KERALA PUBLIC SCHOOL , JAITRAWAS (Rewari)

Holiday homework (Physics)

Class:-11th

**Section :-A**

1) Explain what is meant by dimensions of a physical quantity, its dimensional formula and dimensional equation.

2)Derive the dimensional formulae for acc. due to gravity, constant of gravitation, surface tension, coefficient of viscosity, coefficient of elasticity, Planck's constant, gas constant, torque, specific gravity and impulse.

3) The rate of flow (V) of a liquid flowing through a pipe of radius r and pressure gradient (P/l) is given by Poiseuille's equation V =$\frac{\pi}{8}\frac{pr^4}{l\eta}$ Check the dimensional correctness of this relation.

4) The frequency (v) of an oscillating drop may depend upon radius (r) of the drop, density (p) of liquid and the surface tension (S) of the liquid. Deduce the formula dimensionally.

5) A small spherical ball of radius r falls with a velocity v through a liquid of coefficient of viscosity n. Obtain an expression for viscous drag F on the ball assuming that it depends upon r, v and n.

6) Discuss how errors propagate in sum, difference, product and division of quantities.

7)The voltage across a lamp is (6.0 + 0.1) volt and the current passing through it is (4.0+ 0.2)A. Find the power consumed with error limits.

8)A physical quantity x is calculated from x=$\frac{ab^2}{\sqrt{c}}$ Calculate % error in x, when % error in measuring a, b, c are 4, 2 and 3 respectively.

**Section :-B**

## Single Correct Answer Type

1. $[ML^{-2}T^{-2}]$ represents dimensional formula of which of the following physical quantities?
   a) Energy b) pressure c) Torque d) Pressure gradient
2. The velocity $v$ of water waves may depend on their wavelength ($\lambda$), the density of water ($\rho$) and the acceleration due to gravity (g). The method of dimensions gives the relation between these quantities as
   a) $v^2 \propto \lambda^{-1}\rho^{-1}$ b) $v^2 \propto g\lambda$ c) $v^2 \propto g\lambda\rho$ d) $g^{-1} \propto \lambda^3$
3. If $L, C$ and $R$ denote inductance, capacitance and resistance respectively, then which of the following combination has the dimension of time?
   a) $\frac{C}{L}$ b) $\frac{1}{RC}$ c) $\frac{L}{R}$ d) $\frac{RL}{C}$
4. The length, breadth and thickness of a block is measured to be 50 cm, 2.0 cm and 1.00 cm. The percentage error in the measurement of volume is
   a) 0.8 % b) 8% c) 10% d) 12.5%
5. Given, potential difference $V=(8 \pm 0.5)$ volt and current $I = (2 \pm 0.2)$A. The value of resistance $R$ is
   a) $4 \pm 16.25\%$ b) $4 \pm 6.25\%$ c) $4 \pm 10\%$ d) $4 \pm 8\%$
6. The dimensions of time constant are

a) $[M^0L^0T^0]$ b) $[M^0L^0T]$ c) $[MLT]$ d) None of these

7. A physical quantity $A$ is related to four observables $a, b, c$ and $d$ as follows

$$A = \frac{a^2 b^3}{c\sqrt{d}}$$

The percentage errors of measurement in $a, b, c$ and $d$ are 1%, 3%, 2% and 2% respectively. What is the percentage error in the quantity $A$?

a) 12% b) 7% c) 5% d) 14%

8. Which one of the following pairs of quantities and their unit is proper match?

a) Electric field-coulomb/m b) Magnetic flux-weber
c) Power-farad d) Capacitance-henry

9. The dimensions of emf in MKS is

a) $[ML^{-1}T^{-2}Q^{-2}]$ b) $[ML^{-2}T^{-2}Q^{-2}]$ c) $[MLT^{-2}Q^{-1}]$ d) $[ML^2T^{-2}Q^{-1}]$

10. The physical quantity having the dimensions $[M^{-1}L^{-3}A^2]$ is

a) Resistance b) Resistivity
c) Electrical conductivity d) Electromotive force

11. The equation of alternating current is $I = I_0 e^{-t/CR}$, where $t$ is time, $C$ is capacitance and $R$ is resistance of coil, then the dimensions of $C\ R$ is

a) $[MLT^{-1}]$ b) $[M^0LT]$ c) $[M^0L^0T]$ d) None of these

12. If $f = x^2$, then the relative error in $f$ is

a) $\frac{2\Delta x}{x}$ b) $\frac{(\Delta x)^2}{x}$ c) $\frac{\Delta x}{x}$ d) $(\Delta x)^2$

