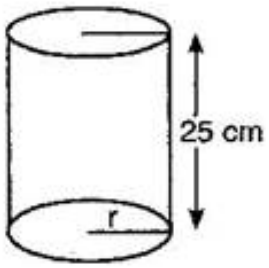
NCERT solutions for class-9 maths surface areas and volumes Ex 13.6

**Assume $\pi = \frac{22}{7}$ unless stated otherwise.**

**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? (1 $m^3$ = 1000$^l$)

**Ans:** Height of vessel = $(h)$ = 25 cm




Circumference of base of vessel

= 132 cm

$\Rightarrow 2\pi r = 132$

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

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

Now, Volume of cylindrical vessel

$= \pi r^2 h = \frac{22}{7} \times 21 \times 21 \times 35 = 34650$ $cm^3$

$= \frac{34650}{1000}$ liters [$\because$ 1000 $cm^3$ = 1 liter]

= 34.65 liters

**Q2.** The inner diameter of a cylindrical wooden pipe is 24 cm and its out 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 0.5 g.

**Ans:** Inner diameter of pipe = 28 cm

$\therefore$ Inner radius of pipe $(r)$

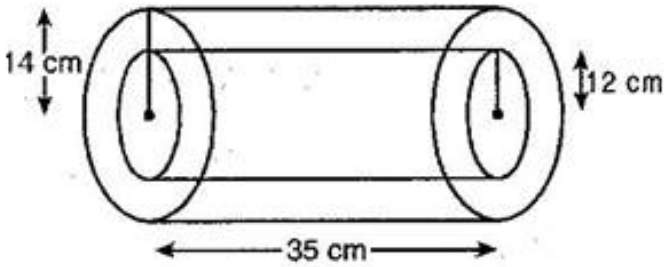
$= \frac{24}{2} = 12$ cm

And Outer diameter of pipe = 28 cm

$\therefore$ Outer radius of pipe (R)

$= \frac{28}{2} = 14$ m

Length of pipe $(h)$ = 35 cm




Volume of wood = Volume of outer cylinder – Volume of inner cylinder

$= \pi R^2 h - \pi r^2 h = \pi h\left(R^2 - r^2\right)$

$= \frac{22}{7} \times 35\left[(14)^2 - (12)^2\right]$

= 110 [ 196 – 144 ] = 110 x 52

= 5720 $cm^3$

∵ Weight of 1 $cm^3$ of wood = 0.6 g

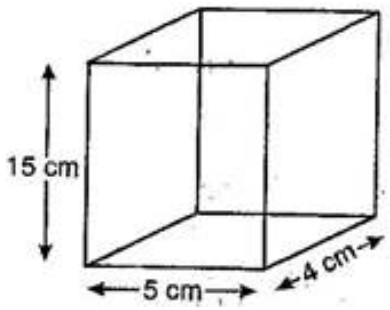
∴ Weight of 5720 $cm^3$ of wood

= 0.6 x 5720 = 3432 g = 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 height of 15 cm (ii) a plastic cylinder with circular base of diameter 7 cm and height 10 cm. Which container has greater capacity and how much?

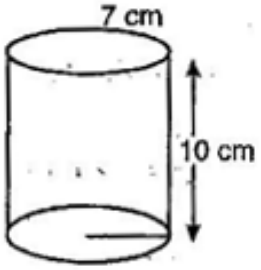
**Ans:** I case: Length of tin $(l)$ = 5 cm, Width of tin $(b)$ = 4 cm

and Height of tin $(h)$ = 15 cm




Then, Capacity of tin = $l \times b \times h$ = 5 x 4 x 15 = 300 $cm^3$

II case: Diameter of base of cylinder = 7 cm




$\therefore$ Radius of base of cylinder $(r) = \frac{7}{2}$ cm

Height of cylinder $(h') = 10$ cm

Capacity of cylinder = $\pi r^2 h'$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 10 = 385$ cm$^3$

From the cases I and II, we observed that cylindrical container has greater capacity by (385 – 300) = 85 cm$^3$.

**Q4.** If the lateral surface of a cylinder is94.2 cm$^2$ and its height is 5 cm, then (i)radius of its base (ii) volume of the cylinder.

**Ans:** Height of the cylinder $(h) = 5$ cm

Lateral surface area of the cylinder

$= 94.2$ cm$^2$

$\Rightarrow 2\pi rh = 94.2$

$\Rightarrow 2 \times 3.14 \times r \times 5 = 94.2$

$\Rightarrow r = \frac{94.2}{2 \times 3.14 \times 5} = 3$ cm

$\therefore$ Volume of cylinder = $\pi r^2 h$

$= 3.14 \times 3 \times 3 \times 5 = 141.3$ 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.

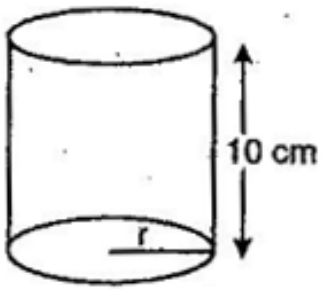
(iii) capacity of the vessel.

