# Volume and Surface Area

In this chapter, we have to deal with the problem of finding the volume and surface area of solid figures. As we know that, solid figures have length, breadth and height (thickness). Hence, this chapter can be featured as 3D and mensuration too.

## Volume

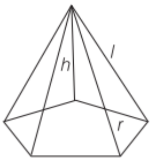
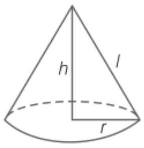
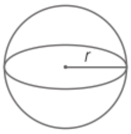
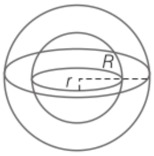
It is the space occupied within the boundary of a 3D figure.

Unit cu cm, cu m (i.e., cube units) etc.

## Surface Area

It is the total area that can be measured on the entire surface. This can only be measured, if the object is a 3D object surface area is measured in square unit.

## Important Formulae Related to Solid Figures

| Name | Figure | Lateral/Curved Surface Area | Total Surface Area | Volume | Nomenclature |
|---|---|---|---|---|---|
| Right pyramid |  | (Perimeter of the base) × (Slant height) | Area of the base + Lateral surface area | $\frac{1}{3}$ (Area of the base) × Height | |
| Right circular cone |  | $\pi rl$ | $\pi r\ (l + r)$ | $\frac{1}{3}\ \pi r^2 h$ | $h$ = Height $r$ = Radius $l$ = Slant height |
| Sphere |  | — | $4\pi r^2$ | $\frac{4}{3}\ \pi r^3$ | $r$ = Radius |
| Hemisphere |  | $2\pi r^2$ | $3\pi r^2$ | $\frac{2}{3}\ \pi r^3$ | $r$ = Radius |
| Spherical shell |  | — | $4\pi\ (R^2 - r^2)$ | $\frac{4}{3}\pi\ (R^3 - r^3)$ | $R$ = Outer radius $r$ = Inner radius |

## Solved Examples:

**1.** If the surface of a cube is 216 sq cm, its volume will be

(a) 108 sq cm
(b) 36 sq cm
(c) 216 sq cm
(d) 216 sq cm

**Sol. (d)** Surface of a cube $= 6 \times (\text{ Side })^2$

$\therefore\ 216 = 6 \times x^2$

Where, $x$ is the side of cube.

$$x^2 = \frac{216}{6} \qquad = 36$$

$$\therefore\ x = \sqrt{36} \qquad = 6 \text{ cm}$$

$\therefore$ Volume of the cube $= 6 \times 6 \times 6 = 216$cucm

**2.** If the area of the floor of a rectangular room be 15sqm and the height of the room be 4 m, then how much air is in the room?

(a) 11 cm
(b) $\frac{15}{4}$ cm
(c) 60 cm
(d) 19 cm

**Sol. (c)** Volume $=$ Area $\times h = 15 \times 4 = 60$cm

**3.** One rectangular tank is 2.1 m long and 2 m broad. If the capacity of the tank is 21 hecto liter, then the height is

(a) 0.9 m
(b) 0.5 m
(c) 0.7 m
(d) 10 m

**Sol. (b)** Capacity $= 21$ hectolitre $= 2100$ L $= 2.1$cum

$\therefore$ Capacity $= l \times b \times h \Rightarrow 2.1 = 2.1 \times 2 \times h$

$\therefore$ $h = \frac{2.1}{2.1 \times 2} = 0.5$ m

**4.** If each edge of a cube is decreased by 40%. Find the per cent decrease in the surface area of the cube.

(a) 64
(b) 84
(c) 80
(d) 74

**Sol. (a)** According to the formula

Percentage decrease in surface area

$$= \left[2(-40) + \frac{(-40)^2}{100}\right] = \left[-80 + \frac{(1600)}{100}\right]$$
$$= (-80 + 16) = -64\%$$

Negative sign shows that decrease takes place here.