**Volume and Surface Area**

| S.NO | SHAPE | FORMULA | UNIT |
|---|---|---|---|
| 1 | CUBOID<br>Here length = l, breadth = b & height = h units. | Volume = (l x b x h) | Cubic units |
| | | Surface area = 2(lb + bh + lh) | square units |
| | | Diagonal = l 2 + b 2 + h 2 | Units |
| 2 | CUBE<br>Here each edge of a cube be of length a. | Volume = $a^3$ | Cube units |
| | | Surface area = $6a^2$ | square units |
| | | Diagonal = 3a | units |
| 3 | CYLINDER<br>Here radius of base = r & Height/length = h. | Volume = $\pi r^2 h$ | Cube units. |
| | | Curved surface area = 2rh | square units |
| | | Total surface area = $2\pi r$ (h + r) square units. | square units |
| 4 | CONE<br>Here radius of base = r & Height = h. | Slant height L= $h^2 + r^2$ | Units |
| | | Volume = $\pi r^2 h / 3$ | Cube units. |
| | | Curved surface area = $\pi rl$ | square units |
| | | Total surface area = ($\pi rl + \pi r^2$) | square units |
| 5 | SPHERE<br>Here the radius of the sphere be r. | Volume = $4\pi r^3 / 3$ | Cube units. |
| | | Surface area = $4\pi r^2$ | square units |
| 6 | HEMISPHERE<br>Here radius of a hemisphere be r. | Volume = $2\pi r^3 / 3$ | Cube units. |
| | | Curved surface area = $2\pi r^2$ | square units |
| | | Total surface area = $3\pi r^2$ | square units |

**Problems with solutions**

1. A hall is 15 m long and 12 m broad. If the sum of the areas of the floor and the ceiling is equal to the sum of the areas of four walls, the volume of the hall is:

**Solution**

$2(15 + 12) \times h = 2(15 \times 12)$

$h = \frac{180}{27}m = \frac{20}{3}m.$

Volume $= \left(15 \times 12 \times \frac{20}{3}\right)m^3 = 1200\ m^3.$

2. 66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in metres will be:

**Solution**

Let the length of the wire be h.

Radius $= \frac{1}{2}mm = \frac{1}{20}cm.$

$\frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times h = 66.$

$h = \frac{66 \times 20 \times 20 \times 7}{22} = 8400\ cm = 84\ m.$

3. A boat having a length 3 m and breadth 2 m is floating on a lake. The boat sinks by 1 cm when a man gets on it. The mass of the man is:

**Solution**

Volume of water displaced $= (3 \times 2 \times 0.01)\ m^3$

$= 0.06\ m^3.$

Mass of man = Volume of water displaced x Density of water

$= (0.06 \times 1000)\ kg$

$= 60\ kg.$

4. 50 men took a dip in a water tank 40 m long and 20 m broad on a religious day. If the average displacement of water by a man is 4 $m^3$, then the rise in the water level in the tank will be:

**Solution**

Total volume of water displaced $= (4 \times 50)\ m^3 = 200\ m^3.$

$\therefore$ Rise in water level $= \left(\frac{200}{40 \times 20}\right)m\ 0.25\ m = 25\ cm.$

5. A cistern 6m long and 4 m wide contains water up to a depth of 1 m 25 cm. The total area of the wet surface is:

**Solution**

Area of the wet surface $= [2(lb + bh + lh) - lb]$

$= 2(bh + lh) + lb$

$= [2 (4 \times 1.25 + 6 \times 1.25) + 6 \times 4] \text{ m}^2$

$= 49 \text{ m}^2$.