13. If error in radius is 3%, what is error in volume of sphere?

a) 3% b) 27% c) 9% d) 6%

14. If the length of rod $A$ is $(3.25 \pm 0.01)$ cm and that of $B$ is $(4.19 \pm 0.01)$ cm, then the rod $B$ is longer than rod $A$ by

a) $(0.94 \pm 0.00)$ cm b) $(0.94 \pm 0.01)$ cm c) $(0.94 \pm 0.02)$ cm d) $(0.94 \pm 0.005)$ cm

15. The position of a particle at time $t$ is given by the equation $x(t) = \frac{v_0}{A}(1 - e^{At})$, $v_0 =$ constant and $A > 0$. Dimensions of $v_0$ and $A$ respectively are

a) $[M^0LT^0]$ and $[M^0L^0T^{-1}]$ b) $[M^0LT^{-1}]$ and $[M^0LT^{-2}]$
c) $[M^0LT^{-1}]$ and $[M^0L^0T]$ d) $[M^0LT^{-1}]$ and $[M^0L^0T^{-1}]$

16. Which of the following sets of quantities have same dimensional formula?

a) Frequency, angular frequency and angular momentum
b) Surface tension, stress and spring constant
c) Acceleration, momentum and retardation
d) Work, energy and torque

17. The dimensions of $e^2/4\pi\varepsilon_0 hc$, where $e, \varepsilon_0, h$ and $c$ are electronic charge, electric permittivity, Planck's constant and velocity of light in vacuum respectively, are

a) $[M^0L^0T^0]$ b) $[ML^0T^0]$ c) $[M^0LT^0]$ d) $[M^0L^0T^1]$

18. Dimensions of impulse are same as that of

a) Force b) Momentum c) Energy d) Acceleration

19. The SI unit of length is the metre. Suppose we adopt a new unit of length which equal $x$ metre. The area of 1 $m^2$ expressed in terms of the new unit has a magnitude

a) $x$ b) $x^2$ c) $x^{-1}$ d) $x^{-2}$

20. Unit of surface tension is
    a) $\mathrm{Nm}^{-1}$ b) $\mathrm{Nm}^{-2}$ c) $\mathrm{N}^2\mathrm{m}^{-1}$ d) $\mathrm{Nm}^{-3}$
21. If the value of the resistance is 10.845Ω and the value of the current is 3.23 A, then the potential difference is 35.02935 V. its value in correct significant figures would be
    a) 35 V b) 35.0 V c) 35.03 V d) 35.029 V
22. A body of mass $m = 3.513$ kg is moving along the $x$ −axis with a speed of 5.00 $\mathrm{ms}^{-1}$. The magnitude of its momentum is recorded as
    a) 17.6 kg $\mathrm{ms}^{-1}$ b) 17.565 kg $\mathrm{ms}^{-1}$ c) 17.56 kg $\mathrm{ms}^{-1}$ d) 17.57 kg $\mathrm{ms}^{-1}$
23. A screw gauge gives the following reading when used to measure the diameter of a wire.
    Main scale reading : 0 mm
    Circular scale reading : 52 divisions
    Given that 1 mm on main scale corresponds to
    100 divisions of the circular scale.
    The diameter of wire from the above data is
    a) 0.052 cm b) 0.026 cm c) 0.005 cm d) 0.52 cm
24. The modulus of elasticity is dimensionally equivalent to
    a) Strain b) Force
    c) Stress d) Coefficient of viscosity
25. The length of a simple pendulum is about 100 cm known to an accuracy of 1 mm. Its period of oscillation is 2s determined by measuring the time for 100 oscillations using a clock of 0.1 s resolution. What is the accuracy in the determined value of g?
    a) 0.2% b) 0.5% c) 0.1% d) 2%
26. A plate has a length $(5 \pm 0.1)$ cm and breadth $(2 \pm 0.01)$ cm. Then the area of the plate is
    a) $(10 \pm 0.2)$ $\mathrm{cm}^2$ b) $(10 \pm 0.01)$ $\mathrm{cm}^2$ c) $(10 \pm 0.001)$ $\mathrm{cm}^2$ d) $(10 \pm 1)$ $\mathrm{cm}^2$
27. The energy $(E)$, andgular momentum $(L)$ and universal gravitational constant $(G)$ are chosen as fundamental quantities. The dimensions of universal gravitational constant in the dimensional formula of Planck's constant $(h)$ is
    a) Zero b) -1 c) $\frac{5}{3}$ d) 1
28. If $3.8 \times 10^{-6}$ is added to $4.2 \times 10^{-5}$ giving due regard to significant figures, then the result will be
    a) $458 \times 10^{-5}$ b) $4.6 \times 10^{-5}$ c) $4.5 \times 10^{-5}$ d) None of the above
29. A highly rigid cubical block $A$ of small mass $M$ and side $L$ is fixed rigidly on to another cubical block of same dimensions and of low modulus of rigidity $\eta$ such that the lower face of $A$ completely covers the upper face of $B$. The lower face of $B$ is rigidly held on a horizontal surface. A small force $F$ is applied perpendicular to one of the side faces of $A$. After the force is withdrawn, block $A$ executes small oscillations, the time period o which is given by
    a) $2\pi\sqrt{M\eta L}$ b) $2\pi\sqrt{\frac{M\eta}{L}}$ c) $2\pi\sqrt{\frac{ML}{\eta}}$ d) $2\pi\sqrt{\frac{M}{\eta L}}$
30. The dimensions of magnetic field in M, L, T and C (coulomb) is given as

