} (c) 10^{-13} (d) 10^{-2}

35. How much times is the electromagnatic force stronger then Gravitational force

(a) 10^{13} (b) 10^{-13} (c) 10^{36} (d) 10^{-36}

36. Who has unified electromagnetism and optics ?

(a) Newton (b) Maxwell (c) Coulomb (d) Faraday

37. Who has unified terrestrial and celestial domains under a common law of Gravitational

(a) Newton (b) Maxwell (c) Coulomb (d) Farady

38. The weak nuclear force, Gravitational force and electromagnatic force are A, B and C Respectively then .....

(a) $C > A > B$ (b) $C > A < B$ (c) $B > A > C$ (d) $C < A < B$

39. Range of weak nuclear force is .....

(a) 10^{-15}km (b) 10^{-14}km (c) 10^{-18}km (d) 10^{-20}km

40. Strong nuclear force close not exist on .....

(a) Proton (b) nuclear (c) neutron (d) electron

41. The force acting between two point charges kept at a certain distance is F_1 Now magnitude of charge are double and distance between them is double. The force acting between them is F_2 find out the ratio of F_2/F_1 = ...

(a) 16 : 1 (b) 1: 16 (c) 1: 1 (d) 1: 8

42. If the resulting external force acting on system is zero then ..... of the system is constant and if the resultant external torque acting on a system is zero then ..... of the system is constart.

(a) total energy, angularmomentum (c) linermomentam, energy

(b) liner momentam, angularmomentum (d) angular and linear momentam

43. Space is homogeneous and isotropic so ..... law of servation is the result of this
(a) linear and angular momentum (c) energy and charge
(b) angular and linear momentum (d) charge and energy

44. Time is homogeneous so ..... law of conserbation is the result of this
(a) angular momentum (b) linear momentum (c) energy (d) charge

45. The basic reason behind existance of which conseration of law is still not known ?
(a) angular momentum (c) energy
(b) linear momentum (d) charge

46. The Gravitational force between any two body charges with distance as $F \alpha r^n$ where n = ...
(a) –1 (b) 2 (c) –3 (d) –2

47. Match the column

Column - I	Column - II
(1) space is isotropic	(P) conservation of linear momentum
(2) space is homogeneous	(Q) conservation of energy
(3) Time is homogeneous	(R) conservation of charge still not known
(4) Time is isotropic	(S) conservation of angular momentam

(a) 1- (S), 2-(P), 3-(R), 4-(Q) (c) 1-(P), 2-(S), 3-(R), 4-(Q)
(b) 1-(S), 2-(P), 3-(Q), 4-(R) (d) 1-(R), 2-(Q), 3-(P), 4-(S)

Measurement and system of units

- Units of physical quantities, system of units, SI system of units, fundamental or Base units. precision in measurement. Error in measurement and significant figures.
- Dimensions and Dimensional formula, Dimensional analysis and its uses.

48. Which of the following unit is not of length ?
(a) light year (b) fermi (c) $\mathring{A}$ (d) becquerel

49. becquerel is a ..... unit and its symbol is .....
(a) supplementary, B*q* (b) fundamental, B*q* (c) derived, B*q* (d) derived, B*v*

50. How many fundamental units are there in SI system ?
(a) 5 (b) 7 (c) 6 (d) 4

51. Which of the following physical quantity is fundamental ?
(a) viscosity (b) velocity (c) force (d) time

52. Poise is the unit of
(a) viscosity (b) velocity (c) force (d) time

53. Which unit of physical quantity remains same for all unit system ?
(a) meter (b) second (c) ampere (d) kilogram

54. Which of the following system of unit is not based on only units of mass length and time.
(a) SI (b) MKS (c) CGS (d) FPS

55. Which of the following symbol of unit does not follow practical norms for the use of SI system ?
(a) Kg (b) kg. (c) k (d) A

56. Why derive luminous intensity simbol form of SI system ?
(a) cd (b) Cd (c) cd. (d) CD

57. What is the ratio of 10 micron to 1 nenometer ?
(a) 10^4 (b) 10^3 (c) 10^{16} (d) 10^{15}

58. $\frac{1\ \text{femtometer}}{100\ \text{nenometer}}$ = ...
(a) 10^{-6} (b) 10^{-8} (c) 10^{24} (d) 10^{-24}

59. If value of gravitational constant in MKS is $6.67\times10^{-11}\ \frac{Nm^2}{kg^2}$ then value of G in CGS = ... $\frac{dyn-cm^2}{gm^2}$
(a) 6.67×10^{-9} (b) 6.67×10^{-7} (c) 6.67×10^{-8} (d) 6.67×10^{-5}

60. A partical has an acceleration of 72 km/min^2 find acceleration in SI system.
(a) $0.5\ m/s^2$ (b) $30\ m/s^2$ (c) $18\ m/s^2$ (d) $20\ m/s^2$

