TOPIC-1
Surface areas and Volumes

- **Cuboid :**

Lateral surface area or Area of four walls $= 2(l + b)h$

Total surface area $= 2(lb + bh + hl)$

Volume $= l \times b \times h$

Diagonal $= \sqrt{l^2 + b^2 + h^2}$

Here, l = length, b = breadth and h = height

- **Cube :**

Lateral surface area or Area of four walls $= 4 \times (\text{edge})^2$

Total surface area $= 6 \times (\text{edge})^2$

Volume $= (\text{edge})^3$

Diagonal of a cube $= \sqrt{3} \times \text{edge}$.

- **Right circular cylinder :**

Area of base or top face $= \pi r^2$

Area of curved surface or curved surface area = perimeter of the base × height $= 2\pi rh$

Total surface area (including both ends) $= 2\pi rh + 2\pi r^2 = 2\pi r(h + r)$

Volume = (Area of the base × height) $= \pi r^2 h$

Here, r is the radius of base and h is the height.

- **Right circular hollow cylinder :**

Total surface area = (External surface + internal sufrace) + (Area of ends)

$= (2\pi Rh + 2\pi rh) + 2(\pi R^2 - \pi r^2)$

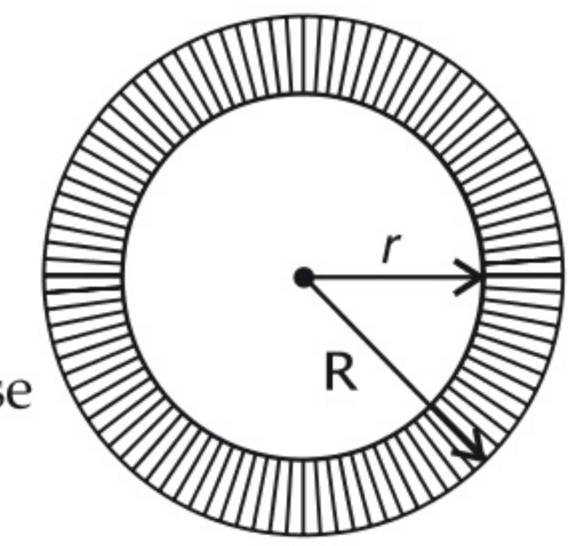
$= [2\pi h(R + r) + 2\pi(R^2 - r^2)]$

$= [2\pi(R + r)(h + R - r)]$

Curved surface area $= (2\pi Rh + 2\pi rh) = 2\pi h(R + r)$

Volume of the material used = (External volume) – (Internal volume)

$= \pi R^2 h - \pi r^2 h = \pi h(R^2 - r^2)$



- **Right circular cone :**

Slant height, $l = \sqrt{h^2 + r^2}$

Area of curved surface $= \pi rl = \pi r\sqrt{h^2 + r^2}$

Total surface area = Area of curved surface + Area of base

$= \pi rl + \pi r^2 = \pi r(l + r)$

Volume $= \frac{1}{3}\pi r^2 h$

- **Sphere :**

Surface area $= 4\pi r^2$

Volume $= \frac{4}{3}\pi r^3$

- **Spherical shell :**

Surface area (outer) $= 4\pi R^2$

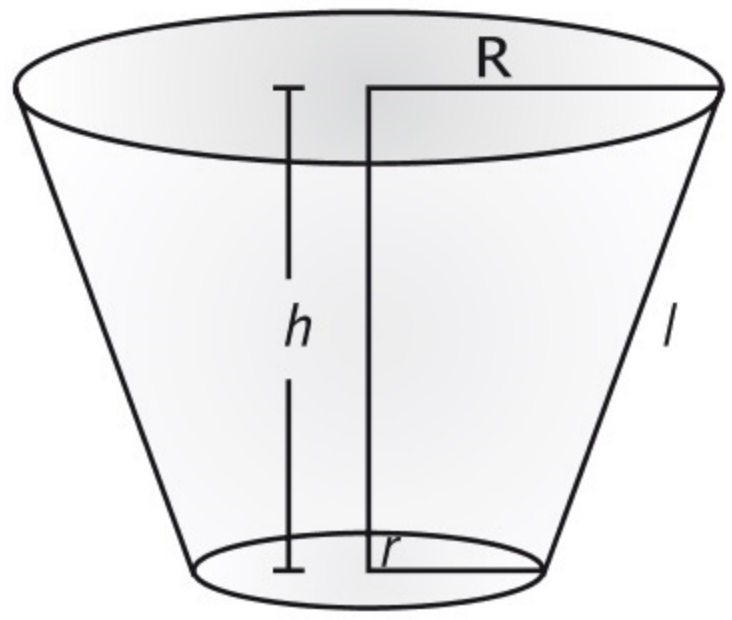
Volume of material $= \frac{4}{3}\pi R^3 - \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(R^3 - r^3)$