a) $[MLT^{-1}C^{-1}]$ b) $[MT^{2}C^{-2}]$ c) $[MT^{-1}C^{-1}]$ d) $[MT^{-2}C^{-1}]$

31. Find the dimensions of electric permittivity
a) $[A^{2}M^{-1}L^{-3}T^{4}]$ b) $[A^{2}M^{-1}L^{-3}T^{0}]$ c) $[AM^{-1}L^{-3}T^{4}]$ d) $[A^{2}M^{0}L^{-3}T^{4}]$
32. Which of the following is dimensionless?
a) $\frac{v^{2}}{rg}$ b) $\frac{v^{2}g}{r}$ c) $\frac{vg}{r}$ d) $v^{2}rg$
33. The number of significant figures in all the given numbers 25.12, 2009, 4.156 and $1.217 \times 10^{-4}$ is
a) 1 b) 2 c) 3 d) 4
34. 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
35. Force constant has the same dimensions as
a) Coefficient of viscosity b) Surface tension
c) Frequency d) Impulse
36. The dimensions of $\frac{a}{b}$ in the equation $p = \frac{a - t^{2}}{bx}$ where $p$ is pressure, $x$ is distance and $t$ is time, are
a) $[M^{2}LT^{-3}]$ b) $[MT^{-2}]$ c) $[LT^{-3}]$ d) $[ML^{3}T^{-1}]$
37. The damping force of an oscillating particle is observed to be proportional to velocity. The constant of proportionality can be measured in
a) Kg $s^{-1}$ b) Kg s c) Kg $ms^{-1}$ d) Kg $m^{-1}s^{-1}$
38. Dimensions of $\frac{1}{\mu_0 \varepsilon_0}$, where symbols have their usual meaning, are
a) $[L^{-1}T]$ b) $[L^{2}T^{2}]$ c) $[L^{2}T^{-2}]$ d) $[LT^{-1}]$
39. In an experiment, we measure quantities $a, b$ and $c$. Then $x$ is calculated from the formula $x = \frac{ab^{2}}{c^{3}}$. The percentage errors in $a, b, c$ are $\pm 1\%, \pm 3\%$, and $\pm 2\%$ respectively. The percentage error in $x$ can be
a) $\pm 1\%$ b) $\pm 4\%$ c) 7% d) $\pm 13\%$
40. The physical quantity which is not a unit of energy is
a) Volt-coulomb b) MeV-sec c) Henry $(\text{ampere})^{2}$ d) Farad-$(\text{volt})^{2}$
41. If the unit of force is 1 kN, the length is 1 km and time is 100 s, what will be the unit of mass?
a) 1 kg b) 100 kg c) 1000 kg d) 10000 kg
42. The relative density of the material of a body I the ratio of its weight in air and the loss of its weight in water. By using a spring balance, the weight of the body in air in measured to be $5.00 \pm 0.05$N. The weight of the body in water is measured to be $4.00 \pm 0.05$N. Then the maximum possible percentage error in relative density is
a) 11% b) 10% c) 9% d) 7%
43. In the equation $y = a \sin(\omega t + kx,)$ the dimensional formula of $\omega$ is
a) $[M^{0}L^{0}T^{-1}]$ b) $[M^{0}LT^{-1}]$ c) $[ML^{0}T^{0}]$ d) $[M^{0}L^{-1}T^{0}]$
44. The dimensions of Planck's constant are
a) $[M^{2}L^{2}T^{-2}]$ b) $[MLT^{-2}]$ c) $[ML^{2}T^{-2}]$ d) $[ML^{2}T^{-1}]$
45. A public park, in the form of a square, has an area of $(100 \pm 0.2)m^{2}$. The side of park is

a) $(10 \pm 0.01)$m b) $(10 \pm 0.1)$m c) $(10.0 \pm 0.1)$m d) $(10.0 \pm 0.2)$m

46. The dimensional formula of magnetic permeability is
a) $[M^0L^{-1}T]$ b) $[M^0L^2T^{-1}]$ c) $[M^0L^2T^{-1}A^2]$ d) $[MLT^{-2}A^{-2}]$