61. 950 dyne = ... newton
(a) 9.5×10^{-3} (b) 95×10^{-5} (c) 950×10^{-7} (d) 9.5×10^{-4}

62. 100 picometer = ...
(a) 10^{-8} cm (b) 10^{-7} m (c) 10×10^{-6} μm (d) 10×10^{-8} μm

63. 100 walt hour = ... joule.
(a) 3.6×10^5 J (b) 3.6×10^6 J (c) 36×10^5 J (d) 36×10^6 J

64. If x meter is a unit of length then area of 1m^2 = ...
(a) x (b) x^2 (c) x^{-2} (d) x^{-1}

65. 1 Mev = ... ev
(a) 10^7 (b) 10^4 (c) 10^5 (d) 10^6

66. Wave length of light radiation 0.000015 m = ...
(a) 15 micron (b) 1.5 micron (c) 150 micron (d) 0.15 micron

67. 1^0 = ...
(a) 600" (b) 3600" (c) 180" (d) 3600'

68. 1 rad = ...
(a) 180^0 (b) 3.14^0 (c) $\left(\frac{180}{\pi}\right)^0$ (d) $\left(\frac{\pi}{180}\right)^0$

69. 1 g = ... amu

(a) 6.02×10^{23} (b) 6.02×10^{-23} (c) 1.66×10^{-27} (d) 1.66×10^{27}

70. 1 parsec = ...

(a) 10^{-15} m (b) 1.496×10^{11} m (c) 1.496×10^{15} m (d) 3.08×10^{16} m

71. Which of the following unit does not represent the unit of power ?

(a) ampere/volt (c) $(\text{ampere})^2 \times$ ohm

(c) joule/second (d) ampere × volt

72. Write the unit of angular acceleration in the SI system.

(a) N.Kg (b) rad / $(\text{sec})^2$ (c) m/sec (d) N/kg

73. unit of universal gravitational constant is .....

(a) kg m sec^{-1} (b) N m^{-1} sec (c) N m^2 kg^{-2} (d) N m kg^{-1}

74. The unit of stefen Boltzman constant (σ) is .....

(a) w^2 m^{-2} k^{-1} (b) w m^2 k^{-3} (c) w m^{-2} k^4 (d) w m^{-2} k^{-4}

75. Unit of momentum physical quantity ?

(a) newton - second (b) newton/second (c) Jule (d) Jule/second

76. Light year is a unit of .....

(a) Mass (b) volume (c) density (d) Distance

77. Joule/seed is the unit of .....

(a) Work (b) angular momentum (c) Pressure (d) Energy

78. The SI unit of momentum is .....

(a) kg × newton (b) kg m^{-2}s^2 (c) kg m^{-1} (d) kg ms^{-1}

79. Volt/meter is the unit of .....

(a) Work (b) viscosity (c) Electric fild intensity (d) velosity

80. The force F is represented by equation $F = P\ell^{-1} + Q\ell$, where ℓ is the length. The unit of P is same as that of .....

(a) Surface tension (b) velocity (c) force (d) momentum

81. Write the unit of surface tension in SI system.

(a) $\frac{N}{m^2}$ (b) $\frac{N}{m}$ (c) $\frac{dyne}{cm^2}$ (d) $\frac{dyne}{cm}$

82. Which physical quantity has unit of pascal - secod ?

(a) Velocity (b) viscocity (c) energy (d) coefficient of viscocity

83. Which physical quantity has unit of joule - second ?

(a) velocity (b) plank's constant (c) energy (d) vescocity

84. What is the least count of vernier callipers ?

(a) 10^{-4} m (b) 10^{-5} m (c) 10^{-2} m (d) 10^{-3} m

85. What is the least count of screw gauge ?

(a) 10^{-4} m (b) 10^{-5} m (c) 10^{-2} m (d) 10^{-6} m

86. For measurement of astronomical distance ..... is used.

(a) vernier callipers (b) spherometer (c) screwgauge (d) indirect method

87. Which mictoscope is used to measure the dimension of particle having dimension less than $4000\ A^0$?

(a) electron microscope (b) simple microscope (c) optical microscope (d) none of above

88. In electron microscope electron behave like .....

(a) charge (b) mass (c) particles (d) wave

89. Which wave length of light is used in an optical microscope ?

(a) radiowave (b) X - ray (c) infrared (d) visible

90. The intercepted area of the spherical surface about the center is $0.25m^2$ having diameter 50 cm what will be solid angle ?

(a) 4×10^{-1} sr (b) 1×10^{3} sr (c) 10^{-1} sr (d) 5×10^{-1} sr

91. One planet is observed from two diametrically opposite point A and B on the earth the angle subtended at the planet by the two directions of observations is 1.8^o. Given the diameter of the earth to be about 1.276×10^{7} m. What will be distance of the planet from the earth ?

