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Assignment
Class 11
Units and Measurements

1. Name the fundamental and supplementary units of measurements in the international system of units.

2. Write the applications & limitations of dimensional analysis.

3. Write the dimensional formula for following:

   a. Thrust
   b. Stress
   c. Strain
   d. Universal constant of gravitation
   e. Viscosity
   f. Young's modulus of elasticity
   g. Planck's constant
   h. Surface tension
   i. Angle
   j. Viscosity
   k. Angular velocity
   l. Pressure gradient
   m. Angular momentum
   n. Charge
   o. Momentum
   p. Impulse
   q. Torque

4. If $x = a + bt + ct^2$ where x is in metres and t is in seconds, what will be the units of c?

5. Solve the following to correct significant figures:

   a. 5.1+13.235
   b. 7.54+18.1295
   c. 14.632-5.52345
   d. 3.021 x 11
   e. 5.143 x 2.01

6. The side r of a cube is measured as $(11.3+0.1)$ cm. what is the volume V of the cube?

7. What is the principle of homogeneity of dimensions?

8. When white light travels through glass the refractive index $\mu = c/v$ is found to vary with wavelength as

$$\mu = A + \frac{B}{\lambda^2}$$

Where A and B are constants. Using the principle of homogeneity of dimensions, determine the SI units in which A and B must be expressed.

9. The density ρ of a metal piece of mass m and volume V is given by the formula

$$\rho = \frac{m}{V}$$

If m=375.32±0.01 g   V= 136.41±0.01 cm^3

Find % error in ρ.

10. If force F, length L and time T are fundamentals unit instead of mass length and time, express compressibility in terms of f, L and T.

11. Experiments show that frequency n of a tuning fork depends upon the length of prong l, the density d and young's modulus Y of its material. From dimensional considerations, find a possible relation for the frequency of a tuning fork.

12. Convert energy of one joule in to ergs.

13. Convert force of one newton in to dyne.

14. In Vanderwall's equation, $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, what are the dimensions of a and b? here P is pressure, V is volume, T is temperature and R is a gas constant.

15. All constants are dimensionless. Comment.

16. The escape velocity from the surface of earth is given by $v = \sqrt{\frac{2GM}{R}}$, where M is mass and R is radius of earth. Check the correctness of the formula.

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

18. Do AU and Å represent the same unit of length?

19. Define astronomical unit, light year and parsec. How are they related?

20. Explain parallax method for measuring distance of a nearby star?

21. How do you measure the size of molecule of oleic acid?

22. A body travels uniformly a distance of (13.8±0.2) m in a time (4.0±0.3) s. calculate its velocity with error limits. What is percentage error in velocity?

23. Write down the significant figures in the following:

i.	5328N		v.	0.039
ii.	4200 kg		vi.	2.000
iii.	34.000 m		vii.	0.050
iv.	0.02340 Nm^{-1}		viii.	3.08 x 10^6

24. What is the difference between 5.0 and 5.00?

25. Round off the following numbers as indicated: i) 25.653 to 3 digits ii) 4.996 X 10^5 to 3 digits iii) 0.6995 to 1 digit iv) 3.350 to 2 digits

26. What is meant by accuracy and precision of instruments?

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

28. A physical quantity P is related to a, b, c and as follows:

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

The percentage errors of measurement in a, b, c and d are 1%, 3%, 4% and 2%, respectively. What is the % error in the quantity P?

29. Explain the common observation: if you look out of the window of a fast moving train, the nearby trees, houses etc. seem to move rapidly in the direction opposite to the train's motion, but the distant object (hill tops, the moon, the stars etc.) seem to stationary.

30. Which of the following measurements is most accurate and which is most precise:

a. 4.00 mm   c. 4.00 m

b. 4.00cm   d. 40.00 m