EXERCISE 13.6 PAGE NO: 230

1. The circumference of the base of the cylindrical vessel is 132cm, and its height is 25cm.

How many litres of water can it hold? (1000 cm^3= 1L) (Assume $\pi = 22/7$)

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 the vessel.

We know that the circumference of the base = $2\pi r$, so

$2\pi r = 132$ (given)

$r = (132/(2\pi))$

$r = 66\times7/22 = 21$

The radius is 21 cm.

Step 2: Find the volume of the vessel.

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

$= (22/7)\times21^2\times25$

$= 34650$

Therefore, the volume is 34650 cm^3

Since **1000 cm^3 = 1L**

So, Volume = 34650/1000 L= 34.65L

Therefore, the vessel can hold 34.65 litres of water.

2. The inner diameter of a cylindrical wooden pipe is 24cm, and its outer diameter is 28 cm. The length of the pipe is 35cm. Find the mass of the pipe, if 1cm^3 of wood has a mass of 0.6g. (Assume $\pi = 22/7$)

Solution:

Inner radius of cylindrical pipe, say r_1 = $diameter_1$/ 2 = 24/2 cm = 12cm

Outer radius of cylindrical pipe, say r_2 = $diameter_2$/ 2 = 28/2 cm = 14 cm

Height of pipe, h = Length of pipe = 35cm

Now, the Volume of pipe = $\pi(r_2^2-r_1^2)h$ cm^3

Substitute the values.

Volume of pipe = 110×52 cm^3 = 5720 cm^3

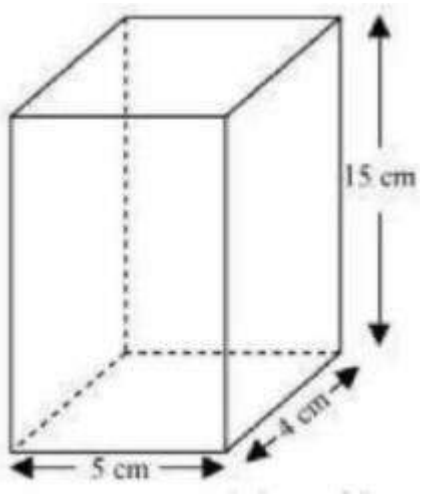
Since **Mass of 1 cm^3 wood = 0.6 g**

Mass of 5720 cm^3 wood = (5720×0.6) g = 3432 g or 3.432 kg.

3. A soft drink is available in two packs – (i) a tin can with a rectangular base of length 5cm and width 4cm, having a height of 15 cm and (ii) a plastic cylinder with a circular base of diameter 7cm and height 10cm. Which container has greater capacity, and by how much? (Assume π=22/7)

Solution:

(i) Tin can will be cuboidal in shape.



Dimensions of the tin can are

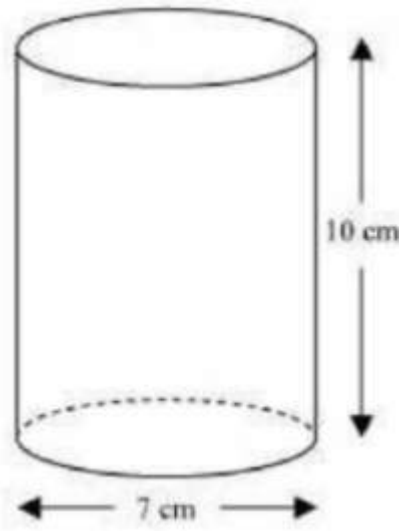
Length, l = 5 cm

Breadth, b = 4 cm

Height, h = 15 cm

Capacity of tin can = l×b×h= (5×4×15) cm^3 = 300 cm^3

(ii) Plastic cylinder will be cylindrical in shape.



Dimensions of the plastic can are

Radius of the circular end of plastic cylinder, r = 3.5cm

Height , H = 10 cm

Capacity of the plastic cylinder = $\pi r^2 H$

Capacity of the plastic cylinder = $(22/7)\times(3.5)^2\times10 = 385$

Capacity of the plastic cylinder is 385 cm^3

From the results of (i) and (ii), the plastic cylinder has more capacity.