(a) 40.06×10^{8} m (b) 4.06×10^{8} m (c) 400.6×10^{13} m (d) 11×10^{8} m

92. Find the distance at which 4 AU would subtend an angle of exactly $1''$ of arc.

$[1AU = 1.496\ \times\ 10^{11}\text{m}, 1'' = 4.85\times\ 10^{16}\text{rad}]$

(a) 1.123×10^{5} m (b) 11.23×10^{5} m (c) 1.123×10^{17} m (d) 11.23×10^{17} m

93. The percentage error in the distance 100 ± 5 cm is ...

(a) 5 % (b) 6% (c) 8 % (d) 20 %

94. In an experiment to determine the density of a cube the percentage error in the measurement of mass is 0.25 % and the percentage error in the measurement of length is 0.50 % what will be the percentage error in the determination of its density ?

(a) 2.75 % (b) 1.75 % (c) 0.75 % (d) 1.25 %

95. If $A = b^4$ the fractional error in A is .....

(a) $\frac{(\Delta b)^4}{b}$ (b) $\frac{\Delta b}{b}$ (c) $4\left(\frac{\Delta b}{b}\right)$ (d) $(\Delta b)^4$

96. If $P = \frac{A^2B}{C^3}$ where percentage error in A , B and C are respectively $\pm2\%\pm3\%$ and $\pm5\%$ then total percentage error in measurement of p

(a)18 % (b) 14 % (c) 21 % (d) 12 %

97. In the experiment of simple pendulum error in length of pendulum (ℓ) is 5 % and that of g is 3 % then find percentage error in measurement of periodic time for pendulum

(a) 4.2 % (b) 1.2 % (c) 2 % (d) 4 %

98. Acceleration due to gravity is given by $g = \frac{GM}{R^2}$ what is the equation of the fractional error $\Delta g/g$ in measurement of gravity g ? [G & M constant]

(a) $-\frac{\Delta R}{R}$ (b) $2\frac{\Delta R}{R}$ (c) $-2\frac{\Delta R}{R}$ (d) $\frac{1}{2}\frac{\Delta R}{R}$

99. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{\ell}{g}}$ what is the equation of the relative error $\frac{\Delta T}{T}$ in measurement of period T ?

(a) $\frac{1}{2}\frac{\Delta \ell}{\ell}$ (b) $2\frac{\Delta \ell}{\ell}$ (c) $\frac{1}{4}\frac{\Delta \ell}{\ell}$ (d) $4\frac{\Delta \ell}{\ell}$

100. The length of a rod is (10.15 ± 0.06) cm what is the length of two such rods ?

(a) (20.30 ± 0.06) cm (b) (20.30 ± 1.6) cm (c) (10.30 ± 0.12) cm (d) (20.30 ± 0.12) cm

101. For a sphere having volume is given by $V = \frac{4}{3}\pi r^3$ What is the equation of the relative error $\frac{\Delta V}{V}$ in measurement of the volume V ?

(a) $3\frac{\Delta r}{r}$ (b) $4\frac{\Delta r}{r}$ (c) $\frac{4}{3}\frac{\Delta r}{r}$ (d) $\frac{1}{3}\frac{\Delta r}{r}$

102. Kinetic energy K and linear momentum P are related as $K = \frac{p^2}{2m}$. What is the equation of the relative error $\frac{\Delta k}{k}$ in measurement of the K ? (mass in constant)

(a) $\frac{p}{\Delta p}$ (b) $2\frac{\Delta p}{p}$ (c) $\frac{p}{2\Delta p}$ (d) $4\frac{\Delta p}{p}$

103. Heat produced in a current carrying conducting wire is $H = I^2Rt$ it percentage error in I, R and t is 2 % , 4 % and 2 % respectively then total percentage error in measurement of heat energy .....

(a) 8 % (b) 15 % (c) 5 % (d) 10 %

104. The resistance of two resistance wires are $R_1 = (100 \pm 5)\Omega$ and $R_2 = (200 \pm 7)\Omega$ are connected in series. find the maximum absolute error in the equivalent resistance of the combination.

(a) $35\,\Omega$ (b) $12\,\Omega$ (c) $4\,\Omega$ (d) $9\,\Omega$

105. The periodic time of simple pendulum is $T = 2\pi\sqrt{\frac{\ell}{g}}$ relative error in the measurement of T and ℓ are $\pm a$ and $\pm b$ respectively find relative error in the measurement of g

(a) $a + b$ (b) $2b + a$ (c) $2a + b$ (d) $a - b$

106. A physical quantity x is given by $x = \frac{A^4 B^{\frac{1}{4}}}{C^3 D^{\frac{4}{3}}}$ due to which physical quantgity produced the maximum percentage error in x

(a) B (b) C (c) A (d) D

107. The resistance $R = \frac{V}{I}$ where $V = 100 \pm 5$ volts and $I = 10 \pm 0.3$ anperes calculate the percentage error in R.

