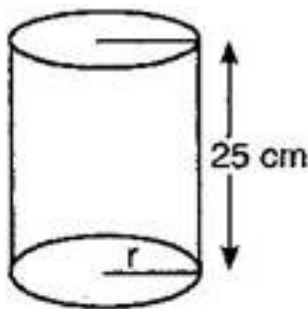


CBSE Class 9 Mathematics
NCERT Solutions
CHAPTER 13
Surface Areas and Volumes(Ex. 13.6)

Assume $\frac{22}{7}$ unless stated otherwise.

1. The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm.
How many litres of water can it hold? ($1 \text{ m}^3 = 1000 \text{ l}$)

Ans. Height of vessel (h) = 25 cm



Circumference of base of vessel = 132 cm

$$\Rightarrow 2\pi r = 132$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 132$$

$$\Rightarrow r = \frac{132 \times 7}{2 \times 22} = 21 \text{ cm}$$

Now, Volume of cylindrical vessel

$$= \pi r^2 h = \frac{22}{7} \times 21 \times 21 \times 25 = 34650 \text{ cm}^3$$

$$= \frac{34650}{1000} \text{ liters} \quad [\because 1000 \text{ cm}^3 = 1 \text{ liter}]$$

$$= 34.65 \text{ liters}$$

2. The inner diameter of a cylindrical wooden pipe is 24 cm and its outer diameter is 28 cm. The length of the pipe is 35 cm. Find the mass of the pipe, if 1cm^3 of wood has a mass of 0.6 g.

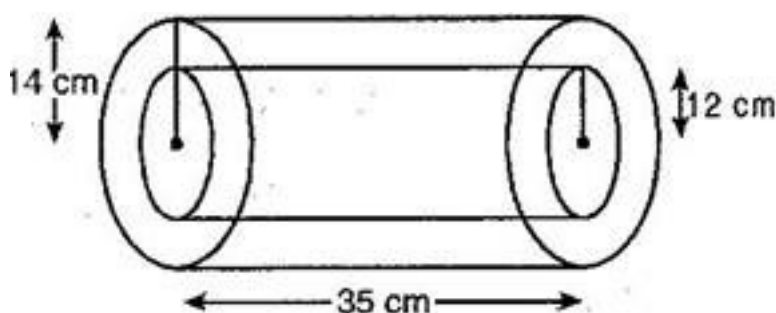
Ans. Inner diameter of pipe = 24 cm

$$\therefore \text{Inner radius of pipe (r)} = \frac{24}{2} = 12 \text{ cm}$$

And Outer diameter of pipe = 28 cm

$$\therefore \text{Outer radius of pipe (R)} = \frac{28}{2} = 14 \text{ cm}$$

Length of pipe (h) = 35 cm



Volume of wood = Volume of outer cylinder – Volume of inner cylinder

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

$$= \frac{22}{7} \times 35 [(14)^2 - (12)^2]$$

$$= 110 [196 - 144] = 110 \times 52$$

$$= 5720 \text{ cm}^3$$

\therefore Weight of 1 cm^3 of wood = 0.6 g

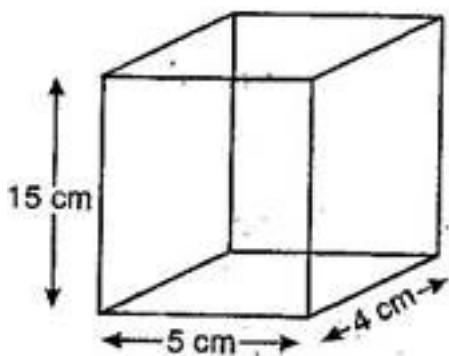
\therefore Weight of 5720 cm^3 of wood

$$= 0.6 \times 5720 = 3432 \text{ g} = 3.432 \text{ kg}$$

3. A soft drink is available in two packs (i) a tin can with a rectangular base of length 5 cm and width 4 cm, having height of 15 cm (ii) a plastic cylinder with circular base of diameter 7 cm and height 10 cm. Which container has greater capacity and how much?