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

4. If the lateral surface of a cylinder is 94.2cm^2 and its height is 5cm, 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 = 5cm

(i) Let the radius of the cylinder be r.

Using the CSA of the cylinder, we get

$2\pi rh = 94.2$

$2\times3.14\times r\times5 = 94.2$

r = 3

The radius is 3 cm.

(ii) Volume of cylinder

The formula for the volume of the cylinder = $\pi r^2 h$

Now, $\pi r^2 h = (3.14 \times (3)^2 \times 5)$ (using the 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 10m 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 $\pi = 22/7$)

Solution:

(i) Rs 20 is the cost of painting 1 m^2 area.

Rs 1 is the cost to paint 1/20 m^2 area.

So, Rs 2200 is the cost of painting = $(1/20 \times 2200)$ m^2

= 110 m^2 area

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

(ii) Radius of the base of the vessel, let us say r.

Height (h) = 10 m and

Surface area formula = $2\pi rh$

Using the result of (i),

$2\pi rh = 110$ m^2

$2 \times 22/7 \times r \times 10 = 110$

r = 1.75

The radius is 1.75 m.

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

Here r = 1.75 and h = 10

Volume = $(22/7)\times(1.75)^2\times10 = 96.25$

The 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 1m is 15.4 litres. How many square metres of the metal sheet would be needed to make it? (Assume $\pi = 22/7$)

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 = $(22/7)\times r^2\times1 = 0.0154$

After simplifying, we get r = 0.07 m

Again, the total surface area of the vessel = $2\pi r(r+h)$

$= 2\times22/7\times0.07(0.07+1)$

$= 0.44\times1.07$

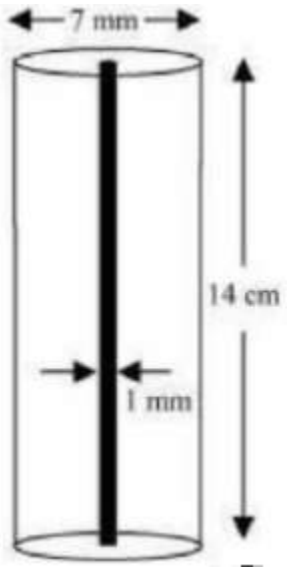
$= 0.4708$

Total surface area of the 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 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. (Assume $\pi = 22/7$)

Solution:



Radius of pencil, r_1 = 7/2 mm = 0.7/2 cm = 0.35 cm

Radius of graphite, r_2 = 1/2 mm = 0.1/2 cm = 0.05 cm

Height of pencil, h = 14 cm

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

Substituting values, we have,

= $[(22/7)\times(0.35^2-0.05^2)\times14]$

= 44×0.12

= 5.28

This implies that the volume of wood in pencil = 5.28 cm^3

Again,

Volume of graphite = r_2^2h cubic units

Substituting the values, we have,

= $(22/7)\times0.05^2\times14$

= 44×0.0025

= 0.11

So, the volume of graphite is 0.11 cm^3.

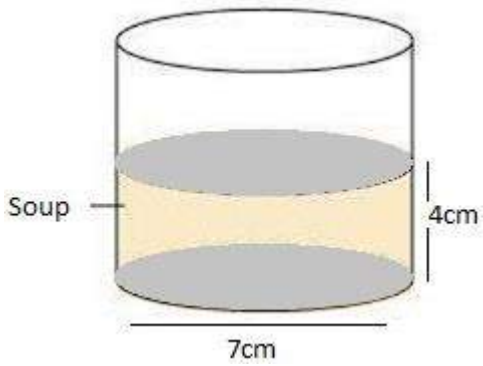
8. A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7cm. If the bowl is filled with soup to a height of 4cm, how much soup the hospital has to prepare daily to serve 250 patients? (Assume π = 22/7)

Solution:

Diameter of the cylindrical bowl = 7 cm

Radius of the cylindrical bowl, r = 7/2 cm = 3.5 cm

Bowl is filled with soup to a height of4cm, so h = 4 cm



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

$(22/7)\times 3.5^2\times 4 = 154$

Volume of the soup in one bowl is 154 cm^3

Therefore,

Volume of the soup given to 250 patients = $(250\times 154)\ cm^3 = 38500\ cm^3$

= 38.5litres.