Exercise 13.6

Question :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? (1000 cm^3 = 1L)

Ans.:

Let the radius of the cylindrical vessel be r

Height (h) of vessel = 25 cm

Circumference of vessel = 132 cm

2∏r = 132 cm

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

= 21 cm

Volume of cylindrical vessel = $\pi r^2 h$

= $\frac{22}{7}$× 21 × 21 × 25

= 34650 cm^3

= $\left(\frac{34650}{1000}\right)$ litres

= 34.65 litres

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

Ans.: Inner radius (r_1) = 24/2 = 12 cm

Outer radius (r_2) = 28/2 = 14 cm

Height (h) = Length = 35 cm

Volume = $\pi (r_2^2 - r_2^1)$ h

= 22/7 × ($14^2 - 12^2$) × 35

= 110 × 52

= 5720 cm^3

Mass of 1 cm^3 wood = 0.6 g

Mass of 5720 cm^3 wood = (5720 × 0.6) g

= 3432 g

= 3.432 kg

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

Ans.: The tin can will be cuboidal in shape while the plastic cylinder will be cylindrical in shape

Length (l) of tin can = 5 cm

Breadth (b) of tin can = 4 cm

Height (h) of tin can = 15 cm

Capacity of tin can = l × b × h

= (5 × 4 × 15) cm^3

= 300 cm^3

Radius (r) of circular end of plastic cylinder = 3.5 cm

Height (H) of plastic cylinder = 10 cm

The capacity of plastic cylinder = $\pi r^2 H$

= (22/7) × 3.5 × 3.5 × 10

= 11 × 35

= 385 cm^3

Clearly, plastic cylinder has the greater capacity

Difference in capacity = (385 − 300) = 85 cm^3

Question :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) its volume. (Use $\pi = 3.14$)

Ans.: (i) Height (h) of cylinder = 5 cm

Let radius of cylinder be r

CSA of cylinder = 94.2 cm^2

$2\pi rh = 94.2$

$(2 \times 3.14 \times r \times 5) = 94.2$

$r = \frac{94.2}{2 \times 3.14 \times 2}$

$= \frac{94.2}{31.4}$

r = 3 cm

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

$= (3.14 \times (3)^2 \times 5)$

= 3.14 x 9 x 5= 3.14 x 45

= 141.3 cm^3

Question :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.:

Rs 20 is the cost of painting 1 m^2 area Rs 2200 is the cost of painting = ($\frac{1}{20}\times$ 2200) m^2

= 110 m^2

Therefore, the inner surface area of the vessel is 110 m^2

(ii) Let the radius of the base of the vessel be r

Height (h) = 10 m

Surface Area = $2\pi rh$ = 110 m^2

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

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

r = 1.75 m

(iii) Volume = $\pi r^2 h$

= $\frac{22}{7}\times 1.75 \times 1.75 \times 10$

= 96.25 m^3

The capacity of the vessel is 96.25 m^3 or 96250 litres

Question :6 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?

Ans.: Let the radius of the circular end be "r".

The volume of cylindrical vessel = 15.4 litres

1 litre = 1/1000 m^3

= 0.0154 m^3

$r^2h = 0.0154\ m^3$

$(\frac{22}{7} \times r \times r \times 1)\ m = 0.0154\ m^3$

r = 0.07 m

TSA of vessel = $2\pi r\ (r + h)$

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

$= 0.44 \times 1.07$

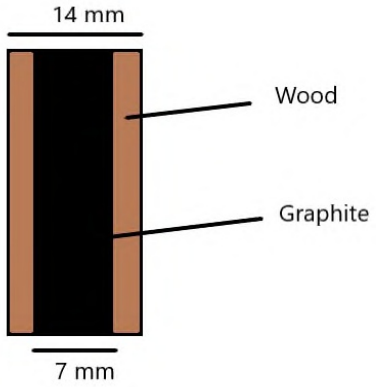
= 0.4708 m^2

Height (h) of cylindrical vessel = 1 m

Therefore, the metal sheet would be required to make the cylindrical vessel is 0.4708 m^2

Question :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 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

Ans.:



Concept Used: Volume of the wood = Volume of a pencil – volume graphite

Volume of Cylinder = $\pi r^2 h$

Where r = radius of the cylinder and h = height of the cylinder

Given: Diameter of pencil = 7 mm

Diameter of graphite = 1 mm

Length of the pencil = 14 cm

Assumption: Let r^1 be the radius of pencil, r^2 be the radius of graphite and h be the height of pencil.

Explanation:

Radius

Radius (pencil), r_1 mm = 0.35 cm

Radius (graphite), r_2 mm = 0.05 cm

Height (Pencil), h = 14 cm

Volume of wood in pencil = $\pi (r_1^2 - r_2^2) h$

= $22/7 [(0.35)^2 - (0.05)^2 \times 14]$

= 22/7 (0.1225 – 0.0025) × 14

= 44 × 0.12

= 5.28 cm^3

Volume of graphite = $\pi r_2^2 h$

= 22/7 × $(0.05)^2$ × 14

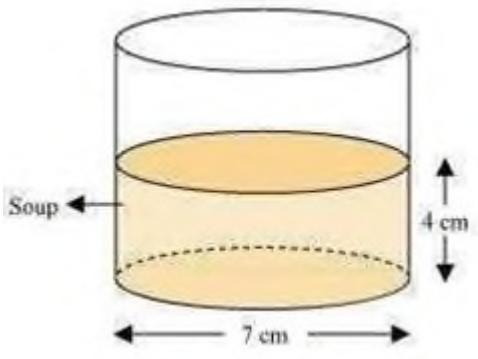
= 44 × 0.0025

= 0.11 cm^3

Hence, The volume of wood in pencil is 5.28 cm^3 and volume of graphite in pencil is 0.11 cm^3.

Question :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.: Radius (r) of cylindrical bowl = $\frac{7}{2}$ = 3.5cm



Height (h) of bowl, up to which bowl is filled with soup = 4 cm

Volume of soup in 1 bowl = $\pi r^2 h$

= $\frac{22}{7}$* 3.5 * 3.5 * 4

$= (11 \times 3.5 \times 4)$

$= 154 \text{ cm}^3$

Volume of soup given to 250 patients $= (250 \times 154) \text{ cm}^3$

$= 38500 \text{ cm}^3$

$= 38.5$ litres.