(a) 8 % (b) 10 % (c) 12 % (d) 14 %

108. The number of significant figures in 0.000150 is .....

(a) 3 (b) 5 (c) 2 (d) 4

109. Which of the following numerical value have significant figure 4 ?

(a) 1.011 (b) 0.010 (c) 0.001 (d) 0.100

110. What is the number of significant figures in 5.50×10^3 ?

(a) 2 (b) 7 (c) 3 (d) 4

111. The mass of substance is 75.5 gm and its volume is 25 cm^2. It's density up to the correct significant figure is .....

(a) $3.02\ gm/cm^3$ (b) $3.200\ gm/cm^3$ (c) $3.02\ gm/cm^3$ (d) $3.1\ gm/cm^3$

112. The area of a rectangle of size 1.25×2.245 cm in significant figure is .....

(a) $2.80625\ cm^2$ (b) $2.81\ cm^2$ (c) $2.806\ cm^2$ (d) $2.8062\ cm^2$

113. The significant figures in 500.5000 are .....

(a) 5 (b) 3 (c) 7 (d) 6

114. Addition of measurement 15.225 cm, 7.21 cm and 3.0 cm in significant figure is .....

(a) 25.43 cm (b) 25.4 cm (c) 25.435 cm (d) 25.4350 cm

115. Substract 0.2 J from 7.36 J and express the result with correct number of significant figures.

(a) 7.160 J (b) 7.016 J (c) 7.16 J (d) 7.2 J

116. After rounding of the number 9595 to 3 significant digits the value becomes .....

(a) 9600 (b) 9000 (c) 9590 (d) 9500

117. How many significant numbers are there in $(2.30 + 4.70) \times 10^5$?

(a) 3 (b) 4 (c) 2 (d) 5

118. The radius of circle is 1.26 cm. According to the concept of significant figures area of it can be represented as -

(a) $4.9850\ cm^2$ (b) $4.985\ cm^2$ (c) $4.98\ cm^2$ (d) $9.98\ cm^2$

119. If A = 3.331 cm B = 3.3 cm then with regard to significant figure A + B = ...

(a) 6.6 cm (b) 6.31 cm (c) 6.631 cm (d) 6 cm

120. If the length of rod A is (2.35 ± 0.01) cm and that of B is (5.68 ± 0.01) cm then the rod B is longer than rod A by .....

(a) (2.43 ± 0.00) cm (b) (3.33 ± 0.02) cm (c) (2.43 ± 0.01) cm (d) (2.43 ± 0.001) cm

121. In acceleration, The dimensions for mass ..... for length .. and for time

(a) 0,1,–2 (b) 1,0,–2 (c) –2,0,1 (d) –2,1,0

122. Dimensional formula for power is .....

(a) $M^2L^{-2}T^{-3}$ (b) $M^1L^2T^{-2}$ (c) $M^1L^3T^{-1}$ (d) $M^0L^2T^{-2}$

123. Dimensional formula for calories is .....

(a) $M^1L^1T^{-2}$ (b) $M^2L^1T^{-2}$ (c) $M^1L^2T^{-2}$ (d) $M^2L^2T^{-2}$

124. Dimensional formula for thermal conductivity (k) is ..

(a) $M^2L^1T^{-2}K^{-1}$ (b) $M^1L^1T^{-2}K^1$ (c) $M^1L^0T^{-3}K^{-1}$ (d) $M^1L^1T^{-3}K^{-1}$

125. Dimensional formula for Resistance (R) is .....

(a) $M^1L^1T^{-3}A^{-1}$ (b) $M^1L^1T^0A^{-1}$ (c) $M^1L^2T^{-3}A^{-2}$ (d) $M^1L^0T^{-3}A^{-1}$

126. Dimensional formula for conductance is .....

(a) $M^{-1}L^2T^{-3}A^2$ (b) $M^1L^2T^{-2}A^1$ (c) $M^1L^{-2}T^3A^2$ (d) $M^{-1}L^{-2}T^3A^2$

