Q.1 Which of these is largest: astronomical unit, light year and par sec?

Q.2 What is the difference between **nm ,mN, Nm ?**

Q.3 Derive the SI unit of joule (**J**) in terms of fundamental units.

Q.4 Calculate the number of astronomical units in one meter.

Q.5 How many a.m.u would make up 1 kg?

Q.6 What is common between bar and torr?

Q.7 Can a body have zero mass and zero weight?

Q.8 Is light year a unit of time?

Q.9 Name two physical quantities having the dimensions [ML^2T^{-2}]

Q.10 Deduce the dimensional formulae of the following physical quantities:
a)Heat **b)** Specific heat**c)** Latent heat**d)** Gas constant **e)** Boltzmann's constant
f) Coefficient of thermal conductivity **g)** Mechanical equivalent of heat.

Q.11 The average wavelength of light from a sodium lamp is **5893** angstroms. Express it in metre and in **nm.**

Q.12 Express an acceleration of 10 ms^{-2} in $km\ h^{-2}$.

Q.13 The density of air is 1.293 **kg** $\mathbf{m^{-3}}$Express it in cgs units.

Q.14 Why parallex method cannot be used for measuring distances of stars more than 100 light years away?

Q.15 Find the number of significant figures in 0.005.

Q.16 What are the limitations of dimensional analysis?

Q. 17 The lenghts of two cylinders are measured to be $l_1 = (5.62 \pm 0.01)$ cm and $l_2 = (4.34 \pm 0.02)$ cm. Calculated difference in lengths with error limits.

Q.18 Which of the following length measurment is most accurate and why?

a) 4.00 cm **b)** 0.004 mm **c)** 40.00 cm.

Q.19 If the displacement of a body, s= (100±5) meters and time taken by it t= (20±0.2) seconds, then find the percentage error in the calculation of velocity.

Q.20 If $l_1 = (10.0 \pm 0.1)$cm and $l_2 = (9.0 \pm 0.1)$cm, find their sum, difference and error in each.

Q.21 A physical quantity *P* is related to four observables *a, b, c* and *d* as follows:

$$P = a^3 b^2 / \sqrt{c}\, d$$

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

Q.22 The voltage across a lamp is (6.0 ± 0.1) volt and the current passing through it is (4.0 ±0.2) ampere. Find the power consumed.

Q.23 The length and breadth of a field are 22.4cm and 15.8cm respectively and have been measured to an accuracy of 0.2cm. Find the percentage error in the area of field.

Q.24 The wavelength of matter waves may depend upon Planck's constant, mass and velocity of the particle. Use the method of dimensions to derive the formula.

Q.25 The velocity of transverse waves on a string may depend upon length of string, tension in the string and mass per unit length of the string. Derive the formula dimensionally.

Q.26 The resistance R = V/ I, where V = (100 ± 5) and I = (10 ± 0.2) A. Find the percentage error in R.

Q.27 Calculate percentage error in the determination of $g = 4\pi^2 l / t^2$ when **l** and **t** are measured with ± 2 % and ± 3 % errors respectively.

Q.28 What are the dimensions of 'a' and 'b' in the relation F = at + bx Where F is force and x is distance?

Q.29 Write the dimensional for the Gravitational Constant, Pressure & Power.

Q.30 In Vander Wall's equation $(\mathbf{P + a/V^2)\ (V - b) = RT}$, what are the dimensions of **a** and **b**? Here, **P** is pressure, **V** is volume, **T** is temperature and **R** is gas constant.

Q.31 Derive by the method of dimensions, an expression for the volume of a liquid flowing out per second through a narrow pipe. Assume that the rate of flow of liqud depends on

1) The coefficient of viscosity 'η' of the liquid
2) The radius 'r' of the pipe
3) The pressure gradient (p/l) along the pipe. (Take k=π/8)

Q32 By the method of dimensions, obtain an expression for the surface tension 'S' of a liquid rising in a capillary tube. Assume that the surface tension depends upon mass 'm' of the liquid, pressure 'p' of the liquid and radius 'r' of the capillary tube. (Take k=1/2)

Q.33 The period of vibration of a tuning fork depends on the length 'l' of its prong, density 'd' and Young's modulus 'Y' of its material. Deduce an expression for the period of vibration on the basis dimensions.

1. If $F = ax + bx^2 + \frac{c}{d-t}$, Where F is force, x is distance, t is time then find the dimension of a, b, c and d.

2. If area A, velocity v and density ρ are the fundamental quantity then using them find dimension of force.

3. Convert universal gravitational constant $G = 6.67 \times 10^{-11}$ in S.I. units into respective cgs system of unit.

4. Find the value of 10 joule on a system having 100 g, 10 cm and 30 s as a fundamental unit.

5. $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, where P is pressure, V is volume, R is gas constant and T is temp.

6. $P = \frac{a - t^2}{bx}$. Where P = pressure, x is distance and t is time. Write dimension of a/b.

7. Given that $h = \frac{2T\cos\theta}{r^2\rho g}$. where T =surface tension, r = radius, ρ = density and g is acceleration due to gravity.

8. A jet of water of cross-sectional area 'a' impinges normally on a stationary flat with velocity 'v'. If ρ is the density of water, then determine by dimensional analysis the expression for the force F exerted by the jet of water on the plate.

9. If the depth 'd' to which a bullet of kinetic energy 'K' can penetrate any body of elasticity 'E', using the method of dimension find a relation among these quantities.

10. A physical quantity P is related to four observable a, b, c and d as $P = \frac{a^3b^2}{\sqrt{cd}}$. find % error in P if % error in a, b, c and d are 1%, 2%,3%, and 2% respectively.

11. Two resistances $R_1 = (6 \pm 0.2)$ohm and $R_2 = (8 \pm 0.6)$ ohm. Express equivalent resistance when they are connected in parallel.

12. The dimensional formula of a physical quantity X is $M^{-1}L^3T^{-2}$. The error in measurement of M, L and T are 2%, 3% and 4%. Find the maximum % error in X.

13. During an experiment to find the value of g using simple pendulum given that $T = 2\pi\sqrt{\frac{L}{g}}$, if L = 90 cm and time for 20 vibrations is 36 s. Find the % error in measurement of g, if length is measured to an accuracy of 0.1 cm and time to 0.2 s .