Ex - 13.6

Q1. 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? (1000 cm^3 = 1ℓ)

Sol. Let the base radius of the cylindrical vessel be r cm.

Then, circumference of the base of the cylindrical vessel = 2πr cm.

According to the question, 2πr = 132

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

Height of the cylindrical vessel, h = 25 cm

$\therefore$ Capacity of the cylindrical vessel

$= \pi r^2 h = \frac{22}{7} (21)^2 (25)\ cm^3$

$= 34650\ cm^3 = \frac{34650}{1000}\ \ell = 34.65\ \ell$

Hence, the cylindrical vessel can hold 34.65 ℓ of water.

Q2. 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 1 cm^3 of wood has a mass of 0.6 g.

Sol. $\because$ Inner diameter = 24 cm

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

$\because$ Outer diameter = 28 cm

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

Length of the pipe (h) = 35 cm

Outer volume = $\pi R^2 h = \frac{22}{7} \times (14)^2 \times 35$

$= 21560\ cm^3$

Inner volume = $\pi r^2 h = \frac{22}{7} \times (12)^2 \times 35 = 15840\ cm^3$

$\therefore$ Volume of the wood used = Outer volume – Inner volume = 21560 cm^3 – 15840 cm^3

$= 5720\ cm^3$

$\therefore$ Mass of the pipe $= 5720 \times 0.6$ g

$= 3432$ g = 3.432 kg

Hence, the mass of the pipe is 3.432 kg.

Q3. 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 a height of 15 cm and (ii) a plastic cylinder with circular base of diameter 7 cm and height 10 cm. Which container has greater capacity and by how much?

Sol. $V_1 = 5 \times 4 \times 15\ cm^3 = 300\ cm^3$

$V_2 = \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 10\ cm^3 = 385\ cm3$

$V_2 > V_1$, i.e., the cylinder has 85 cm^3 greater capacity.

Q4. 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) its volume. (Use $\pi = 3.14$)

Sol. (i) $2\pi r \times h = 94.2 \Rightarrow 2 \times 3.14 \times r \times 5 = 94.2 \Rightarrow r = \frac{94.2}{31.4} = 3cm \Rightarrow r = 3\ cm$

(ii) Volume $= 3.14 \times (3)^2 \times 5\ cm^3$

$= 15.7 \times 9\ cm^3 = 141.3\ cm^3$

Q5. 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.

Sol. Inner curved surface area × Rs. 20 = Rs. 2200]

Ans. (i) 110 m^2 ; (ii) 1.75 m ; (iii) 96.25 m^3 (or 96.25 kl).

(i) Inner curved surface area $= \frac{2200}{20} = 110m^2$

(ii) $2 \times \frac{22}{7} \times r \times 10 = 110$

$r = \frac{7}{4} = 1.75$

(iii) Vol. of vessel $= \frac{22}{7} \times 1.75 \times 10 = 96.25\ m^3$

Q6. The capacity of a closed cylindrical vessel of height 1 m is 15.4 litres. How many square metres of metal sheet would be needed to make it?

Sol. Let the radius of the vessel be r m.

Volume of vessel = 15.4 ℓ = 0.0154 m^3

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

Ans. 0.07 m^2.

Q7. 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 the diameter of the graphite is 1 mm. If the length of the pencil is 14 cm, find the volume of the wood and that of the graphite.

Sol. We have, 10 mm = 1 cm, $\therefore$ 1mm = $\frac{1}{10}$cm

For graphite cylinder

diameter = 1mm = $\frac{1}{10}$cm

Radius = $\frac{1}{10} \times \frac{1}{2}$ cm = $\frac{1}{20}$ cm

Length (h) = 14 cm

$\therefore$ Volume = $\pi r^2 h = \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 14$ cm^3

= 0.11 cm^2

Now, diameter of pencil = 7 mm = $\frac{7}{10}$ cm

$\therefore$ Radius of the pencil (R) = $\frac{7}{20}$cm

Height of the pencil h = 14 cm

Volume = $\frac{22}{7} \times \frac{7}{20} \times \frac{7}{20} \times 14$ cm^3

Volume = 5.39 cm^3

Volume of the wood = Volume of pencil – Volume of graphite

$\Rightarrow$ 5.39 cm^3 – 0.11 cm^3 = 5.28 cm^3

Q8. 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?

Sol. r = 7/2 cm, h = 4 cm

Capacity of one bowl = $\frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times$ 4cm^3 = 154 cm^3

Soup required for 250 patients

= 250 × 154 cm^3 =38500 cm^3

= $\frac{38500}{1000}$lit. = 38.5 lit.