127. Which physical quantity is represented by $M^1L^3T^{-3}\bar{A}^2$?

(a) Resistivily (b) Resistance (c) conductance (d) conductivity

128. Which physical quantity is represented by $M^{-1}L^{-3}T^3A^2$?

(a) Resistivity (b) Resistance (c) conductance (d) conductivity

129. Which physical quantity is represented by $M^1L^1T^{-3}A^{-1}$?

(a) Stress (b) Resistance (c) Electricfield (d) potential Difference

130. The dimensional formula of plank's constant is .....

(a) $M^3L^2T^{-1}$ (b) $M^1L^2T^{-1}$ (c) $M^2L^1T^{-1}$ (d) $M^1L^2T^{-3}$

131. Dimensional formula of latent heat is .....

(a) $M^0L^2T^{-2}$ (b) $M^2L^0T^{-2}$ (c) $M^1L^2T^{-1}$ (d) $M^2L^2T^{-1}$

132. Dimensions of impulse are.

(a) $M^{-1}L^{-1}T^1$ (b) $M^1L^1T^{-1}$ (c) $M^1L^1T^1$ (d) $M^1L^2T^{-2}$

133. Write dimensional formula of coefficient of viscosity

(a) $M^1L^2T^{-1}$ (b) $M^{-1}L^1T^1$ (c) $M^1L^{-1}T^{-1}$ (d) $M^1L^1T^{-1}$

134. Dimensional formula for torque is

(a) $M^2L^2T^{-3}$ (b) $M^2L^1T^{-2}$ (c) $M^1L^1T^{-2}$ (d) $M^1L^2T^{-2}$

135. Dimensional formula for capisitance (C)

(a) $M^{-1}L^{-2}T^4A^2$ (b) $M^1L^{-2}T^4A^2$ (c) $M^{-1}L^{-2}T^3A^1$ (d) $M^3L^1T^{-1}A^{-2}$

136. Dimensional formula for Boltzmann's constant is .....

(a) $M^1L^1T^{-2}K^{-1}$ (b) $M^2L^1T^{-2}K^{-1}$ (c) $M^1L^2T^{-2}K^{-1}$ (d) $M^2L^2T^1K^{-2}$

137. Dimensional formula for electromotive force (emf)

(a) $M^2L^1T^{-1}K^{-3}$ (b) $M^1L^2T^{-3}K^{-1}$ (c) $M^1L^1T^{-3}K^{-1}$ (d) $M^1L^2T^3K^{-1}$

138. Which physical quantity has dimensional formula as CR where C - capisitance and R - Resistance ?

(a) Frequency (b) current (c) Time period (d) acceleration

139. Write the dimensional formula of the ratio of linear momentum to angular momentum.

(a) $M^0L^{-1}T^0$ (b) $M^1L^1T^0$ (c) $M^0L^1T^0$ (d) $M^0L^1T^1$

140. If L and R are respesented as the inductance and resistance respectively then the dimensional formula of $\frac{R}{L}$ will be .....

(a) $M^{-2}L^1T^{-2}A^1$ (b) $M^0L^0T^{-1}A^0$ (c) $M^1L^{-1}T^0A^1$ (d) $M^1L^3T^1A^0$

141. Write the dimensional formula of r.m.s (root mean square) speed.

(a) $M^1L^2T^{-2}$ (b) $M^0L^2T^{-2}$ (c) $M^0L^1T^{-1}$ (d) $M^1L^0T^{-1}$

142. One physical quantity represented by an equation as $\frac{\pi}{2}(p-q)c$ where p, q and c are length then quantity is ..

(a) length (b) velocity (c) Area (d) volume

143. The dimensional formula of magnetic flux is .....

(a) $M^1L^2T^{-2}A^{-1}$ (b) $M^1L^2T^1A^2$ (c) $M^1L^2T^{-2}A^2$ (d) $M^{-1}L^{-2}T^1A^2$

144. Which physical quantity has unit of pascal - second ?

(a) Force (b) Energy (c) Coefficient of viscocity (d) velocity

145. Dimensional formula of CV ? where C - capacitance and V - potential different

(a) $M^1L^{-2}T^4A^2$ (b) $M^1L^2T^{-3}A^1$ (c) $M^0L^0T^1A^{-1}$ (d) $M^0L^0T^1A^1$

146. The equation of a wave is given by $Y = A\sin\omega\left[\frac{x}{v}-k\right]$ where ω is the angular velocity and v is the linear velocity. Write the dimensional formula of K

(a) $M^0L^0T^1$ (b) $M^1L^0T^{-1}$ (c) $M^0L^1T^1$ (d) $M^1L^{-1}T^1$

147. If P and q are diffrent physical quantities then which one of following is only possible dimensionally ?

(a) p + q (b) $\frac{p}{q}$ (c) p − q (d) p = q

148. From $\left(p+\frac{a}{v^2}\right)(v-b) =$ constant equation is dimensionally correct find the dimensional formula for b ? where P = preasure V = volume