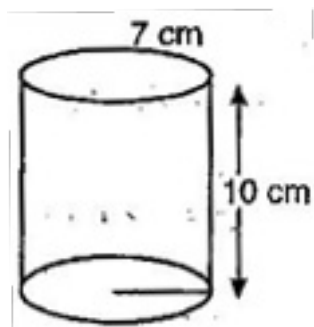
Ans. Case 1: Length of tin (l) = 5 cm, Width of tin (b) = 4 cm

and Height of tin (h) = 15 cm



Then, Capacity of tin = $l \times b \times h = 5 \times 4 \times 15 = 300 \text{ cm}^3$

case II: Diameter of base of cylinder = 7 cm



\therefore Radius of base of cylinder (r) = $\frac{7}{2}$ cm

Height of cylinder (h') = 10 cm

Capacity of cylinder = $\pi r^2 h'$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 10 = 385 \text{ cm}^3$$

From the cases I and II, we observed that

cylindrical container has greater capacity by $(385 - 300) = 85 \text{ cm}^3$.

4. If the lateral surface of a cylinder is 94.2 cm^2 and its height is 5 cm, then find (i) radius of its base (ii) volume of the cylinder. [Use $\pi = 3.14$]

Ans. Height of the cylinder (h) = 5 cm

(i) Lateral surface area of the cylinder = 94.2 cm^2

$$\Rightarrow 2\pi rh = 94.2$$

$$\Rightarrow 2 \times 3.14 \times r \times 5 = 94.2$$

$$\Rightarrow r = \frac{94.2}{2 \times 3.14 \times 5} = 3 \text{ cm}$$

(ii) Volume of cylinder = $\pi r^2 h$

$$= 3.14 \times 3 \times 3 \times 5 = 141.3 \text{ cm}^3$$

5. It costs Rs. 2200 to paint the inner curved surface of a cylindrical vessel 10 m deep. If the cost of painting is at the rate of Rs. 20 per m^2 , find:

(i) inner curved surface area of the vessel.

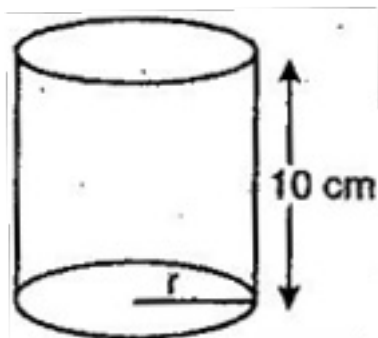
(ii) radius of the base.

(iii) capacity of the vessel.

Ans. Total cost to paint inner curved surface area of the vessel = Rs. 2200

Rate = Rs. 20 per square meter

$$\text{(i) Inner curved surface area of vessel} = \frac{\text{Total cost}}{\text{Rate}} = \frac{2200}{20} = 110 \text{ m}^2$$



(ii) Depth of the vessel (h) = 10 m

Radius of base = r cm

Now, Inner surface area of vessel = 110 m^2

$$\Rightarrow 2\pi rh = 110$$

$$\Rightarrow 2 \times \frac{22}{7} \times r \times 10 = 110$$

$$\Rightarrow r = \frac{110 \times 7}{2 \times 22 \times 10} = 1.75 \text{ m}$$

(iii) Since $r = 1.75 \text{ m}$ and

$$h = 10 \text{ m}$$

\therefore Capacity of vessel

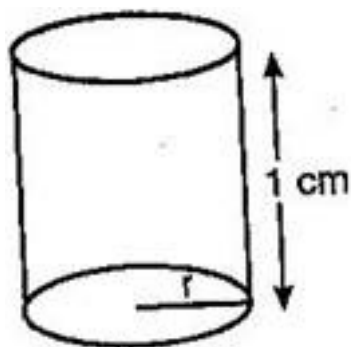
$$= \text{Volume of cylinder} = \pi r^2 h$$

$$= \frac{22}{7} \times 1.75 \times 1.75 \times 10 = 96.25 \text{ m}^3$$

$$= 96.25 \text{ kl} [\because 1 \text{ m}^3 = 1 \text{ kl}]$$

6. The capacity of a closed cylindrical vessel of height 1 m is 15.4 litres. How many square meters of metal sheet would be needed to make it? (1000 litres = 1 m^3)