47. What is the dimensional formula of $\frac{\text{planck's constant}}{\text{linear momentum}}$?
a) $[M^0L^0T^0]$ b) $[M^0L^0T]$ c) $[M^0LT^0]$ d) $[MLT^{-1}]$

48. Consider a new system of units in which $c$(speed of light in vacuum), $h$(Planck's constant) and $G$(gravitational constant) are taken as fundamental units. Which of the following would correctly represent mass in this new system?
a) $\sqrt{\frac{hc}{G}}$ b) $\sqrt{\frac{Gc}{h}}$ c) $\sqrt{\frac{hG}{c}}$ d) $\sqrt{hGc}$

49. What is the area of a disc of radius 1.1 cm?
a) 3.8028571 $cm^2$ b) 3.8029 $cm^2$ c) 3.803 $cm^2$ d) 3.8 $cm^2$

50. Let $L$ denote the self-inductance of coil which is in series with a capacitor of capacitance $C$. Which of the following has the unit second?
a) $\sqrt{LC}$ b) $C/L$ c) $CL$ d) $L^2/C^2$

51. If $F = 6\pi\eta^a r^b v^c$,
Where $F$ =viscous force
$\eta$ = coefficient of viscosity
$r$ = radius of spherical body
$v$ = terminal velocity of the body.
Find the values of $a$, $b$ and $c$.
a) $a = 1, b = 2, c = 1$ b) $a = 1, b = 1, c = 1$
c) $a = 2, b = 1, c = 1$ d) $a = 2, b = 1, c = 2$

52. The measured mass and volume of a body are 23.42 g and 4.9 $cm^3$ respectively with possible error 0.01 g and 0.1 $cm^3$. The maximum error in density is nearly
a) 0.2% b) 2% c) 5% d) 10%

53. If $v = \frac{A}{t} + Bt^2 + Ct^3$ where $v$ is velocity, $t$ is time and $A$, $B$ and $C$ are constants, then the dimensional formula of $B$ is
a) $[M^0LT^0]$ b) $[ML^0T^0]$ c) $[M^0L^0T\ ]$ d) $[M^0LT^{-3}]$

54. If $K$ denotes coefficient of thermal conductivity, $d$ the density and $c$ the specific heat, the unit of $X$, where $X = K/dc$ will be
a) cm $sec^{-1}$ b) $cm^2$ $sec^{-2}$ c) cm sec d) $cm^2$ $sec^{-1}$

55. Which of the following pairs has same dimensions?
a) Current density and charge density b) Angular momentum and momentum
c) Spring constant and surface energy d) Force and torque

56. The refractive index of a material is given by the equation $n = \frac{A+B}{\lambda^2}$, where $A$ and $B$ are constant. The dimensional formula for $B$ is
a) $[M^0L^2T^{-1}]$ b) $[M^0L^{-2}T^0]$ c) $[M^0L^2T^{-2}]$ d) $[M^0L^2T^0]$

57. What is the dimensional formula of $mc^2$, where the letters have their usual meanings?
a) $[MLT^{-1}]$ b) $[ML^0T^0]$ c) $[ML^2T^{-2}]$ d) $[M^{-1}L^3T^6]$

58. In the equation $X = 3YZ^2$, $X$ and $Z$ have dimensions of capacitance and magnetic induction

respectively. In MKSQ system, the dimensional formula of $Y$ is

a) $[M^{-3}L^{-2}T^{-2}Q^{-4}]$ b) $[ML^{-2}]$ c) $[M^{-3}L^{-2}Q^{4}T^{8}]$ d) $[M^{-3}L^{-2}Q^{4}T^{4}]$

59. 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

a) 8% b) 3% c) 4% d) 5%

60. Given $\pi = 3.14$. the value of $\pi^2$ with due regard for significant figures is

a) 9.86 b) 9.859 c) 9.8596 d) 9.85960

61. One slug is equivalent to 14.6 kg. A force of 10 pound is applied on a body of 1 kg. The acceleration of the body is

a) 44.5 $ms^{-2}$ b) 4.448 $ms^{-2}$ c) 44.4 $ms^{-2}$ d) None of these

62. Which has not the same unit as other?

a) Watt-sec b) Kilowatt-hour c) eV d) Js

63. A resistor of 10 kΩ having tolerance 10% is connected in series with another resistor of 20kΩ having tolerance 20%. The tolerance of the combination will be approximately

a) 10% b) 13% c) 17% d) 20%

64. Ampere-hour is the unit of

a) Quantity of charge b) Potential c) Energy d) Current

65. Given that $2l\sqrt{\frac{m}{T}}$, where $l$ is the length of a string of linear density $m$, under tension $T$ ha the same dimensional formula as that of

a) Mass b) Time c) Length d) Mole