Questions from M.S.B.T.E. Question Papers

(1) Define error, state basic types of errors. **(4 M, W-06)**

(2) Define system of units. State different types of system of units and name fundamental quantities in them with their units. **(4 M, S-07)**

(3) Define errors and state types of errors with examples. **(4 M, S-07)**

(4) Explain different types of errors. Define percentage error. **(4 M, S-07)**

(5) Define (i) Absolute error, (ii) Average absolute error, (iii) Relative error, (iv) Percentage error. **(4 M, S-08)**

(6) Classify the following physical quantities as fundamental and derived quantities :
Length, force, temperature, acceleration, area, luminous intensity, pressure, time. **(2 M, W-08)**

(7) Define unit of physical quantity and state requirements of good unit. **(4 M, W-08)**

(8) Classify following physical quantities as fundamental and derived quantities :
mass, velocity, length, force **(2 M, S-09)**

(9) Define fundamental quantity, derived quantity, instrumental error, systematic error.

(10) Write CGS and SI unit of the following physical quantities:
mass, length, force and density **(2 M, W-09)**

(11) Define unit and give any two requirements of standard unit. **(2 M, S-10)**

(12) Define significant figures. State the rules to find number of significant figures in measurement. **(4 M, S-10)**

(13) Classify the following into fundamental and derived units : kilogram, coulomb, second, volt, candela. **(2 M, W-10)**

(14) Define derived physical quantity. Give two examples. **(2 M, S-11)**

MCQs on Units and Measurements

1. *To calculate weight of the man, which of the following parameters is used .....*
   (a) length *(b) mass*
   (c) time *(d) none of these*
2. *Which of the following quantity is measured in Kelvin ?*
   (a) length *(b) mass*
   (c) time *(d) temperature*
3. *The unit of acceleration in S.I. is .....*
   (a) m/s *(b) km/h*
   (c) m/s^2 *(d) km/h^2*

4. The unit of force in C.G.S. is .....
   (a) pound force (b) Newton
   (c) kg force (d) dyne

5. Kilogram metre per second square is the unit of .....
   (a) force (b) pressure
   (c) work (d) velocity

6. The unit of work is .....
   (a) Newton-metre (b) Newton
   (c) Joule/s (d) kilogram-metre

7. The unit of plane angle is .....
   (a) degree Celsius (b) radian
   (c) steradian (d) none of these

8. The length of the table is 3 metre, here 3 is the .....
   (a) standard (b) unit
   (c) magnitude (d) quantity

9. Which of the following is not a requirement of standard unit .....
   (a) it should be same for all quantities (b) it should be universally accepted
   (c) it should be well defined (d) it should be fixed with time and place

10. The ..... used for measurement of physical quantity is called unit of that quantity.
    (a) quantity (b) dimension
    (c) time (d) standard

11. A physical quantity is a quantity which can .....
    (a) be defined (b) be measured
    (c) not quantified (d) not computed

12. The physical quantity which do not depend on any other physical quantity for their measurement is called .....
    (a) fundamental quantity (b) derived quantity
    (c) scalar quantity (d) vector quantity

13. Which of the following is not a fundamental quantity ?
    (a) length (b) speed
    (c) mass (d) time

14. Which of the following is a fundamental quantity ?
    (a) density (b) pressure
    (c) momentum (d) time

15. *Physical quantity which depends on one or more fundamental quantities for their measurement is called as .....*

(a) *fundamental quantity* (b) *derived quantity*

(c) *MKS quantity* (d) *CGS quantity*

16. *Which of the following is not a fundamental unit ?*

(a) *metre* (b) *kilogram*

(c) *newton* (d) *second*

17. *Which of the following is a derived unit ?*

(a) *metre* (b) *kilogram*

(c) *second* (d) *joule*

18. *Pascal is the S.I. unit of .....*

(a) *force* (b) *pressure*

(c) *density* (d) *momentum*

19. *The system of units which are in use are .....*

(a) *C.G.S., M.K.S., P.S.T. and S.I.* (b) *M.K.S., C.G.S., V.I.T. and S.I.*

(c) *C.G.S., M.K.S., P.S.T. and F.I.* (d) *C.G.S., M.K.S., F.P.S. and S.I.*

20. *In M.K.S. system, the units of length, mass and time are .....*

(a) *millisecond, kilohertz and second* (b) *metre, kilogram and second*

(c) *millimetre, kilobyte and second* (d) *mile, kilogram and second*

21. *The units of length, mass and time are centimetre, gram and second which are used in the ..... system.*

(a) *C.G.S.* (b) *M.K.S.*

(c) *F.P.S.* (d) *S.I.*

22. *1 gigahertz means .....*

(a) 10^6 *Hz* (b) 10^3 *Hz*

(c) 10^{12} *Hz* (d) 10^9 *Hz*

23. *1 millimetre means .....*

(a) 10^{-2} *m* (b) 10^{-3} *m*

(c) 10^{-6} *m* (d) 10^{-9} *m*

24. 10^{-6} *metre means .....*

(a) *1 mm* (b) *1 cm*

(c) *1 nm* (d) *1 μm*

25. *1 nanometre equals to .....*

(a) 10^{-9} *m* (b) 10^{-6} *m*

(c) 10^{-3} *m* (d) 10^{-1} *m*

26. The unit of area in M.K.S. system is .....
(a) hectare (b) metre square
(c) guntha (d) square feet

27. Centimetre per second is the unit of speed in .....
(a) S.I. system (b) F.P.S. system
(c) M.K.S. system (d) C.G.S. system

28. The dimensions of physical quantity are the ..... to which fundamental units must ..... to obtain the unit of a given physical quantity.
(a) scales, caliberated (b) system, scaled
(c) powers, raised (d) false

29. To decide dimensions of a physical quantity, the unit of time is expressed by .....
(a) 'S' (b) 'L'
(c) 'M' (d) 'T'

30. Dimensional formula for '**area**' is .....
(a) $[L^2 M^0 T^0]$ (b) $[L^2 M^{-1} T^0]$
(c) $[L^0 M^2 T^1]$ (d) $[L^0 M^0 T^2]$

31. Dimensional formula for '**density**' is .....
(a) $[L^1 M^{-3} T^0]$ (b) $[L^{-3} M^1 T^0]$
(c) $[L^1 M^0 T^{-3}]$ (d) $[L^3 M^1 T^0]$

32. In the dimensional equation $[L^a, M^b, T^c] \rightarrow [^a, ^b, ^c]$ are called .....
(a) dimensional formulae (b) dimensions
(c) basic quantities (d) derived quantities

33. $[L^1 M^0 T^{-1}]$ are the dimensions of the quantity .....
(a) acceleration (b) density
(c) speed (d) area

34. Dimensions of ..... and ..... are same.
(a) pressure, stress (b) work, force
(c) velocity, acceleration (d) length, mass

35. Error is ..... in a given measurement.
(a) mistake (b) accuracy
(c) uncertainty (d) certainty

36. An error caused due to faulty instrument is called .....
(a) systematic error (b) personal error
(c) random error (d) constant error

37. Error can be minimized by .....
    (a) taking large magnitude of physical quantity which is to be measured
    (b) taking large number of readings
    (c) using smallest least count instrument
    (d) all of the above

38. The difference between reading and the mean reading is called as .....
    (a) corrected reading
    (b) absolute error
    (c) average absolute error
    (d) relative error

39. The ratio of average absolute error to mean reading is called .....
    (a) average absolute error
    (b) absolute error
    (c) relative error
    (d) random error

40. Same person may get different readings because of human limitations, this comes under .....
    (a) instrumental error
    (b) constant error
    (c) random error
    (d) personal error

41. A significant figure is defined as a figure in any place which is reasonably .....
    (a) non considerable
    (b) meaningless
    (c) not important
    (d) meaningful

42. The digits 1, 2, 3, 4, 5, 6, 7, 8, 9 are .....
    (a) not significant
    (b) sometimes significant
    (c) always significant
    (d) all of the above

43. All non-zero digits are .....
    (a) always significant
    (b) not significant
    (c) sometimes significant
    (d) all of the above

44. If distance between Mumbai to Pune by train is 90.5 km, in this, zero is .....
    (a) not significant
    (b) significant
    (c) may be significant
    (d) may not be significant

45. Which of the following value is more precise ?
    (a) 1.200×10^3 km
    (b) 1.20×10^3 km
    (c) 1.2×10^3 km
    (d) 1200 km

46. If readings of thickness of metal plate are 0.626 cm, 0.627 cm, 0.625 cm, 0.627 cm and 0.626 cm then the average reading will be .....
    (a) 0.6362 cm
    (b) 0.6226 cm
    (c) 0.6262 cm
    (d) 0.6622 cm

47. If corrected average reading is 0.2525 cm and average absolute error is 0.00031 cm then relative error will be .....

(a) 0.001227 (b) 0.01227

(c) 0.002127 (d) 0.02127

48. In a given measurement, if percentage error is 0.123, then relative error is .....

(a) 0.00213 units (b) 0.0123 units

(c) 0.0213 units (d) 0.00123 units

49. Calculate corrected reading, if diameter of rod measured by micrometer screw gauge is 1.234 cm (zero error of micrometer is + 0.002 cm) .....