➢ **Hemisphere :**

$$\text{Area of curved surface} = 2\pi r^2$$
$$\text{Total surface area} = \text{Area of curved surface} + \text{Area of base}$$
$$= 2\pi r^2 + \pi r^2$$
$$= 3\pi r^2$$
$$\text{Volume} = \frac{2}{3}\pi r^3$$

➢ **Frustum of a cone :**

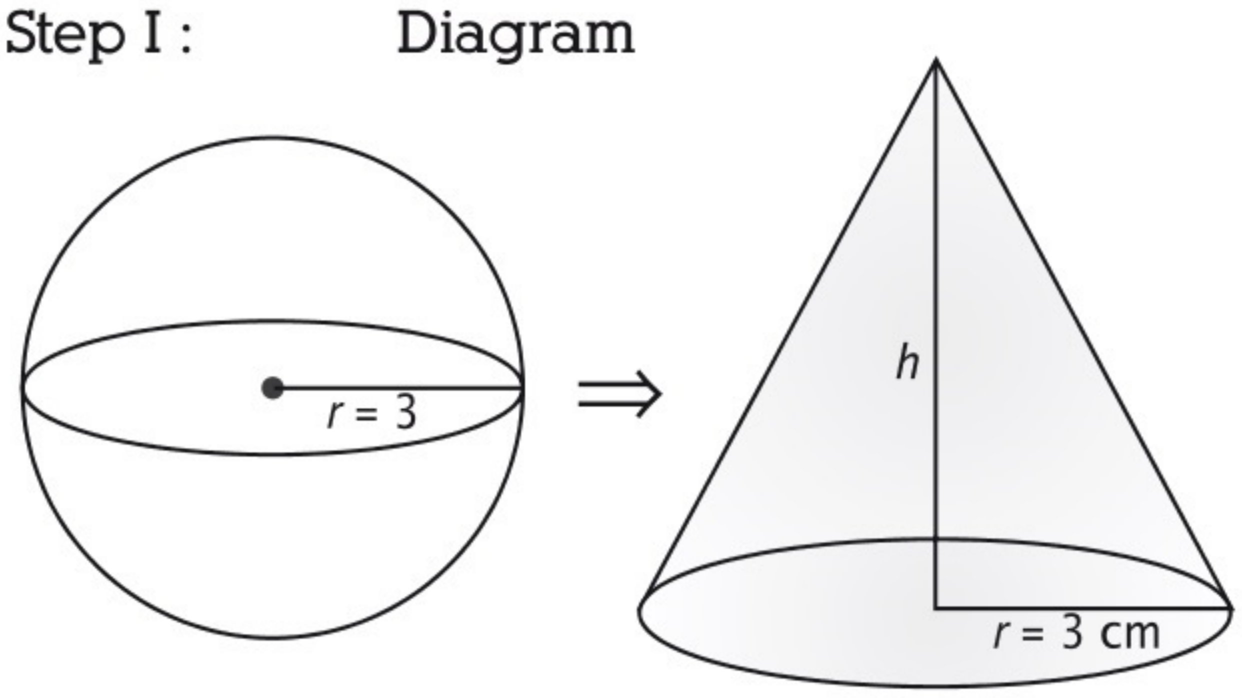


$$\text{Total surface area} = \pi[R^2 + r^2 + l(R + r)]$$
$$\text{Volume of the material} = \frac{1}{3}\pi h[R^2 + r^2 + Rr]$$
$$\text{Curved surface area} = \pi l(R + r)$$
$$\text{Where } l = \sqrt{h^2 + (R - r)^2}$$

TOPIC-2
Problems involving converting one type of metallic solid into another

A Q. A spherical ball of radius 3 cm is melted and recast into a cone of same radius. Calculate the height of cone

Sol. Step I : Diagram



Step II : Volume of spherical ball

$$V = \frac{4}{3}\pi(3)^3 \text{ cm}^3$$

Volume of cone $V = \frac{1}{3}\pi(3)^2 h$

Step III : According to question

$$\frac{4}{3}\pi \times 27 = \frac{\pi}{3} \times 9 \times h$$
$$\frac{4 \times 27}{9} = h$$
$$h = 12 \text{ cm}$$

$\therefore$ Height of cone = 12 cm.

$$\text{Area} \times \text{Rate} = \text{Cost}$$
$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$
$$1 \text{ m}^3 = 1000 \text{ L}$$
$$1 \text{ m}^3 = 1 \text{ kL}$$
$$1 \text{ L} = 1000 \text{ cm}^3$$
$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$1 \text{ km/hr} = \frac{5}{18} \text{ m/sec}$$
$$1 \text{ km/hr} = \frac{50}{3} \text{ m/min}$$
$$\text{Shape of river} = \text{Cuboid}$$
$$1 \text{ acre} = 100 \text{ m}^2$$
$$1 \text{ hectare} = 10000 \text{ m}^2$$

$$1 \text{ km} = 1000 \text{ m} = 10^5 \text{ cm}$$
$$1 \text{ km}^2 = 10^6 \text{ m}^2$$
$$1 \text{ m} = 100 \text{ cm}$$
$$1 \text{ m}^2 = 10000 \text{ cm}^2$$