(a) $M^0L^3T^0$ (b) $M^1L^3T^0$ (c) $M^0L^1T^3$ (d) $M^1L^1T^{-1}$

149. Pressure P = A cosBx + c sinDt where xin meter and t in time then find dimensional formula of $\frac{D}{B}$

(a) $M^1L^1T^{-1}$ (b) $M^0L^1T^{-1}$ (c) $M^1L^1T^0$ (d) $M^{-1}L^0T^1$

150. Find the dimensional formula for energy per unit surface area per unit time

(a) $M^1L^0T^{-2}$ (b) $M^0L^1T^{-1}$ (c) $M^1L^0T^{-3}$ (d) $M^1L^{-1}T^1$

151. Equation of force $F = at + bt^2$ where F is force in Newton t is time in second, then write unit of b.

(a) Nm^{-1} (b) Nm^2 (c) Nm (d) Nm^{-2}

152. Pressure $P = \frac{at^2}{bx}$ where x = distance, t= time find the dimensional formula for $\frac{a}{b}$

(a) $M^1L^0T^{-4}$ (b) $M^1L^1T^{-1}$ (c) $M^1L^0T^{-2}$ (d) $M^{+1}L^0T^{-2}$

153. $F = A_0(1 - e^{-Bxt^2})$ where F is force and x is desplacement. write the dimension formula of B

(a) $M^2L^1T^{-1}$ (b) $M^0L^{-1}T^{-2}$ (c) $M^1L^0T^{-2}$ (d) $M^1L^2T^{-1}$

154. Equation of physical quantity $v = at + bt^2$ where v = velocity t = time so write the dimensional formula of a in this equation

(a) $M^0L^1T^{-1}$ (b) $M^1L^1T^{-1}$ (c) $M^0L^1T^{-2}$ (d) $M^1L^2T^0$

155. Density of substance in CGS system is 3.125 gm/cm^3 what is its magnitude is SI system ?

(a) 0.3125 (b) 3.125 (c) 31.25 (d) 3125

156. The resistivity of resistive wire is $\rho = \frac{AR}{L}$ where L = length of wire A = Area of wire and R is resistance of wire find dimension formula of ρ.

(a) $M^1L^3T^{-3}A^{-2}$ (b) $M^1L^2T^{-3}A^{-2}$ (c) $M^2L^3T^1A^2$ (d) $M^2L^3T^{-3}A^{-2}$

157. A cube has numerically equal volume and surface area calculate the volume of such a cube.

(a) 2000 Unit (b) 216 Unit (c) 2160 Unit (d) 1000 Unit

158. Which out of the following is dimensionally correct.

(a) $p^2 = h\rho g$ (b) $p = h\rho^2 g$ (c) $p = h\rho g$ (d) $p = h^2\rho g$

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

(a) $-\frac{1}{2}, \frac{1}{2}, \frac{5}{2}$ (b) $\frac{1}{2}, \frac{1}{2}, \frac{5}{2}$ (c) $\frac{5}{2}, \frac{1}{2}, -\frac{1}{2}$ (d) $\frac{1}{2}, -\frac{1}{2}, \frac{5}{2}$

160. If the centripetel force is of the form $m^a v^b r^c$ find the values of a, b and c

(a) 1,2,1 (b) 1,2,–1 (c) 1,3,–2 (d) –1,3,–1

161. equation of $\ell_t = \ell_0[1 + \alpha (T_2 - T_1)]$ find out the dimensions of the coefficient of linear expansion α suffix.

(a) $M^0L^0T^1K^1$ (b) $M^0L^1T^1K^1$ (c) $M^1L^1T^0K^1$ (d) $M^0L^0T^0K^{-1}$

162. Test if the following equation are dimensionally correct (S = surface tension ρ = density P = pressure v = volume n = coefficient of viscocity r = redious)

(a) $h = \frac{2S\cos\theta}{\rho rg}$ (b) $v = \sqrt{\frac{p}{\rho}}$ (c) $v = \frac{\pi pr^4 t}{8n\ell}$ (d) all correct

163. Match list - I with list - II

List - I	List - II
(1) Joule	(a) henry $\times$ ampere/sec
(2) Walt	(b) coulomb $\times$ volt
(3) volt	(c) metre $\times$ ohm
(4) Resistivity	(d) (ampere)^2 $\times$ ohm

(a) b,d,c,a (b) c,a,b,d (c) b,d,a,c (d) b,c,a,d

164. Match column - I with column - II

Column -I	Column - II
(1) capacitance	(a) $M^1L^1T^{-3}A^{-1}$
(2) Electricfield	(b) $M^1L^2T^{-1}$
(3) planck's constant	(c) $M^{-1}L^{-2}T^4A^2$
(4) Angular momentum	(d) $M^1L^2T^{-1}$

(a) a,c,b,d (b) c,a,d,b (c) c,a,b,d (d) a,b,d,c

165. In the relation $P = \frac{\alpha}{\beta} e^{\frac{-\alpha z}{k_B\theta}}$, P is pressure, z is distance, k is boltz mann constant and θ is the temperature. The dimensional formula of B will be