(a) 1.322 cm (b) 1.232 cm

(c) 1.223 cm (d) 2.132 cm

50. The mass of the object is 23.4 ± 0.02 gm. Percentage error in this measurement is .....

(a) 0.0585% (b) 0.585%

(c) 0.0855% (d) 0.855%

51. Which of the following is more accurate reading ?

(1) 1.22 ± 0.003 mm (2) 3.22 ± 0.004 mm

(3) 4.22 ± 0.005 mm

(a) case 1 (b) case 2

(c) case 3 (d) case 1 and case 3

52. Diameter of the metal ball measured by vernier calliper is 2.34 cm. If least count of vernier is 0.01 cm, calculate percentage error.

(a) 0.427% (b) 0.247%

(c) 0.742% (d) 0.724%

53. Calculate percentage error in kinetic energy of a body of mass 23 ± 0.1 gm and moving with velocity of 46 ± 0.2 cm/s.

(a) 4.013% (b) 3.104%

(c) 1.043% (d) 1.304%

54. Calculate percentage error in the measurement of density of cube, if mass of cube has 3% error and length has 2% error.

(a) 6% (b) 8%

(c) 9% (d) 7%

55. State the number of significant figures in the measurement of 0.0045.

(a) 1 (b) 2

(c) 3 (d) 4

56. The number of significant figure in the measurement of 0.0560 is .....
(a) 1 (b) 2
(c) 3 (d) 4

57. The number of significant figure in the measurement of 0.007800 is .....
(a) 1 (b) 2
(c) 3 (d) 4

58. The number of significant figure in the measurement of 2.34×10^{11} is .....
(a) 1 (b) 2
(c) 3 (d) 4

59. The number of significant figure in the measurement of 203 is .....
(a) 1 (b) 2
(c) 3 (d) 4

60. Calculate $(2.34 \times 10^4 - 1.23 \times 10^3)$ with respect to significant figures.
(a) 2.22×10^3 (b) 2.22×10^4
(c) 2.22×10^5 (d) 2.22×10^6

61. Considering four significant digits, round off the number 12.3466×10^9
(a) 12.347×10^9 (b) 12.34×10^9
(c) 12.35×10^9 (d) 12.346×10^9

62. 5.6 kg is equal to .....
(a) 5.6×10^6 gm (b) 5.6×10^9 gm
(c) 5.6×10^{-3} gm (d) 5.6×10^3 gm

63. 23 mm is equal to .....
(a) 2.3 cm (b) 230 cm
(c) 0.23 cm (d) 0.023 cm

64. 200 μF is equal to .....
(a) 200×10^{-9} F (b) 200×10^6 F
(c) 200×10^{-6} F (d) 200×10^9 F

65. 6 MW is equal to .....
(a) 6×10^9 W (b) 6×10^6 W
(c) 6×10^{-9} W (d) 6×10^{-6} W

66. 2 GHz is equal to .....
(a) 2×10^{-6} Hz (b) 2×10^6 Hz
(c) 2×10^{-9} Hz (d) 2×10^9 Hz

67. 1500 nF is equal to .....
(a) 1500×10^{-6} F (b) 1500×10^6 F
(c) 1500×10^{-9} F (d) 1500×10^9 F

68. 2000 pF is equal to .....
(a) 2000×10^{-9} F (b) 2000×10^9 F
(c) 2000×10^{12} F (d) 2000×10^{-12} F

69. *Length of table is 3 m. Convert this into mm.*
   (a) 3×10^{-3} mm (b) 3×10^{3} mm
   (c) 3×10^{-2} mm (d) 3×10^{2} mm

70. *220 cm is equal to .....*
   (a) 220×10^{-2} m (b) 220×10^{2} m
   (c) 220×10^{3} m (d) 220×10^{-3} m

Answers and Hints on Unit-I - Units and Measurements

1. (b)	2. (d)	3. (c)	4. (d)	5. (a)	6. (a)	7. (b)	8. (c)	9. (a)	10. (d)
11. (b)	12. (a)	13. (b)	14. (d)	15. (b)	16. (c)	17. (d)	18. (b)	19. (d)	20. (b)
21. (a)	22. (d)	23. (b)	24. (d)	25. (a)	26. (b)	27. (d)	28. (c)	29. (d)	30. (a)
31. (b)	32. (b)	33. (c)	34. (a)	35. (c)	36. (d)	37. (d)	38. (b)	39. (c)	40. (c)
41. (d)	42. (c)	43. (a)	44. (b)	45. (a)	46. (c)	47. (a)	48. (d)	49. (b)	50. (c)
51. (c)	52. (a)	53. (d)	54. (c)	55. (b)	56. (c)	57. (d)	58. (c)	59. (c)	60. (b)
61. (c)	62. (d)	63. (a)	64. (c)	65. (b)	66. (d)	67. (c)	68. (d)	69. (b)	70. (a)

30. **Hint :** Area $= L \times b = L \times L$.

31. **Hint :** Density $= \dfrac{\text{Mass}}{\text{Volume}} = \dfrac{\text{Mass}}{L \times B \times H} = \dfrac{M}{L \times L \times L}$

33. **Hint :** $[L^1 M^0 T^{-1}] = \dfrac{L}{T} = \dfrac{\text{Distance}}{\text{Time}} = \text{Speed}$

46. **Hint :** $\dfrac{(0.626 + 0.627 + 0.625 + 0.627 + 0.626)}{5} = 0.6262$

47. **Hint :** Relative error $= \dfrac{\delta x_{avg}}{x_m} = \dfrac{0.00031}{0.2525} = 0.001227$

48. **Hint :** $R = \dfrac{\%\ \text{error}}{100}$

49. **Hint :** $x_c = x - z = (1.234 - 0.002) = 1.232$ cm.

50. **Hint :** $\%\ \text{error} = \dfrac{0.02}{23.4} \times 100 = 0.0855$

51. **Hint :** (1) % error is 0.246, (2) % error is 0.124, (3) % error is 0.118.
% error of case (3) is less, therefore more accurate.

52. **Hint :** $\dfrac{0.01}{2.34} \times 100 = 0.427\%$

53. **Hint :** $\left(\dfrac{0.1}{23} \times 100\right) + 2 \times \left(\dfrac{0.2}{46} \times 100\right)$

54. **Hint :** $3\% + (3 \times 2\%) = 9\%$

❑❑❑

Q.2 The reference standard used for measurement of physical quantity is called _____.

[a] quantity [b] unit [c] number [d] systems of unit

Q.3 The requirements of good unit _____.

[a] universely accepted [b] well defined and easily available

[c] invariable [d] all of the above

Q.4 A set of fundamental and derived units is called _____.

[a] quantity [b] system of units

[c] system of quantity [d] both (b) and (c)

Q.5 CGS means _____.

[a] cm-g-sec [b] m-g-sec [c] cm-kg-sec [d] cm-g-m

Q.6 MKS means_____ .

[a] m-kg-s [b] m-g-s [c] cm-kg-s [d] m-cm-g

Q.7 FPS means _____.

[a] ft-lb-s [b] ft-p-s [c] ft-d-m [d] foot-p-s

Q.8 The physical quantities which do not depend on any physical quantities for their measurements are known as _____.

[a] derived quantities [b] fundamental quantities

[c] derived unit [d] both (a) and (b)

Q.9 The physical quantities which depend on one or more fundamental quantities for their measurements are called _____.

