Exercise 13.6 Page No: 230

1. The circumference of the base of cylindrical vessel is 132cm and its height is 25cm. How many litres of water can it hold? (1000 cm^3= 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 = $2\pi r$, so
$2\pi r = 132$ (given)
$r = (132/(2\pi))$
$r = 66\times7/22 = 21$
Radius is 21 cm

Step 2: Find the volume of vessel
Formula: Volume of cylindrical vessel = $\pi r^2 h$
$= (22/7)\times21^2\times25$
= 34650
Therefore, volume is 34650 cm^3

Since, **1000 cm^3 = 1L**
So, Volume = 34650/1000 L= 34.65L

Therefore, 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 π = 22/7)

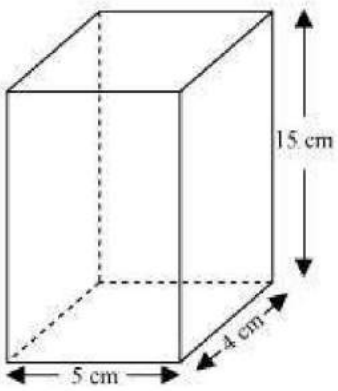
Solution:

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. Answer!

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

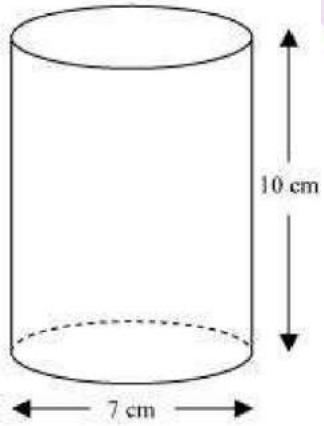
Solution:

(i) tin can will be cuboidal in shape



Dimensions of 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 plastic can are:
Radius of circular end of plastic cylinder, r = 3.5cm
Height , H = 10 cm

Capacity of plastic cylinder $= \pi r^2 H$
Capacity of plastic cylinder $= (22/7)\times(3.5)^2\times10 = 385$
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 = 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 radius of cylinder be r.
Using CSA of cylinder, we get
$2\pi rh = 94.2$
$2\times3.14\times r\times5 = 94.2$
$r = 3$
radius is 3 cm

(ii) Volume of cylinder
Formula for volume of cylinder $= \pi r^2 h$
Now, $\pi r^2 h = (3.14\times(3)^2\times5)$ (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 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 π = 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 = $(1/20\times2200)$ 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 result of (i)
$2\pi rh = 110\ m^2$
$2\times22/7\times r\times10 = 110$
$r = 1.75$
Radius is 1.75 m.

(iii) Volume of vessel formula = πr^2h
Here r = 1.75 and h = 10
Volume = $(22/7)\times(1.75)^2\times10) = 96.25$
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 1m is15.4 liters. How many square meters of metal sheet would be needed to make it? (Assume $\pi = 22/7$)

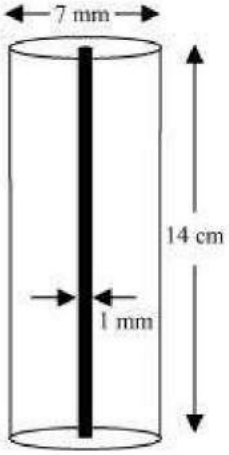
Solution:

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, total surface area of vessel = $2\pi r(r+h)$
$= (2\times22/7\times0.07(0.07+1))$
$= 0.44\times1.07$
$= 0.4708$
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 $\pi = 22/7$)

Solution:



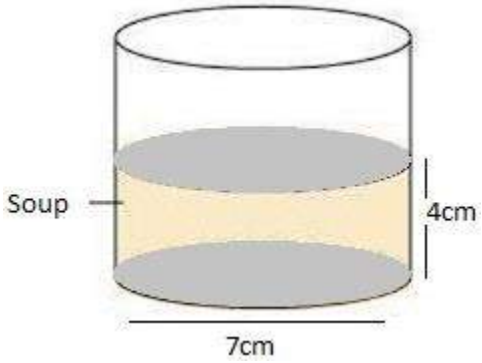
Radius of pencil, r_1 = 7/2 mm = 0.7/2 cm = 0.35 cm
Radius of graphite, r_2 = 1/2 mm = 0.1/2 cm = 0.05 cm
Height of pencil, h = 14 cm
Formula to find, volume of wood in pencil = $\pi(r_1^2-r_2^2)h$ cubic units
Substitute the values, we have
= $[(22/7)\times(0.35^2-0.05^2)\times14]$
= 44×0.12
= 5.28
This implies, volume of wood in pencil = 5.28 cm^3

Again,
Volume of graphite = $\pi r_2^2 h$ cubic units
Substitute 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 cylindrical bowl = 7 cm
Radius of cylindrical bowl, r = 7/2 cm = 3.5 cm
Bowl is filled with soup to a height of4cm, so h = 4 cm



Volume of soup in one bowl= $\pi r^2 h$
$(22/7)\times 3.5^2\times 4 = 154$

Volume of soup in one bowl is 154 cm^3
Therefore,
Volume of soup given to 250 patients = $(250\times 154)\ cm^3 = 38500\ cm^3$
= 38.5litres. Answer!