Exercise 13.6   Page No: 230

1. The circumference of the base of cylindrical vessel is 132 cm and its height is 25 cm. How many litres of water can it hold? (1000 cm³ = 1L) (Assume π = 22/7)

Solution:

Circumference of the base of cylindrical vessel = 132 cm
Height of vessel, h = 25 cm
Let r be the radius of the cylindrical vessel.
Step 1: Find the radius of vessel
We know that, circumference of base = 2πr, so
2πr = 132 (given)
 r = (132 / (2 π))
r = 66 x 7/22 = 21
Radius is 21 cm
Step 2: Find the volume of vessel

Formula: Volume of cylindrical vessel = πr²h
= 22/7 x 21² x 25
= 34650
Therefore, volume is 34650 cm³

Since **1000 cm³ = 1L**
So Volume = 34650/1000 L = 34.65 L

Therefore, vessel can hold 34.65 litres of water.

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 cm³ of wood has a mass of 0.6g. (Assume π = 22/7)

Solution:

Inner radius of cylindrical pipe, say r_1 = diameter_1/ 2 = 24/2 cm = 12 cm
Outer radius of cylindrical pipe, say r_2 = diameter_2/ 2 = 28/2 cm = 14 cm
Height of pipe, h = Length of pipe = 35 cm
Now, the Volume of pipe =   π(r_2^2 - r_1^2) h   cm³
Substitute the values.
Volume of pipe = 110 x 52 cm³ =5720 cm³
Since**, Mass of 1 cm³ wood = 0.6 g**
Mass of 5720 cm³ wood = (5720 x 0.6) g = 3432 g or 3.432 kg. Answer!

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 circular base of diameter 7 cm and height 10 cm. Which container has greater capacity and by how much? (Assume π = 22/7)

Solution:

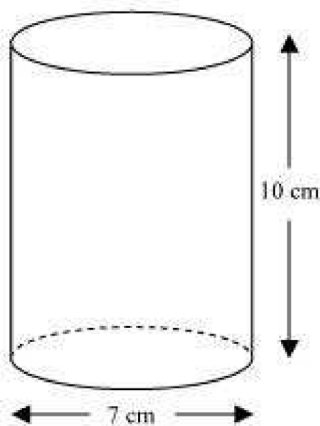 (i) tin can will be cuboidal in shape
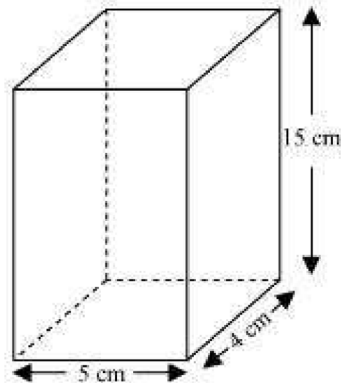
Dimensions of tin can are
Length, l = 5 cm
Breadth, b = 4 cm
Height, h = 15 cm
Capacity of tin can = l x b x h = (5 x 4 x 15) cm^3 = 300 cm^3

  (ii) plastic cylinder will be cylindrical in shape.

Dimensions of plastic can are

Radius of circular end of plastic cylinder, r = 3.5 cm
Height , H =10 cm

Capacity of plastic cylinder = $\pi r^2 H$
Capacity of plastic cylinder = 22/7 x (3.5)^2 x 10 = 385
Capacity of plastic cylinder is 385 cm^3

From results of (i) and (ii), plastic cylinder has more capacity.
Difference in capacity = (385 - 300) cm^3 = 85 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) its volume.[Use π= 3.14]

Solution:
CSA of cylinder = 94.2 cm^2
Height of cylinder, h = 5 cm

(i) Let radius of cylinder be r.
Using CSA of cylinder, we get
2πrh = 94.2
2 x 3.14 x r x 5 = 94.2
r = 3
Radius is 3 cm

(ii) Volume of cylinder
Formula for volume of cylinder = $\pi r^2 h$
Now, $\pi r^2 h$ = (3.14 x (3)^2 x 5) (using value of r from (i))
= 141.3
Volume is 141.3 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
(Assume π=22/7)

Solution:

(i) Rs 20 is the cost of painting 1 m^2 area.
Rs 1 is he cost to paint 1/20 m^2 area
So Rs 2200 is the cost of painting = (1/20 x 2200)m^2 =110 m^2 area

The inner surface area of the vessel is 110 m^2.