[a] derived quantities [b] fundamental quantities

[c] fundamental unit [d] both (a) and (b)

Q.10 The SI unit of temperature is _____.

[a] °C [b] °F [c] °K [d] all of the above

Q.11 The SI unit of luminous intensity is _____.

[a] candal [b] candela [c] mole [d] m/s

Q.12 The SI unit of amount of substance is _____.

[a] mole [b] candela [c] ampere [d] kilogram

Q.13 The SI unit of plane angle is _____.

[a] kilogram [b] radian [c] steradian [d] candela

Q.14 The SI unit of solid angle is _____.

[a] kilogram [b] radian [c] steradian [d] mole

Q.15 The SI unit of force is _____.

[a] N [b] $kg\text{-}m/s^2$ [c] dyne [d] both (a) and (b)

Q.16 The CGS unit of force is _____.

[a] dyne [b] newton [c] ampere [d] poise

Q.17 The unit of energy is _____.

[a] joule [b] newton-metre

[c] erg [d] all of the above

Q.18 The SI unit of temperature gradient is _____.

[a] °C [b] °K [c] °K/m [d] °C/cm

Q.19 The dimensional symbol of luminous intensity is_____.

[a] L [b] I [c] C [d] K

Q.20 The dimensional formula for velocity _____.

[a] $[L^1\ M^1\ L^1]$ [b] $[L^1\ M^0\ T^1]$

[c] $[L^1\ M^1\ L^0]$ [d] $[L^1\ M^0\ T^{-1}]$

Explanation :

$$\text{Velocity} = \frac{\text{displacement}}{\text{time}} = \frac{L}{T}$$

$$\therefore \quad \text{Dimensions} = \left[L^1\ M^0\ T^{-1}\right]$$

Q.21 The dimensions of temperature gradient is _____ .

[a] $\left[L^{-1}\ M^0\ T^0\ K^1\right]$ [b] $\left[L^1\ M^0\ T^0\ K^1\right]$

[c] $\left[L^0\ M^1\ T^1\ K^{-1}\right]$ [d] $\left[L^1\ M^1\ T^1\ K^{-1}\right]$

Explanation :

$$\text{Temperature gradient} = \frac{\text{Temperature}}{\text{distance}} = \frac{T}{L} \Rightarrow \left[L^{-1}\ M^0\ T^0\ K^1\right]$$

Q.22 The dimensions of magnetic flux is _____.

[a] $\left[L^2\ M^1\ T^{-1}\ I^{-1}\right]$ [b] $\left[L^0\ M^1\ T^{-1}\ I^1\right]$

[c] $\left[L^1\ M^0\ T^{-2}\ I^{-2}\right]$ [d] $\left[L^2\ M^1\ T^{-2}\ I^{-1}\right]$

Explanation :

$$\text{Magnetic flux} = \text{Magnetic Field} \times \text{Area}$$

$$= \frac{\text{Force}}{\text{Current} \times \text{Length}} \times \text{Area}$$

$$= \frac{\text{Mass} \times \text{Acceleration} \times \text{Area}}{\text{Current} \times \text{Length}}$$

$$= \frac{M \times {}^{L}\!/_{T^2} \times L^2}{I \times L} = \frac{M \times L^3}{L^3 \times I \times L} = \frac{M \times L^2}{T^2 \times I}$$

$$\text{Dimensions} = \left[L^2\ M^1\ T^{-2}\ I^{-1}\right]$$

Q.23 Dimensions of charge is _____.

[a] $\left[L^0\ M^0\ T^{-1}\ I^1\right]$ [b] $\left[L^0\ M^0\ T^1\ I^{-1}\right]$

[c] $\left[L^0\ M^0\ T^1\ I^1\right]$ [d] $\left[L^0\ M^0\ T^{-1}\ I^{-1}\right]$

Explanation :

$$\text{Charge} = \text{Current} \times \text{Time}$$
$$= I \times t \Rightarrow \left[L^0\ M^0\ T^1\ I^1\right]$$

Q.24 The dimensions of work is _____.

a $\left[L^2\ M^1\ T^2\right]$ b $\left[L^2\ M^{-1}\ T^2\right]$

c $\left[L^2\ M^1\ T^{-2}\right]$ d $\left[L^{-2}\ M^1\ T^{-2}\right]$

Explanation :

$$\text{Work} = \text{Force} \times \text{Displacement}$$
$$= \text{Mass} \times \text{Acceleration} \times \text{Displacement}$$
$$= M \times \frac{L}{T^2} \times L \Rightarrow \left[L^2\ M^1\ T^{-2}\right]$$

Q.25 The SI unit and dimensions of density _____.

a $\frac{kg}{m^3}, \left[L^3\ M^1\ T^0\right]$ b $\frac{m^3}{kg}, \left[L^{-3}\ M^3\ T^0\right]$

c $\frac{kg}{m^3}, \left[L^{-3}\ M^1\ T^0\right]$ d $\frac{kg}{m^3}, \left[L^3\ M^{-1}\ T^0\right]$

Explanation :

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{M}{L^3} \Rightarrow \left[L^{-3}\ M^1\ T^0\right] \text{ and unit is } kg/m^3$$

Q.26 The dimensions of resistance is _____.

a $\left[L^2\ M^1\ T^{-3}\ I^{-2}\right]$ b $\left[L^2\ M^1\ T^{-2}\ I^{-1}\right]$

c $\left[L^{-2}\ M^2\ T^{-2}\ I^{-3}\right]$ d $\left[L^2\ M^1\ T^{-2}\ I^{-2}\right]$

Explanation :

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}}$$
$$= \frac{(\text{Work/Charge})}{\text{Current}} = \frac{(W/q)}{I} = \frac{W}{qI} = \frac{F \times S}{It \times I}$$

$$= \frac{\left[L^1\ M^1\ T^{-2}\right] \times [L]}{\left[T\ I^2\right]} = \left[L^2\ M^1\ T^{-3}\ I^{-2}\right]$$

Q.27 The difference between true value and measured value is known as _____.

[a] unit [b] error [c] quantity [d] accuracy

Q.28 _____ can not be eliminated but they can be minimised.

[a] units [b] errors [c] quantities [d] random

Q.29 For less error, measurement is _____.

[a] more accurate [b] less accurate

[c] constant accurate [d] both (a) and (b)

Q.30 Which of the following is more accurate instrument_____.

[a] vernier caliper [b] micrometer screw gauge

[c] metre scale [d] all of the above

Explanation :

LC of vernier caliper = 0.01 cm

LC of meter scale = 0.1 cm

LC of micrometer screw guage = 0.001 cm

Compare to all, micrometer has less L.C.

Q.31 The errors occurs due to use of faulty instrument is called _____.

[a] instrumental errors [b] systematic errors

[c] random errors [d] both (a) and (b)

Q.32 The errors occurs due to defective setting in the measuring instruments is called _____ .

[a] instrumental errors [b] systematic errors

[c] random errors [d] all of the above

Q.33 The errors due to sudden change in experimental conditions are called _____ .

[a] instrumental errors [b] systematic errors

[c] random errors [d] force errors

Q.34 Which type of errors can not be controlled ?

[a] Random errors [b] Experimental errors

[c] Instrumental errors [d] Systematic errors

Q.35 How to minimize the errors in the measurement ?

[a] Taking a large magnitude of the quantity to be measured

[b] Taking large number of readings and find its mean value

[c] Using an instrument whose least count is small

[d] All of the above

Q.36 The magnitude of difference between mean value and each measured value is called as _____.

[a] absolute error [b] random error

[c] relative error [d] none of the above

Q.37 The ratio of mean absolute error in the measurement of physical quantity to mean value is called _____.

[a] absolute error [b] relative error

[c] random error [d] experimental error

Q.38 A figure which is of some significance but it does not necessarily denote a certainly is called _____.

[a] significant figure [b] basic figure

[c] numbering figure [d] decimal figure

Q.39 The mass and volume of a plate are 4.237 kg and 2.51 m^3 respectively. Find density of plate in S.F.

[a] 1.688 kg/m^3 [b] 1.69 kg/m^3

[c] 1.6880 kg/m^3 [d] 1.6890 kg/m

Q.40 The experimental calculation of specific heat of aluminium was found to be 0.156 cal/g °C, but the actual value is given 0.185 cal/g °C. Calculate percentage error in s.f.

