

PHYSICAL WORLD AND DIMENSIONS

- The standard of time is based on _____.
- The standard of length is based on _____.
- The standard of mass is based on _____.
- The SI base unit for mass is _____.
- Why there is no SI base unit for area?
- Name the SI base units.
- The number of significant figures in 15.0 _____.
- The number of significant figures in 0.00150 _____.
- A right circular cylinder has a radius of 2.3 cm and a height of 1.4 m. Its volume is _____.
- During a short interval of time the velocity v in m/s of an automobile is given by $v = at^2 + bt^3$ where the time t is in seconds. The units of a and b are respectively _____.
- Suppose $A = BC$, where A has the dimensions L/M and C has the dimensions L/T . Then B has dimensions _____.
- Suppose $A = B^n C^m$, where A has dimensions LT , B has dimensions $L^2 T^1$ and C has dimensions LT^2 . Then the exponents, m and n have the values _____.
- The density of water is 1.0 g/cm^3 . Using dimensions find its value in kilograms per cubic meter.
- What is the percent error in each of the following approximations to π ?
(a) $22/7$ (b) $355/113$.
- As you eat your way through a bag of chocolate cookies, you observe that each cookie is a circular disk of diameter $8.50 \pm 0.005 \text{ cm}$. Find the average volume of a cookie and the uncertainty in the volume.
- A rectangular piece of aluminium is $3.70 \pm 0.01 \text{ cm}$ wide.
(a) Find the area of the rectangle and the uncertainty in the area.
(b) Verify that the fractional uncertainty in the area is equal to the sum of the fractional uncertainties in the length and in the width.
- Discuss in brief the various techniques employed to measure very small distances and very large distances.
- Ultrasonic sent by a SONAR return back to it after reflection from a rock under water after a time lapse of 2.2 s. If the velocity of ultrasonic in water is 1245 ms^{-1} , find the depth of the rock below water surface.
- For a new unit of length, the velocity of radio waves is unity. Find the distance of an aeroplane from the radar, if the radio signal is received back by the radar in $8.4 \mu\text{s}$.
- In the following equation, find the dimensions of η where V is the volume of liquid flowing per unit volume, L is the length of the pipe, P is the pressure difference between the two ends of the tube and r is the radius of the tube.

$$V = \frac{\pi Pr^4}{8\eta l}$$

- In Vander Waal's equation $(P + a/V^2)(V - b) = RT$, what are the dimensions of the constants 'a' and 'b'?
- Assuming that frequency (n) of a vibrating string may depend upon applied tension(T), length of the string (l) and mass per unit length (m), using dimensions prove that

$$n = 1/2l \sqrt{T/m}$$

23. Can
- (a) a quantity has units but still be dimensionless?
 - (b) a quantity has dimensions but still have no unit?
 - (c) Are all constants dimensionless?
24. What is the advantage of using dimensions of physical quantities?
25. Assuming that the mass m of the largest stone that can be moved by a flowing river depends upon the velocity v , the density ρ and acceleration due to gravity g , show that it varies inversely with the sixth power of the velocity of flow.