(ii) Radius of the base of the vessel, let us say r.
Height (h) = 10 m and
Surface area formula = 2πrh
Using result of (i)
2πrh = 110 m^2
2 x 22/7 x r x 10 = 110
r= 1.75
Radius is 1.75 m

(iii) Volume of vessel formula = π r^2 h
Here r = 1.75 and h = 10
Volume = (22/7 x (1.75)^2 x 10) = 96.25
Volume of vessel is 96.25 m^3
Therefore, the capacity of the vessel is 96.25 m^3 or 96250 litres.

6. The capacity of a closed cylindrical vessel of height 1 m is 15.4 liters. How many square meters of metal sheet would be needed to make it? (Assume π = 22/7)

Solution:

Height of cylindrical vessel, h = 1 m
Capacity of cylindrical vessel = 15.4 litres = 0.0154 m^3
Let r be the radius of the circular end.
Now,
Capacity of cylindrical vessel = (22/7 x r^2 x 1) = 0.0154
After simplifying, we get, r = 0.07 m
Again, total surface area of vessel = 2πr (r + h)
= (2 x 22/7 x 0.07 (0.07 + 1))
= 0.44 · 1.07
= 0.4708
Total surface area of vessel is 0.4708 m^2

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

7. A lead pencil consists of a cylinder of wood with 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. (Assume π = 22/7)

Solution:
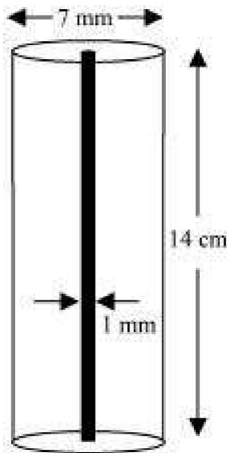
Radius of pencil, $r_1 = \frac{7}{2} \, mm = \frac{0.7}{2} cm = 0.35 \, cm$

Radius of graphite, $r_2 = \frac{1}{2} \, mm = \frac{0.1}{2} cm = 0.05 \, cm$

Height of pencil, h = 14 cm

Formula to find, volume of wood in pencil = $\pi(r_1^2 - r_2^2)h$ cubic units

Substitute the values, we have

$= \left[\frac{22}{7}(0.35^2 - 0.05^2)14\right]$

= 44 x 0.12

= 5.28

This implies, volume of wood in pencil = 5.28 cm³

Again,

Volume of graphite = $\pi(r_2^2)h$ cubic units

Substitute the values, we have

$= \left[\frac{22}{7}(0.05)^2 14\right]$

= 44 x 0.0025

= 0.11

So the volume of graphite is 0.11 cm³ .

8. A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7cm. If the bowl is filled with soup to a height of 4cm, how much soup the hospital has to prepare daily to serve 250 patients? (Assume π=22/7)

Solution:

Diameter of cylindrical bowl = 7 cm
Radius of cylindrical bowl, r = 7/2 cm = 3.5 cm
Bowl is filled with soup to a height of 4 cm, so h = 4 cm
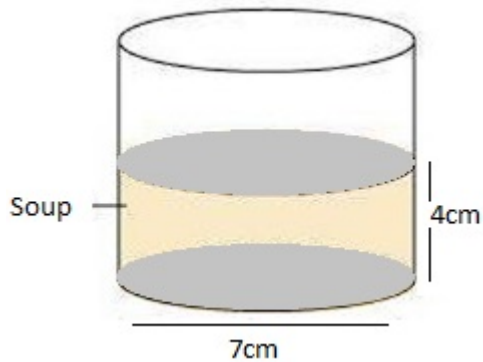
Volume of soup in one bowl = π r² h
(22/7 x 3.5² x 4) = 154

Volume of soup in one bowl is 154 cm³
Volume of soup given to 250 patients = (250 x 154) cm³ = 38500 cm³
= 38.5litres. Answer!