[a] 15.701% [b] 15.72% [c] 15.7% [d] 16%

Q.41 The area and volume of sphere is 4.50 ± 0.10 cm^2 and 50.30 ± 0.10 cm^3. Calculate total percentage error in the measurement of area and volume of sphere.

[a] 2.4% [b] 2.42% [c] 2.424% [d] 2.4245%

Q.42 Which one of the following units is a fundamental unit ?

[a] watt [b] joule/sec. [c] ampere [d] newton

Q.43 kg m/sec is the unit of _____ .

[a] impulse [b] angular acceleration

[c] capacity of condenser [d] acceleration

Q.44 Candela is the unit of _____ .

[a] magnetic flux [b] intensity of electric field

[c] luminous intensity [d] charge

Q.45 The fundamental unit which is common in F.P.S. and M.K.S. systems is _____ .

[a] foot [b] sec [c] kilogram [d] pound

Q.46 Which of the following is unit of length ?

[a] lunar month [b] kelvin [c] candela [d] light year

Q.47 Which of the following is a fundamental physical quantity ?

[a] Acceleration [b] Velocity [c] Speed [d] Length

Q.48 Which one of the following is the unit of energy ?

[a] Newton [b] N/sec [c] N-sec [d] None of the above

Q.49 Which of the following is not a unit of power ?

[a] watt [b] joule/hr [c] Nm/sec [d] N/sec

Q.50 The physical quantity having units of mass is _____ .

[a] density [b] momentum [c] inertia [d] moment of force

Q.51 S.I. unit of electric intensity is _____ .

[a] coulomb/m [b] henry [c] V/m [d] watt

Q.52 Which of the following is S.I. unit of resistance ?

[a] meter [b] second [c] ohm [d] ampere

Q.53 Which is the physical quantity whose dimensional formula is $\left[L^1M^1T^{-2}\right]$?

[a] Bulk modulus [b] Electric conductance

[c] Surface tension [d] Force

Explanation :

$$\text{Force} = \text{Mass} \times \text{Acceleration}$$

$$= m \times \frac{L}{T^2} = L^1M^1T^{-2}$$

Q.54 Which is the physical quantity whose dimensional formula is $\left[L^2M^1T^{-2}\right]$?

[a] Electric current [b] time

[c] energy [d] force

Explanation :

$$\text{Energy} = \text{Force} \times \text{Displacement}$$

$$= kg \cdot m^2 \cdot s^{-2} = \left[L^2M^1T^{-2}\right]$$

Q.55 Which of the following is a derived unit ?

[a] ampere [b] mole [c] candela [d] newton

Q.56 Which of the following is not a fundamental physical quantity ?

[a] celsius [b] candela [c] newton [d] all the above

Q.57 Which of the following is the unit of energy ?

[a] joule [b] N/m^2 [c] N-m [d] $kg\text{-}m/s^2$

Q.58 Systametic error occured due to poor calibration of instrument that can be corrected by _____ .

[a] taking several readings [b] replacing instruments

[c] taking mean values [d] taking median of values

Q.59 Error that occurs due to equally affected measurement is called _____ .

[a] random error [b] systematic error

[c] frequent error [d] precision

Q.60 How many fundamental units are there in SI system ?

[a] 5 [b] 7 [c] 6 [d] 4

Q.61 Which of the following physical quantity is fundamental ?

[a] velocity [b] force [c] temperature [d] volume

Q.62 Which of the physical quantity remains same for all unit system ?

[a] metre [b] second [c] ampere [d] kilogram

Q.63 What is the ratio of 1 micron to one nanometer ?

[a] 10^4 [b] 10^3 [c] 10^{16} [d] 10^{-6}

Explanation :

$$\text{Ratio} = \frac{1\text{micron}}{1\text{nanometer}} = \frac{1\mu m}{1nm}$$

$$= \frac{10^{-6}\,m}{10^{-9}\,m} = 10^{-6+9} = 10^3$$

Q.64 1 MeV = _____ eV

[a] 10^7 [b] 10^4 [c] 10^5 [d] 10^6

Q.65 Unit of momentum physical quantity ?

[a] newton-second [b] newton/second

[c] joule [d] joule/second

Explanation :

$$\text{Momentum} = \text{Mass} \times \text{Velocity}$$

$$= \text{kg} - \frac{\text{m}}{\text{s}} = \text{kg} - \frac{\text{m}}{\text{s}} \times \frac{\text{s}}{\text{s}}$$

$$= \text{kg} - \frac{\text{m}}{\text{s}^2} \times \text{s} = \text{N-s}$$

Q.66 The SI unit of momentum is _____ .

[a] kg newton [b] kg $m^{-2}s^2$ [c] kg m^{-1} [d] kg ms^{-1}

Q.67 Volt/meter is the unit of _____ .

[a] work [b] viscosity

[c] electric field intensity [d] velosity

Q.68 What is the least count of vernier callipers ?

[a] 10^{-4} m [b] 10^{-5} m [c] 10^{-2} m [d] 10^{-3} m

Explanation :

$$\text{L.C. of V.C} = 0.01 \text{ cm}$$

$$= 0.01 \times 10^{-2} \text{ m} = 10^{-4} \text{ m}$$

Q.69 What is the least count of screw gauge ?

[a] 10^{-4} m [b] 10^{-5} m [c] 10^{-2} m [d] 10^{-6} m

Explanation :

$$\text{L.C. of MSG} = 0.001 \text{ cm} = 0.001 \times 10^{-2} \text{ m}$$

$$= 1 \times 10^{-5} \text{ m}$$

Q.70 The percentage error in the distance 100 ± 5 cm is _____ .

[a] 5 % [b] 6 % [c] 8 % [d] 20 %

Explanation :

$$\% \text{ error } = \frac{5}{100} \times 100 = 5\ \%$$

Q.71 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 %

Explanation :

$$\text{density } = \frac{\text{mass}}{\text{volume}} = \frac{\text{mass}}{(\text{length})^3}$$

$$\therefore \quad \% \text{ error in density } = \% \text{ error in mass} + \% \text{ error in } L^3$$

$$= \% \text{ error in mass} + 3 \times \% \text{ error in L}$$

$$= 0.25 + 3 \times 0.50 = 0.25 + 1.50 = 1.75\ \%$$

Q.72 If $P = \frac{A^2B}{C^3}$ where percentage error in A, B and C are respectively 2 %, 3 % and 5 % then total percentage error in measurement of p _____ .

[a] 18 % [b] 14 % [c] 22 % [d] 12 %

Explanation :

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

$$\% \text{ error in P } = \% \text{ error in } A^2 + \% \text{ error in B} + \% \text{ error in } C^3$$

$$= 2 \times \% \text{ error in A} + \% \text{ error in B} + 3 \times \% \text{ error in C}$$

$$= 2 \times 2 + 3 + 3 \times 5 = 4 + 3 + 15 = 22\ \%$$

Q.73 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

Q.74 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 %

Explanation :

$$H = I^2Rt$$

$$\% \text{ error in } H = 2 \times \% \text{ error in } I + \% \text{ error in } R + \% \text{ error in } t$$

$$= 2 \times 2 + 4 + 2 = 4 + 4 + 2 = 10\ \%$$

Q.75 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 percentage error in the equivalent resistance of the combination.

[a] 8.5 % [b] 12 % [c] 4 % [d] 9 %

Explanation :

$$R_1 = (100 \pm 5)\ \Omega$$

$$R_2 = (200 \pm 5)\ \Omega$$

$$\% \text{ error in combination} = \% \text{ error in } (100 \pm 5)\Omega + \% \text{ error in } (200 \pm 5)\ \Omega$$

$$= \frac{5}{100} \times 100 + \frac{7}{200} \times 100 = 5 + 3.5 = 8.5\ \%$$

Q.76 The resistance $R = \frac{V}{I}$ where $V = 100 \pm 5$ volts and $I = 10 \pm 0.3$ amperes, calculate the percentage error in R.

[a] 8 % [b] 10 % [c] 12 % [d] 14 %

Q.77 The number of significant figures in 0.000150 is _____

[a] 3 [b] 5 [c] 2 [d] 4

Q.78 Which of the following numerical value have significant figure 4 ?

[a] 1.011 [b] 0.010 [c] 0.001 [d] 0.100

Q.79 What is the number of significant figures in 5.50×10^3 ?