(a) $M^0L^2T^0$ (b) $M^1L^0T^1$ (c) $M^1L^1T^{-1}$ (d) $M^1L^1T^0$

KEY NOTE

1(B)	26(B)	51(D)	76(D)	101(A)	126(D)	151(D)
2(C)	27(B)	52(A)	77(B)	102(B)	127(A)	152(A)
3(C)	28(A)	53(B)	78(D)	103(D)	128(D)	153(B)
4(A)	29(C)	54(A)	79(C)	104(B)	129(C)	154(C)
5(B)	30(B)	55(B)	80(A)	105(C)	130(B)	155(D)
6(B)	31(A)	56(A)	81(B)	106(C)	131(A)	156(A)
7(C)	32(B)	57(A)	82(D)	107(A)	132(B)	157(B)
8(B)	33(A)	58(B)	83(B)	108(A)	133(C)	158(C)
9(A)	34(B)	59(C)	84(A)	109(A)	134(C)	159(A)
10(C)	35(C)	60(D)	85(B)	110(C)	135(D)	160(B)
11(A)	36(B)	61(A)	86(D)	111(D)	136(A)	161(D)
12(D)	37(A)	62(C)	87(A)	112(B)	137(B)	162(D)
13(D)	38(A)	63(A)	88(D)	113(C)	138(C)	163(C)
14(B)	39(C)	64(C)	89(D)	114(B)	139(A)	164(B)
15(D)	40(D)	65(D)	90(A)	115(D)	140(B)	165(B)
16(D)	41(C)	66(A)	91(B)	116(C)	141(C)	
17(B)	42(B)	67(B)	92(C)	117(A)	142(C)	
18(C)	43(A)	68(C)	93(A)	118(C)	143(A)	
19(A)	44(C)	69(A)	94(B)	119(A)	144(C)	
20(B)	45(D)	70(D)	95(C)	120(B)	145(D)	
21(B)	46(D)	71(A)	96(C)	121(A)	146(A)	
22(C)	47(B)	72(B)	97(D)	122(B)	147(B)	
23(D)	48(D)	73(C)	98(B)	123(C)	148(A)	
24(A)	49(A)	74(D)	99(A)	124(D)	149(B)	
25(B)	50(B)	75(A)	100(D)	125(C)	150(C)	

HINT

33 $\frac{\text{Strong nuclear force}}{\text{Electronmagnaticforce}} = \frac{1}{10^{-2}} = 10^2$

34 $\frac{\text{Strong nuclear force}}{\text{Weak nuclear force}} = \frac{1}{10^{-13}} = 10^{13}$

35 $\frac{\text{Electronmagnetic force}}{\text{Gravational force}} = \frac{10^{-2}}{10^{-38}} = 10^{36}$

41 $F_1 = \frac{kq_1q_2}{r_1^2}$ $F_2 = \frac{kq_1'q_2'}{r_2^2}$

49 $\frac{10\times10^{-6}}{10^{-9}} = 10^4$

58 $\frac{10^{-15}}{100\times10^{-9}} = 10^{-8}$

60 $72\,\frac{km}{(\text{min})^2} = \frac{72\times1000}{3600} = 20\,\frac{m}{(\text{sec})^2}$

64 Area = ℓ^2

$A = x^2m^2$

$1\,m^2 = \frac{A}{x^2} = \frac{1}{x^2} = x^{-2}$

69 1 amu = 1.66×10^{-27} kg

= 1.66×10^{-24} gm

$1gm = 6.023\times10^{23}$ amu

80 $F = p\ell^{+1} + q\ell^{-1}$

$p\ell^{+|1} = F$

$P = \frac{F}{\ell} = \frac{N(\text{Neuton})}{\ell(\text{meter})} = \text{surface tension}$

90 $\Delta A = 0.025\,m^2$

$2r = 0.5m$

$\text{Solid angle} = \frac{\Delta A}{r^2} = 0.4\,Sr$

$= 4\times10^{-1}\,Sr$

91 $\theta = 1.8^0 = 0.01\,\pi$ rad

$b = 1.27\times10^7$ m

$D = \frac{b}{\theta} = 4.06\times10^8$ m

94 $\text{density}(\rho) = \frac{\text{mass}(m)}{\text{volume}(l^3)}$

percentage error in density

$= [\frac{\Delta M}{M} + 3\left(\frac{\Delta l}{l}\right)]\times100$

= 1.75 %

96 $P = \frac{A^2B}{C^3}$

$\frac{\Delta P}{P}\% = [2\frac{\Delta A}{A} + \frac{\Delta B}{B} + 3\frac{\Delta C}{C}]$

= 21 %

97 $T = 2\pi\sqrt{\frac{l}{g}}$

$\frac{\Delta T}{T}\times100 = [\frac{1}{2}\times\frac{\Delta l}{l}\times\frac{1}{2}\times\frac{\Delta g}{g}]\times100$