**Ans:** Total cost to paint inner curved surface area of the vessel = Rs. 2200

Rate = Rs. 20 per square meter

**(i)** Inner curved surface area of vessel = $\frac{\text{Total cost}}{\text{Rate}} = \frac{2200}{20}$

$= 110\ m^2$




**(ii)** Depth of the vessel $(h) = 10$ m

Now, Inner surface area of vessel

$= 110\ m^2$

$\Rightarrow 2\pi rh = 110$

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

$\Rightarrow r = \frac{110\times 7}{2\times 22\times 10} = 1.75$ m

**(iii)** Since $r = 1.75$ m and

$h = 10$ m

$\therefore$ Capacity of vessel

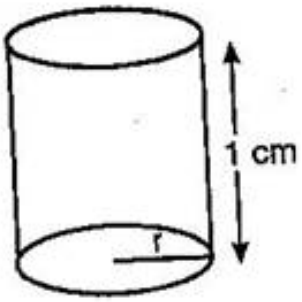
= Volume of cylinder = $\pi r^2 h$

$= \frac{22}{7}\times 1.75\times 1.75\times 10 = 96.25\ m^3$

$= 96.25$ kl [$\because 1\ m^3 = 1$ kl]

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

**Ans:** Height of the vessel $(h) = 1$ m




Capacity of vessel = 15.4 liters

$= \frac{15.4}{1000}$ kilo liters

$= 0.0154\ m^3$ [$\because 1\ m^3 = 1\ kl$]

$\Rightarrow \pi r^2 h = 0.0154$

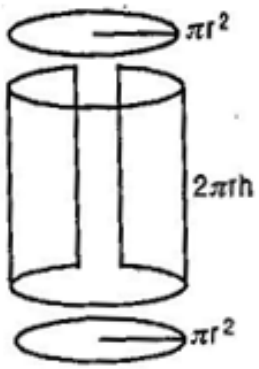
$\Rightarrow \frac{22}{7} \times r^2 \times 1 = 0.0154$

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

$\Rightarrow r^2 = 0.0007 \times 7 = 0.0048$

$\Rightarrow r = 0.07\ m$

Now, Area of metal sheet required = TSA of cylindrical vessel




$= 2\pi r(r+h)$

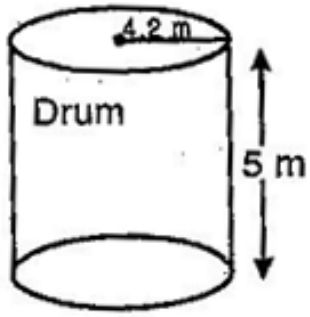
$= 2 \times \frac{22}{7} \times 0.07(1+0.07)$

$= \frac{44}{7} \times 0.07 \times 1.07$

$= 0.4708\ m^2$

**Q7.** A bag of grain contains 2.8 $m^3$ of grain. How many bags are needed to fill a drum of radius 4.2 m and height 5 m?

**Ans:** Radius of drum $(r) = 4.2$ m and Height of drum $(h) = 5$ m




Volume of a drum = $\pi r^2 h$

$= \frac{22}{7} \times 4.2 \times 4.2 \times 5$

$= 22 \times 0.6 \times 4.2 \times 5 = 277.2 \text{ m}^3$

Now, Number of bags

$= \frac{\text{Volume of grain in the drum}}{\text{Volume of each bag}}$

$= \frac{277.2}{2.8} = 99$

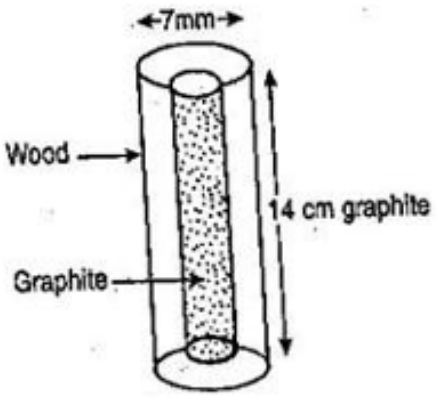
Hence 99 bags are needed to fill the drum.

**Q8.** 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 diameter of graphite is 1 mm. If the length of the pencil is 14 cm, find the columns of the wood and that of the graphite.

**Ans:** Diameter of graphite = 1 mm

$\therefore$ Radius of drum = 0.5 mm

= 0.05 cm




Height of graphite $(h)$ = 14 cm

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

$= \frac{22}{7} \times (0.05)^2 \times 14 = 0.11 \text{ cm}^3$

Diameter of pencil = 7 mm

$\therefore$ Radius of pencil (R) = 3.5 mm

= 0.35 cm

Volume of pencil= $\pi R^2 h$

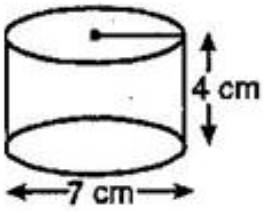
$= \frac{22}{7} \times (0.35)^2 \times 14 = 5.39 \text{ cm}^3$

Now, Volume of wood = Volume of pencil – Volume of graphite

$= 5.39 - 0.11 = 5.28 \text{ cm}^3$

**Q9.** 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:** Diameter of circular base of cylindrical bowl = 7 cm




$\therefore$ Radius of circular base of cylindrical bowl $(r) = \frac{7}{2}$ cm

Height of the bowl $(h)$ = 4 cm

Now, Volume of cylindrical bowl = $\pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 4 = 22 \text{ x } 7 = 154 \text{ cm}^3$

$\therefore$ Quantity of soup filled in a bowl

$= 154 \text{ cm}^3$

Therefore, total quantity of soup to be prepared by the hospital = 250 x 154

$= 38500 \text{ cm}^3$

$= \frac{38500}{1000}$ liter [$\because$ 1 liter = 1000 $\text{cm}^3$]

= 38.5 liters

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