[a] 2 [b] 7 [c] 3 [d] 4

Q.80 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

Explanation :

For **multiplication and division,** answer should be rounded off to least significant figure.

Solution : Here 1.25 has 3 S.F and 2.245 has 4 S.F.

$\therefore$ Answer is rounded to least significant figure i.e. 2.81 cm^2 (3 S.F.)

Q.81 The significant figures in 500.5000 are _____ .

[a] 5 [b] 3 [c] 7 [d] 6

Q.82 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

Explanation :

For Addition and Subtraction

Answer should be rounded off to **least decimal places**

Solution : 15.225 cm has 5 s.f, 7.21 cm has 3 s.f and 3.0 cm has 2 s.f

Here 3.0 has one decimal (least decimal)

$\therefore$ Answer = 25.4 cm (Ans. is rounded to least decimal)

Q.83 If the length of the 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] (3.33 ± 0.00) cm

Q.84 In acceleration, the dimensions for mass, length, time are _____

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

Answers :

Q.1	a	Q.2	b	Q.3	d	Q.4	b	Q.5	a
Q.6	a	Q.7	a	Q.8	b	Q.9	a	Q.10	c
Q.11	b	Q.12	a	Q.13	b	Q.14	c	Q.15	d
Q.16	a	Q.17	d	Q.18	c	Q.19	c	Q.20	d
Q.21	a	Q.22	d	Q.23	c	Q.24	c	Q.25	c
Q.26	a	Q.27	b	Q.28	b	Q.29	a	Q.30	b
Q.31	a	Q.32	b	Q.33	c	Q.34	a	Q.35	d
Q.36	a	Q.37	b	Q.38	a	Q.39	b	Q.40	c
Q.41	b	Q.42	c	Q.43	a	Q.44	c	Q.45	b
Q.46	d	Q.47	d	Q.48	d	Q.49	d	Q.50	c
Q.51	c	Q.52	c	Q.53	d	Q.54	c	Q.55	d
Q.56	c	Q.57	a	Q.58	b	Q.59	b	Q.60	b
Q.61	c	Q.62	b	Q.63	b	Q.64	d	Q.65	a
Q.66	d	Q.67	c	Q.68	a	Q.69	b	Q.70	a
Q.71	b	Q.72	c	Q.73	d	Q.74	d	Q.75	a
Q.76	a	Q.77	a	Q.78	a	Q.79	c	Q.80	b
Q.81	c	Q.82	b	Q.83	b	Q.84	a		

❑❑❑

Q. 28 Write CGS and SI units of the following physical quantities mass, length, force, density.

Q. 29 A student measures the diameter of a bob three times using vernier calliper. The measurements are 2.35 cm, 2.36 cm, 2.31 cm. Estimate error in the measurement (Calculate absolute error and % error)

1.7 Multiple Choice Questions

1. 1KWH is unit of
   (a) Time (b) Power
   (c) Energy (d) Stress **Ans. : (c)**

2. Unit of Intensity of magnetic induction field is
   (a) N/Am (b) Tesla
   (c) Wb/m^2 (d) All above **Ans. : (d)**

3. Which of the following has no units?
   (a) Thermal capacity
   (b) Magnetic susceptibility
   (c) Angular acceleration
   (d) Moment of a magnet **Ans. : (b)**

4. Which one of the following units is a fundamental unit?
   (a) Watt (b) Joule/sec
   (c) Ampere (d) Newton **Ans. : (c)**

5. kg m/sec is the unit of
   (a) Impulse
   (b) Angular acceleration
   (c) Capacity of condenser
   (d) Acceleration. **Ans. : (a)**

6. Candela is the unit of
   (a) Magnetic flux
   (b) Intensity of electric field
   (c) Luminous intensity
   (d) Charge **Ans. : (c)**

7. If 10 newton = X dynes, the value of x is
   (a) 10^6 (b) 10^4
   (c) 10^8 (d) 10^3 **Ans. : (a)**

8. 1 KWh is equal to
   (a) 360 J (b) 1800 J
   (c) 1800×10^5 J (d) 360×10^5 J
   Ans. : (d)

9. Which of the following is a common unit of a physical quantity in M.K.S & S.I systems ?
   (a) Ampere (b) Kelvin
   (c) Mole (d) Joule/sec **Ans. : (d)**

10. The fundamental unit which is common in F.P.S and M.K.S systems is
    (a) Foot (b) Sec
    (c) Kilo gram (d) Pound **Ans. : (b)**

11. Which of the following is Unit of length?
    (a) Lunar Month (b) Kelvin
    (c) Candela (d) Light year
    Ans. : (d)

12. rad / sec is the unit of
    (a) Angular displacement
    (b) Angular velocity
    (c) Angular acceleration
    (d) Angular momentum **Ans. : (b)**

13. The ratio of S.I unit of K.E to C.G.S unit of K.E is
    (a) 10^7 (b) 10^{-7}
    (c) 10^{-5} (d) 10^5 **Ans. : (b)**

14. Which one of the following is the unit of energy ?
    (a) Newton (b) N/sec
    (c) N – sec (d) None of the above
    Ans. : (d)

15. Which of the following is not a unit of power ?
    (a) Watt (b) joule/hr
    (c) Nm/sec (d) N/sec **Ans. : (d)**

16. The physical quantity having units of mass is
    (a) Density (b) Momentum
    (c) Inertia (d) Moment of force
    Ans. : (c)

17. S.I unit of electric intensity is
(a) coulomb / m (b) Henry
(c) V / m (d) watt **Ans. : (c)**

18. Which is the dimensional formula of the physical quantity whose dimensional S.I unit is Siemen ?
(a) $M^{-1} L^{-2} T^3 I^3$ (b) $M^{-1} L^{-1} T^3 I^3$
(c) $M^1 L^{-2} T^3 I^3$ (d) $M^{-1} L^{-2} T^2 I^2$
Ans. : (a)

19. Which is the physical quantity whose dimensional formula is $M^1 L^0 T^{-2}$ is
(a) Bulk Modulus
(b) Electric conductance
(c) Surface tension
(d) Frequency **Ans. : (c)**

20. If $M^a L^b T^c$ is the dimensional formula of force, find the value of $2a - b - c$
(a) 8 (b) – 4 (c) 3 (d) 6
Ans. : (c)

21. Which of the following is a derived unit ?
(a) ampere (b) Mole
(c) candela (d) Newton **Ans. : (d)**

22. Which of the following is not a physical quantity ?
(a) kelvin (b) Candela
(c) henry (d) all the above
Ans. : (d)

23. If the unit of length is doubled, unit of time is halved and unit of momentum is quadrupled, the unit of work would change by _____ times.
(a) 1/8 (b) 1/16
(c) 16 (d) 8 **Ans. : (c)**

Soln. : Let the original unit of work be

$$W = M_1 L_1^2 T_1^{-2};$$

$$W = [M_1 L_1 T_1^{-1}] [L_1] [T_1^{-1}]$$

But $p_1 = M_1 L_1 T_1^{-1}$

Therefore $W = p_1 L_1 T_1^{-1}$ ...(1)

Let the new units of work, momentum, length and time be W′, p′, L′ and T′ respectively.

Given that, $p' = 4 p_1$; $L' = 2 L_1$ and $T' = (1/2) T_1$

The new unit of work $W' = p' L' T'^{-1}$;

Substituting the values of p′, L′ and T′ in above equation we get $W' = (4p_1)(2L_1)\left(\frac{T_1}{2}\right)^{-1}$

$W' = 16 p_1 L_1 T_1^{-1} = 16 W$

24. If the unit of force were 20N, that of power were 1 MW and that of time were 1 millisecond then the unit of length would be
(a) 20 m (b) 50 m
(c) 100 m (d) 1000 m **Ans. : (b)**

Soln. :

Given that, unit of power $P = [M L^2 T^{-3}] = 10^6$ W;

$$F = [MLT^{-2}] = 20 \text{ N}; \quad T = 10^{-3} \text{ sec}$$

$$P = MLT^{-2} LT^{-1} = FLT^{-1}$$

Substitute the values of P, F and T in above equation $10^6 = 20 (L) (10^{-1})^{-3}$

$$L = \frac{10^6}{20 \times 10^3} = 50 \text{ m}$$

25. If the unit of force is 10 N, that of length is 2 m and that of velocity is 100 m/sec, then the unit of mass is
(a) 0.002 kg (b) 2 kg
(c) 20 kg (d) 0.2 kg **Ans. : (a)**

Soln. :

Given that, unit of F = 10N = $[MLT^{-2}]$;

Unit of length L = 2 m ;

unit of velocity V = 100 m/sec = $[LT^{-1}]$

The unit of F = $[MLT^{-2}]$

$$= [M] [(LT^{-1})^2] \div [L]$$

$$F = \frac{MV^2}{L} \; ; \quad M = \frac{FL}{V^2}$$

$$M = \frac{(10)(2)}{100^2} = \frac{20}{10000} = 0.002 \text{ kg}$$

26. A force 100N acts on a body. If the units of mass and length are doubled and unit of time is halved, then the force in the new system changes to
(a) 160 N (b) 1.6 N
(c) 16 N (d) 1600 N **Ans. : (d)**

Soln. :

Let the original unit of force F=100 N = $[MLT^{-2}]$

Let the new unit of force, length, mass and time be F′, L′, M′ and T′ respectively.