= 4 %

100 length of two rods = 2l

= $2(10.15\pm0.06)$

= (20.30 ± 0.12) cm

103 heat energy $H = I^2RT$

$\frac{\Delta H}{H}\times100 = [2\frac{\Delta I}{I} + \frac{\Delta R}{R} + \frac{\Delta T}{T}]\times100$

= 10 %

105 $g = 4\pi^2\,\frac{l}{T^2}$

$\frac{\Delta g}{g} = \frac{\Delta l}{l} + 2\times\frac{\Delta T}{T}$

= b + 2q

107 $\text{Resistance } R = \frac{V}{I}$

$\frac{\Delta R}{R} = \frac{\Delta V}{V} + \frac{\Delta I}{I}$

$\frac{\Delta R}{R} = \frac{5}{100} + \frac{0.3}{10}$

$\frac{\Delta R}{R} = \frac{8}{100}$

$\frac{\Delta R}{R}\% = 8\%$

111 $\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{75.5}{25}$

$= 3.02 = 3.1\,g/cm^3$

128 $\text{Resistivity} = \frac{\text{Resistance} \times \text{Area}}{\text{length}}$

129 $\text{Electricfield} = \frac{\text{force}}{\text{electric charge}}$

130 $\text{plank's constant} = \frac{\text{mass} \times (\text{distance})^2}{\text{time}}$

131 $\text{latent heat}(Q) = \frac{\text{heat energy}}{\text{mass}}$

133 $\text{coefficientof viscosity} = \frac{\text{Force} \times \text{time}}{(\text{length})^2}$

141 $\text{Urms} = \sqrt{\langle u^2 \rangle} = \text{root mean square speed}$

142 If $p = q = c = L$
then $(p - q)c = L^2 = \text{Area}$

144 If $F = nA\frac{dv}{dx}$

$\therefore n = \frac{F}{A\frac{dv}{dx}} = \text{pascal second}$

146 $y = A \sin\omega(\frac{x}{v} - k)$

$\therefore \frac{x}{v} = k$

$k = \frac{x}{v} = M^0L^0T^1$

148 $\left(P + \frac{a}{v^2}\right)(v - b) = \text{constant}$

$PV - Pb + \frac{a}{v} - \frac{ab}{v^2} = \text{constant}$

$\therefore PV - Pb$

$\therefore V = b = M^0L^3T^0$

149 $\cos Bx = \text{dimensionl less}$

$Bx = M^0L^0T^0$

$B = \frac{M^0L^0T^0}{X} = M^0L^{-1}T^0$

Same as

$D = M^0L^0T^{-1}$

$\therefore \frac{D}{B} = M^0L^1T^{-1}$

151 $F = at + bt^2$

$F = bt^2 = at$

$b = \frac{F}{t^2} = \frac{N}{m^2}$

153 $F = A(1 - e^{-Bxt^2})$

$Bxt^2 = \text{dimensional less}$

$B = \frac{M^0L^0T^0}{xt^2} = M^0L^{-1}T^{-2}$

155 $\text{Density} = 3.125 \times \frac{gm}{cm^3}$

$= \frac{3.125 \times 10^{-3}\,kg}{10^{-6}\,m^3}$

$= 3125\ kg/m^3$

157 $\text{volume of cube } V = a^3$

$\text{total surface area of cube } A = 6a^2$

$\therefore V = A$

$a^3 = 6a^2$

$a = 6$

$\therefore V = (6)^3 = 216 \text{ unit}$

159 $E = G^P h^q c^r$

$E = M^1L^2T^{-2}$

$G = M^{-1}L^3T^{-2}$

$h = M^1L^2T^{-1}$

$c = M^0L^1T^{-1}$ take it

$(M^1L^2T^{-2}) = (M^{-1}L^3T^{-2})^p (M^1L^2T^{-1})^q$

$(M^0L^1T^{-1})^c$

$= M^{-p+q}L^{3p+2q+r}T^{-2p-q-r}$

$\therefore P = \frac{1}{2}, q = \frac{1}{2}, r = \frac{5}{2}$

160 $F \alpha m^a v^b r^c$

$F = M^1L^1T^{-2}$

$v = M^0L^1T^{-1}$

$r = M^0L^1T^0$

$m = M^1L^0T^0$ take it

$(M^1L^1T^{-2}) = (M^1)^a (L^1T^{-1})^b (L^1)^c$

$= M^aL^{b+c}T^{-b}$

$\therefore a = 1, b = 2, c = -1$

165 $\frac{\alpha z}{kB\theta} = M^0L^0T^0$

$\therefore \alpha = \frac{kB\theta}{z}$ and $P = \frac{\alpha}{\beta}$

$\therefore \beta = \frac{\alpha}{p} = \frac{kB\theta}{pz}$

$= M^0L^2T^0$