Ans. Height of the vessel (h) = 1 m



$$\text{Capacity of vessel} = 15.4 \text{ liters} = \frac{15.4}{1000} = 0.0154 \text{ m}^3 \quad [\because 1 \text{ m}^3 = 1 \text{ kl}]$$

$$\Rightarrow \pi r^2 h = 0.0154$$

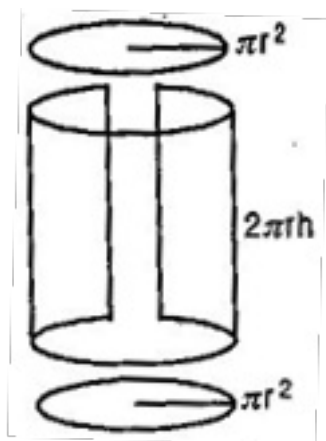
$$\Rightarrow \frac{22}{7} \times r^2 \times 1 = 0.0154$$

$$\Rightarrow r^2 = \frac{0.0154 \times 7}{22}$$

$$\Rightarrow r^2 = 0.0007 \times 7 = 0.0049$$

$$\Rightarrow r = 0.07 \text{ m}$$

Now, Area of metal sheet required = TSA of cylindrical vessel



$$= 2\pi r(r + h)$$

$$= 2 \times \frac{22}{7} \times 0.07(1 + 0.07)$$

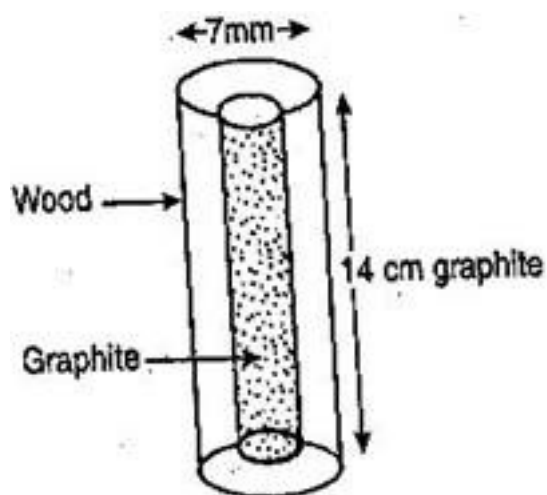
$$= \frac{44}{7} \times 0.07 \times 1.07$$

$$= 0.4708 \text{ m}^2$$

7. A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior. The diameter of the pencil is 7 mm and diameter of graphite is 1 mm. If the length of the pencil is 14 cm, find the volume of the wood and that of the graphite.

Ans. Diameter of graphite = 1 mm

∴ Radius of graphite = 0.5 mm = 0.05 cm



Height of graphite (h) = 14 cm

$$\text{Volume of graphite} = \pi r^2 h = \frac{22}{7} \times (0.05)^2 \times 14 = 0.11 \text{ cm}^3$$

Diameter of pencil = 7 mm

∴ Radius of pencil (R) = 3.5 mm = 0.35 cm

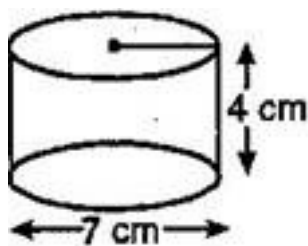
$$\text{Volume of pencil} = \pi R^2 h = \frac{22}{7} \times (0.35)^2 \times 14 = 5.39 \text{ cm}^3$$

Now, Volume of wood = Volume of pencil – Volume of graphite

$$= 5.39 - 0.11 = 5.28 \text{ cm}^3$$

8. A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7 cm. If the bowl is filled with soup to a height of 4 cm, how much soup the hospital has to prepare daily to serve 250 patients?

Ans. Diameter of circular base of cylindrical bowl = 7 cm



$$\therefore \text{Radius of circular base of cylindrical bowl } (r) = \frac{7}{2} \text{ cm}$$

$$\text{Height of the bowl } (h) = 4 \text{ cm}$$

$$\text{Now, Volume of cylindrical bowl} = \pi r^2 h$$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 4 = 22 \times 7 = 154 \text{ cm}^3$$

$$\therefore \text{Quantity of soup filled in a bowl} = 154 \text{ cm}^3$$

$$\text{Therefore, total quantity of soup to be prepared by the hospital} = 250 \times 154 = 38500 \text{ cm}^3$$

$$= \frac{38500}{1000} \text{ liter} [\because 1 \text{ liter} = 1000 \text{ cm}^3]$$

$$= 38.5 \text{ liters}$$