Given that, units of mass and length are doubled i.e. L′ = 2 L and M′ = 2M and unit of time is halved T′ = T/2

The new unit of force $F' = [M' L' T'^{-2}]$

$$= (2M)(2L)\left(\frac{T}{2}\right)^{-2}$$

$$= 16\,[MLT^{-2}] = 16\,F = 1600\ N$$

27. The unit of energy is 10 J, if the unit of mass is tripled, unit of acceleration is doubled and the unit of length is halved. What will be the new unit of energy.

(a) 15 J (b) 30 J

(c) 300 J (d) 3 J **Ans. : (b)**

Soln. :

Original unit of power is $E = M L^2 T^{-2} = 10$ J

$$E = ML^2T^{-2} = (M)(LT^{-2})(L) = (M)(a)(L)$$

Let the new units of mass, acceleration and length be M′, a′ and L′ respectively

Given that, L′ = L/2, a′ = 2a and M′ = 3M

The new unit of energy $E = M' L'^2 T'^{-2}$

$$= (M')(L' T'^{-2})(L) = (M')(a')(L')$$

$$E = (3\,M)(2a)(L/2)$$

$$= 3\,(M)(a)(L) = 3\,E = 30\ J$$

28. The power of a motor is 150W.If the unit of force is doubled, unit of velocity is tripled what will be the new unit of power ?

(a) 600 W (b) 750 W

(c) 900 W (d) 300 w **Ans. : (c)**

Soln. : The original unit power of motor is P = 150W

$$= [ML^2T^{-3}]$$

The Unit of force F = $[MLT^{-2}]$ and unit of velocity V = $[LT^{-1}]$

$$P = [(MLT^{-2})]\,[(LT^{-1})] = F\,V$$

Let the new unit of power, force and velocity be P′, F′ and V′ respectively.

Given that F′ = 2F and V′ = 3V

$$P' = [M' L'^2 T'^{-3}] = [(M' L' T'^{-2})(L' T'^{-1})]$$

$$= F'\,V'$$

$$P' = (2F)(3V) = 6\,FV = 6P = 6(150) = 900\ W$$

29. The electric resistance of a conductor is 54 ohm. If the unit of mass and length are tripled, units of time and electric current are doubled. Then the value of new electric resistance.

(a) 540 ohm (b) 1080 ohm

(c) 1620 ohm (d) 1944 ohm **Ans. : (d)**

Soln. :

The original unit of electric resistance $R = [M L^2 T^{-3} I^{-2}] = 54$ ohm

Let the changed units of resistance, length, mass, time and current are R′, L′, M′, T′ and I′ respectively.

Given that, L′ = 3L, M′ = 3M , T′ = 2T and I′ = 2I

$$R' = [M' L'^2 T'^{-3} I'^{-2}];$$

$$R' = [(3M)(3L)^2 (2T)^{-3} (2I)^{-2}]$$

$$R' = 36\,[M L^2 T^{-3} I^{-2}] = 36\,R$$

$$= 36(54) = 1944 \text{ ohm.}$$

30. The unit of angular momentum is 25 $kg \cdot m^2\ sec^{-1}$. If the momentum is doubled and length is quadrapled, what will be the new unit of angular momentum ?

(a) 200 units (b) 150 units

(c) 400 units (d) 600 units **Ans. : (a)**

Soln. :

Let the angular momentum $X = [M L^2 T^{-1}] = 25$

Momentum $p = [MLT^{-1}]$

$$X = [(MLT^{-1})(L)]\ ;\ X = p\,(L)$$

Let the new Angular momentum, momentum and length be X′, p′ and L′ respectively.

Given that, p′ = 2p and L′ = 4L

$$X' = [M' L'^2 T'^{-1}] = [(M' L' T'^{-1})(L')]$$

$$X' = p'(L') = (2p)(4L) = 8\,pL = 8\,X$$

$$= 8(25) = 200 \text{ units}$$

31. The ratio of C.G.S unit of gravitational constant to S.I unit is

(a) 10^2 (b) 10^3

(c) 10^{-2} (d) 10^{-3} **Ans. : (d)**

Soln. : Let the S.I unit of gravitational constant

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

C.G.S unit be $G' = [M'^{-1} L'^3 T'^{-2}]$;

$$\frac{G'}{G} = \frac{M'^{-1} L'^3 T'^{-2}}{M^{-1} L^3 T^{-2}}$$

$M = 1000\, M'$; $L = 100L'$ and $T = T'$

Substituting these values in above equation we get

$$\frac{G'}{G} = \frac{M'^{-1} L'^3 T'^{-2}}{(1000\, M')^{-1} (100\, L')^3 T^{-2}}$$

$$\frac{G'}{G} = \frac{1000}{10^6} = 10^{-3}$$

32. Which of the following is dimensionally correct formula ?

(a) $V = ut + at$ (b) $v + u = at$

(c) $V/u = at$ (d) $vt = u - a$ **Ans. : (b)**

Soln. :

The dimensions of L and T are same in all the terms of $v + u = at$. Hence, according to principle of homogeneity it a dimensionally correct equation.

33. The dimensional formula of coefficient of kinematic viscosity is

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

(c) $M^1 L^2 T^{-3}$ (d) $M^0 L^3 T^{-1}$ **Ans. : (a)**

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

(a) joule (b) Nm

(c) W (d) $kgm^2 sec^{-2}$ **Ans. : (c)**

35. Dimensional formula of latent heat is

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

(c) $M^1 L^2 T^{-1}$ (d) $M^0 L^2 T^{-2}$ **Ans. : (d)**

36. Pair of quantities having same dimensional formula are

(a) Velocity, Impulse

(b) Force, Weight

(c) Impulse, Inertia

(d) Angular momentum, Linear momentum **Ans. : (d)**

37. If the unit of power is 100 erg/minute, the unit of force is 100 dyne and the unit of time is 100 seconds, the unit of length is

(a) 5/3 cm (b) 2/3 cm

(c) 1/3 cm (d) none **Ans. : (a)**

Soln. :

$P = M^1 L^2 T^{-3} = 100$ erg/min

$= (100/60)$ erg/sec

$F = M^1 L^1 T^{-2} = 100$ dyne

$T = M^0 L^0 T^1 = 100$ sec

$P = (M^1 L^1 T^{-2})\,(L)\,(T^{-1}) = F\,(L)\,(T^{-1})$

$L = P F^{-1} T = (100/60)(1/100)(100) = 5/3$

38. If $M^a L^b T^c$ is the dimensional formula of Electric power, find the value of $5a + 2b - 6c$.

(a) 25 (b) 27

(c) 30 (d) -9 **Ans. : (b)**

Soln. :

Dimensional formula of Electric power $= M^1 L^2 T^{-3} = M^a L^b T^c$

Comparing the powers of M, L and T we get $a = 1$, $b = 2$ and $c = -3$.

Therefore $5a + 2b - 6c = 5(1) + 2(2) - 6(-3)$

$= 5 + 4 + 18 = 27.$

39. If $M^a L^b T^c I^d$ is the dimensional formula of Magnetic moment, find the value of $a - 2b + 3c - d$.

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

Ans. : (d)

Soln. :

Dimensional formula of Magnetic moment is $M^0 L^2 T^0 I^1 = M^a L^b T^c I^d$

Comparing the powers of M, L, T and I we get $a = 0$, $b = 2$, $c = 0$ and $d = 1$;

Therefore $a - 2b + 3c - d = 0 - 2(2) + 3(0) - 1$

$= -4 - 1 = -5.$

40. If $M^{5a} L^b T^{3c} I^{2d}$ is the dimensional formula of magnetic pole strength, find the value $5a + b + 3c + 2d$

(a) 3 (b) 2 (c) -2 (d) 0 **Ans. : (b)**

Soln. :

Dimensional formula of Magnetic pole strength is $M^0 L^1 T^0 I^1 = M^{5a} L^b T^{3c} I^{2d}$

Comparing the powers of M, L, T and I we get $5a = 0$, $b = 1$, $3c = 0$ and $2d = 1$;

Therefore $5a + b + 3c + 2d = 0 + 1 + 0 + 1 = 2.$

41. Which of the following quantities consists of S.I. unit as Hertz?
(a) Charge (b) Force
(c) Frequency (d) Power **Ans. : (c)**

42. Which one of the following units is a fundamental unit?
(a) Newton (b) Ampere
(c) Watt (d) Joule/sec **Ans. : (a)**

43. Which of the quantity consists of SI unit as Candela?
(a) Velocity (b) Impulse
(c) Luminous intensity (d) Force
Ans. : (c)

44. Which of the quantity consists of unit as Pascal ?
(a) Temperature (b) Pressure
(c) Force (d) Impulse
Ans. : (b)

45. Which of the quantity consists of unit as newton-second?
(a) Impulse (b) Acceleration
(c) Speed (d) Velocity **Ans. : (a)**

46. Which of the quantity consists of unit as kg m/sec ?
(a) Speed (b) Momentum
(c) Acceleration (d) Impulse
Ans. : (b)

47. What is the standard unit for length ?
(a) Meter (b) Inch
(c) Kilometer (d) Centimeter
Ans. : (a)

48. What is the name of physical quantities which are independent of each other?
(a) Fundamental quantity
(b) Derived quantity
(c) Numerical quantity
(d) None of the above **Ans. : (a)**

49. The Metric System is also called as:
(a) CGS (b) MKS system
(c) SI (d) None of the above
Ans. : (b)

50. Which devices used to measure the temperature of an object ?
(a) Poteintiometer (b) Odometer
(c) Thermometers (d) Galvanometer
Ans. : (c)

51. What is the SI units of mass, length and time respectively ?
(a) g, m and s (b) kg, cm and s
(c) g, cm and s (d) kg, m and s
Ans. : (d)

52. Which of the two have same dimensions ?
(a) Force and strain
(b) Angular velocity and angular frequency
(c) Force and stress
(d) None of the above **Ans. : (d)**

53. How many fundamental units are there ?
(a) 4 (b) 6 (c) 8 (d) 7
Ans. : (d)

54. What is the formulas for momentum ?
(a) force × displacement
(b) mass × velocity
(c) mass × acceleration
(d) change of velocity / time **Ans. : (b)**

55. What is the SI unit of Angle?
(a) Steradian
(b) Candela
(c) Radian
(d) Degree **Ans. : (c)**

56. What is the formula for acceleration?
(a) Mass × velocity
(b) Change in velocity / time
(c) Mass × acceleration
(d) Force × displacement **Ans. : (b)**

57. The errors mainly caused by human mistakes are
(a) gross error
(b) instrumental error.
(c) observational error.
(d) systematic error. **Ans. : (a)**

58. The measured value of a resistance is 10.25 ohm, whereas its value of 10.22 ohm. What is absolute error of the measurement?
(a) 0.01 ohm. (b) 0.03 ohm.
(c) 15.36 ohm. (d) 10.26 ohm.
Ans. : (b)

59. Quantities that are used to describe laws of physics are called
(a) atomic quantities
(b) nuclear quantities
(c) mechanical quantities
(d) physical quantities **Ans. : (d)**

60. Units given by system international for measuring physical quantities are called
(a) IS units (b) SI units
(c) S units (d) I units **Ans. : (b)**

61. One nanometer is equal to
(a) 10^{-6} m (b) 10^{-8} m
(c) 10^{-9} m (d) 10^{-5} m **Ans. : (c)**

62. Joule is the unit of
(a) Temperature (b) Pressure
(c) Energy (d) Heat
Ans. : (c)

63. How many Ergs are there in 1 joule?
(a) 10^2 (b) 10^4
(c) 10^6 (d) 10^7 **Ans. : (d)**

64. The unit of current is
(a) Ohm (b) Watt
(c) Ampere (d) None of the above
Ans. : (c)

65. The unit of energy in MKS system is
(a) Volt (b) Erg
(c) Ohm (d) Joule **Ans. : (d)**

66. The unit of current is
(a) Ohm (b) Watt
(c) Ampere (d) None of the above
Ans. : (c)

67. The unit of energy in MKS system is
(a) Volt (b) Erg
(c) Ohm (d) Joule **Ans. : (d)**

68. The instrument used to measure electric current is
(a) Ammeter (b) Electrometer
(c) Galvanometer (d) Spectrometer
Ans. : (a)

69. $[ML^{-1}T^{-2}]$ is the dimensional formula of
(a) force
(b) coefficient of friction
(c) modulus of elasticity
(d) energy **Ans. : (c)**

70. The dimensional formula of coefficient of viscosity is
(a) $[MLT^{-1}]$ (b) $[M^{-1}L^2T^{-2}]$
(c) $[ML^{-1}T^{-1}]$ (d) none of these
Ans. : (c)

71. On the basis of dimensional equation, the maximum number of unknown that can be found, is
(a) one (b) two
(c) three (d) four **Ans. : (c)**

72. If v stands for velocity of sound, E is elasticity and d the density, then find x in the equation $v = (d/E)^x$
(a) 1 (b) 1/2
(c) 2 (d) – 1/2 **Ans. : (d)**

73. The multiplication of 10.610 with 0.210 upto correct number of significant figure is
(a) 2.2281 (b) 2.228
(c) 2.22 (d) 2.2 **Ans. : (b)**

74. The measurement of radius of a circle has error of 1%. The error in measurement of its area is
(a) 1% (b) 2%
(c) 3% (d) none of these **Ans. : (b)**

75. Dimensional formula of latent heat
(a) $M^0L^2T^{-2}$ (b) MLT^{-2}
(c) ML^2T^{-2} (d) ML^2T^{-2} **Ans. : (a)**

76. In case of measurement of 'g', if error in measurement of length of pendulum is 2%, the percentage error in time period is 1%. The maximum error in measurement of g is
(a) 1 % (b) 2 %
(c) 4 % (d) no error. **Ans. : (c)**

77. If length of pendulum is increased by 2%. The time period will
(a) increases by 1%
(b) decreases by 1%
(c) increases by 2%
(d) decreases by 2% **Ans. : (a)**

78. If radian correction is not considered in specific heat measurement. The measured value of specific heat will be
(a) more than its actual value.
(b) less than its actual value.
(c) remains same as actual value.
(d) none of these. **Ans. : (a)**

79. The S.I. unit of universal gas constant is
(a) Watt $K^{-1} mol^{-1}$ (b) $N K^{-1} mol^{-1}$
(c) $JK^{-1} mol^{-1}$ (d) erg $K^{-1} mol^{-1}$
Ans. : (c)

80. The dimensional formula of couple
(a) ML^2T^{-2} (b) MLT^{-1}
(c) $ML^{-1}T^{-1}$ (d) $M^1L^1T^{-2}$ **Ans. : (a)**

81. An experiment measures quantities a, b, c and x is calculated from $x = ab^2/c^3$. If the maximum percentage error in a, b and c are 1%, 3% and 2% respectively, the maximum percentage error in x will be
(a) 13% (b) 17%
(c) 14% (d) 11% **Ans. : (a)**

82. Dimensional formula of thermal conductivity is
(a) $ML^2T^{-3}\theta^{-1}$ (b) $ML^2T^{-2}\theta^{-4}$
(c) $ML^2T^{-2}\theta^{-1}$ (d) $MLT^{-3}\theta^{-1}$ **Ans. : (c)**

83. Three measurements 7.1J, 7.2J and 6.7J are made as experiment the result with correct number of significant figures is
(a) 7.1 J (b) 7.06 J
(c) 7.0 J (d) 7J **Ans. : (c)**

84. Which of the following is a possible dimensionless quantity?
(a) Velocity gradient
(b) Pressure gradient
(c) Displacement gradient
(d) Force gradient **Ans. : (c)**

85. In the experiment of verification of Ohm's law the error in the current measurement is 1%, while that in the voltage measurement is 2%. The error in the resistance has a maximum value of
(a) 1% (b) 2%
(c) 3% (d) none of these.
Ans. : (c)

86. Can there be a physical quantity which has no unit and dimensions
Ans. : Yes, strain

87. Can a physical quantity have unit without having dimensions
Ans. : Yes, angle with units radians

88. Fill in the blanks
(i) Three physical quantities which have same dimensions are _____.
(ii) Mention a scalar and a vector physical quantities having same dimensions _____.
Ans. :
(i) Work, energy, torque
(ii) Work, torque

89. Choose the correct statement (s)
(a) all quantities may be represented dimensionally in terms of the base quantities
(b) all base quantity cannot be represented dimensionally in terms of the rest of the base quantities
(c) the dimension of a base quantity in other base quantities is always zero.
(d) the dimension of a derived quantity is never zero in any base quantity.
Ans. : (a)

90. Round off the following numbers to three significant digits
(a) 15462 (b) 14.745
(c) 14.750 (d) 14.650×10^{12}.
Ans. :
(a) The third significant digit is 4. This digit is to be rounded. The digit next to it is 6 which is greater than 5. The third digit should,

therefore, be increased by 1. The digits to be dropped should be replaced by zeros because they appear to the left of the decimal. Thus, 15462 becomes 15500 on rounding to three significant digits.

(b) The third significant digit in 14.745 is 7. The number next to it is less than 5. So 14.745 becomes 14.7 on rounding to three significant digits.

(c) 14.750 will become 14.8 because the digit to be rounded is odd and the digit next to it is 5.

(d) 14.650×10^{12} will become 14.6×10^{12} because the digit to be rounded is even and the digit next to it is 5.

91. Evaluate $(25.2 \times 1374) / 33.3$

All the digits in this expression are significant.

Soln. : We have $(25.2 \times 1374) / 33.3 = 1039.7838$ .....

Out of the three numbers given in the expression 25.2 and 33.3 have 3 significant digits and 1374 has four. The answer should have three significant digits. Rounded 1039.7838 .... to three significant digits, it becomes 1040.

Thus, we write.

$(25.2 \times 1374) / 33.3 = 1040$

92. Evaluate $24.36 + 0.0623 + 256.2$

Soln. :

24.36

0.0623

256.2

Now the first column where a doubtful digit occurs is the one just next to the decimal point (256.2). All digits right to this column must be dropped after proper rounding. The table is rewritten and added below

24.4

0.1

256.2

280.7 The sum is 280.7

93. Unit for density is

(a) m (b) mole

(c) $kg\ m^{-3}$ (d) Pa **Ans. : (c)**

94. While measuring length eye must be kept

(a) above the scale

(b) at an acute angle

(c) horizontal with scale

(d) none of above **Ans. : (a)**

95. Derived quantities can be expressed in form of

(a) base quantities

(b) physical quantities

(c) non measurable quantities

(d) both B and C **Ans. : (a)**

96. Significant figures in 0.00580 are

(a) 3 (b) 2 (c) 1 (d) 0

Ans. : (a)

97. Most of technologies throughout world are related to

(a) chemistry (b) biology

(c) mathematics (d) physics

Ans. : (d)

98. Standard quantity for measuring is called

(a) base quantity

(b) physical quantity

(c) derived quantity

(d) unit **Ans. : (d)**

99. Smallest possible division up to which an instrument can measure is called

(a) large count (b) least count

(c) small count (d) shortest length

Ans. : (b)

100. In physics we study

(a) matter and energy

(b) interaction between matter and energy

(c) both A and B

(d) none of above **Ans. : (c)**

101. Number 0.0000548 can be represented in scientific notation as

(a) 5.48 (b) 548

(c) 5.48×10^{-5} (d) 54.8 **Ans. : (c)**

102. Prefix for 4800000 W is

(a) 48 kW (b) 480 kW

(c) 48 W (d) 4800 kW **Ans. : (d)**

103. 1.35 can be rounded to
(a) 1.5 (b) 1.3
(c) 1.4 (d) 1.6 **Ans. : (c)**

104. Study of fourth state of matter is called
(a) nuclear physics (b) plasma physics
(c) nano physics (d) quantum physics
Ans. : (b)

105. Non-zero digits are always
(a) significant (b) non-significant
(c) worthless (d) none of above
Ans. : (a)

106. Prefix for 10^9 is
(a) giga (b) milli
(c) nano (d) pico **Ans. : (a)**

107. Final zeroes after decimal are
(a) non significant (b) significant
(c) worthless (d) none of above
Ans. : (b)

108. Study of internal structure of earth is
(a) geophysics
(b) electricity and magnetism
(c) mechanics
(d) thermodynamics **Ans. : (a)**

109. Quantities on basis of which other ones are expressed are called
(a) derived quantities
(b) physical quantities
(c) base quantities
(d) none of above **Ans. : (c)**

110. All physical quantities are
(a) not measurable
(b) measurable
(c) related to each other
(d) not related to each other **Ans. : (b)**

111. Base quantity among following is
(a) electric charge
(b) amount of substance
(c) area
(d) volume **Ans. : (b)**

112. Measuring cylinder is used to measure the
(a) area of liquid
(b) volume of liquid
(c) density of liquid
(d) none of above **Ans. : (b)**

113. A meter rule is used to measure
(a) weight (b) mass
(c) length (d) force **Ans. : (c)**

114. How many disciplines physical sciences are divided?

Ans. : Physical sciences were divided in to five disciplines in 19th century, which are; chemistry, physics, astronomy, geology and meteorology and physics is the most fundamental of above mentioned disciplines

115. What is plasma physics?

Ans. : It is the study of fourth state of matter which is called plasma. In plasma physics we study the production and properties of this ionic state of matter.

116. How physics can be applied?

Ans. : Physics is involved in almost every discipline of life for example pulleys are used to lift heavy weight objects, electricity is widely used at industrial as well as domestic level, different communication systems which made our lives easier and different transportation means etc. All of these machines and technologies are based on the laws of physics.

117. Define physical quantities.

Ans. : Those quantities which can be measured are called physical quantities. For example length, mass, time etc. Physical quantities include the magnitude as well as units for their description, for example length of meter rod is 100 cm.

118. What are base quantities?

Ans. : Those physical quantities on whose basis other quantities are described are called base quantities. They are seven in count and are given as; length, mass, time, temperature, electric current, intensity of light and amount of substance.

119. How can express liters?

Ans. : 1L volume is equal to 1000 mL, 1 dm^3 and 1000 cm^3.

120. What are base units?

Ans. : The units which describe the base quantities are called base units. For example base unit for length is meter. The base unit for temperature is (K), for amount of substance it's mole (mol) and for intensity of light it's candela (cd)

121. What is pressure and units of pressure?

Ans. : As pressure is a derived quantity so it's units would be called derived units. The unit of pressure is pascal (Pa) and 1 Pa is equal to 1 Nm^{-2}.

122. What are prefixes?

Ans. : Words that are added before the SI units are called prefixes, they are usually used to describe very large or small quantities. For example prefix for 10^3 is kilo. The multiplier for prefix femto is 10^{-15}.

123. How to express Hz in MHz?

Ans. : The quantity 3 300 000 000 Hz can be described in mega Hz as; 3 300 $\times$ 10^6 Hz or 3300 MHz

124. What is scientific notation?

Ans. : Expression of a number by multiplying it with powers of 10 is called scientific notation for example 34595 can be expressed as 3.4595×10^4.

125. How to express in scientific notation?

Ans. : The distance between earth and moon can be expressed in scientific notation as 3.84×10^8 m.

126. What is meter rule?

Ans. : A meter rule is a device which is used to measure length of different objects. A meter rule of length 1 m is equal to 100 centimeters (cm). On meter rule each cm is divided further in to 10 divisions which are called millimeters (mm). So, a meter rule can measure up to 1mm as smallest reading.

127. What is eye position measuring from meter rule?

Ans. : While measuring the length or distance from the meter rule, the position of eye must be kept vertical to the meter rule. This care while taking readings should be considered because if the position of eye is left or right to the scale then one cannot measure with accuracy.

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