Exercise 3.6

Sum 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? ($1000 cm^3 = 1 l$)

Sol :-

The Circumference of the base of Cylindrical Vessel = 132 cm

Means Circumference of Circle = 132 cm

$$2\pi r = 132 cm$$

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

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

$$r = 21 cm$$

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

$$= \frac{22}{7} \times (21)^2 \times 25$$

$$= \frac{22}{7} \times 21 \times 21 \times 25$$

$$= 34650 cm^3$$

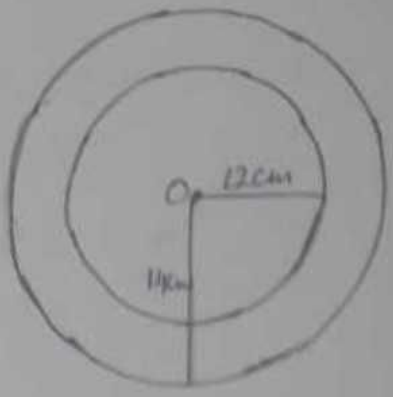
Volume in litre $= \frac{34650}{1000} l$

$= 3465 l$ Ans.

Q. 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.

Sol :- inner diameter = 24 cm

inner radius (r) = $\frac{24}{2}$ = 12 cm



outer diameter = 28 cm

outer radius (R) = $\frac{28}{2}$ = 14 cm

height = 35 cm.

Volume of wood = volume of outer cylinder − volume of inner cylinder

$= \pi R^2 h - \pi r^2 h$

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

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

$= \frac{22}{7} \times \overset{5}{35} (196 - 144)$

$= 110 \times 52\ cm^3$

$= 5720\ cm^3$

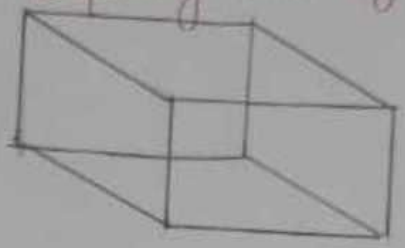
Mass of the pipe of $1\ cm^3$ = 0.6 g

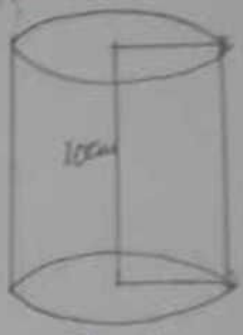
Mass of the pipe of $5720\ cm^3$ = Rs 0.6×5720 g

= 3432 g Ans

3.Sum: 13.6 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 15cm and (ii) a plastic Cylinder with Circular base of diameter 7cm and height 10cm. Which Container has greater capacity and by how much?

Sol:





Length of Cuboid = 5cm
Breadth of Cuboid = 4cm
Height of Cuboid = 15cm

Volume of Cuboid = lbh
= 5×4×15
= 300cm³

Diameter of Cylinder = 7cm
radius of Cylinder = $\frac{7}{2}$cm
height of Cylinder = 10cm
Volume of Cylinder = $\pi r^2 h$

$= \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 10$

$= \frac{\cancel{22}^{11}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{7}{2} \times \cancel{10}^{5}$

$= 11 \times 7 \times 5 \text{ cm}^3$

$= 385 \text{cm}^3$

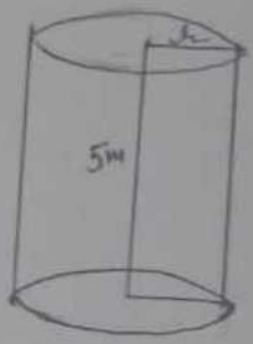
Cylinderical packet have more volume than Cuboid.

385 – 300

Cylinderical packet have 85 cm^3 more volume than Cuboid

13.6 : 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 $\pi = 3.14$).

Sol: height = 5 cm



Lateral surface area of Cylinder $= 2\pi rh$

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

$$\frac{942}{10} = 2 \times \frac{314}{100} \times r \times 5$$

$$\frac{\cancel{942}^{3}}{19} \times \frac{1}{\cancel{7}_{1}} \times \frac{\cancel{5}}{\cancel{314}_{1}} \times \frac{1}{\cancel{5}} = r$$

$$3\,cm = r$$

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

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

$$= 3.14 \times 3 \times 3 \times 5$$

$$= \underline{141.3\ cm^3}\ \text{Ans}$$

Example 13.6: At 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 vessel (ii) radius of base (iii) Capacity of the vessel.

Sol.

Cost = Rs 2200

Rate = Rs 20 per m^2

$h = 10\ m$

(i) Cost = R × Curved surface area

$2200 = 20 \times$ Curved Surface area

$\frac{110}{\cancel{20}} \frac{\cancel{2200}}{\cancel{20}}$ = Curved Surface area

$110\ m^2$ = Curved Surface area Ans

(ii) Curved Surface area = $110\ m^2$

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

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

$r = \frac{110 \times 7}{2 \times \frac{22}{2} \times 10} = \frac{7}{4}\ m$ Ans

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

$= \frac{22}{7} \times \left(\frac{7}{4}\right)^2 \times 10$

$= \frac{\overset{11}{\cancel{22}}}{7} \times \frac{7}{\underset{2}{\cancel{4}}} \times \frac{7}{4} \times 10$

$= \frac{\cancel{770}}{\cancel{8}_4}\ 385 = \frac{385}{4}\ m^3$

$= 96.25\ m^3$ Ans

13.6 : The capacity of a closed cylindrical vessel of height 1m is 15.4 litres. How many square metres of metal sheet would be needed to make it.

Sol: height = 1 m

$1m^3 = 1000l$

Capacity of closed cylindrical vessel = 15.4 litres

$$\pi r^2 h = \frac{15.4}{1000} m^3$$

$$\frac{22}{7} \times r^2 \times 1 = \frac{154}{10000} m^3$$

$$r^2 = \frac{154}{10000} \times \frac{7}{22}$$

$$r^2 = \frac{7 \times 7}{10000}$$

$$r = \sqrt{\frac{7 \times 7}{100 \times 100}} = \frac{7}{100} = 0.07 m$$

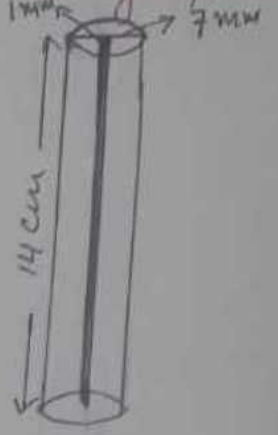
Total surface area of cylindrical vessel $= 2\pi r(r+h)$

$$= 2 \times \frac{22}{7} \times \frac{7}{100} (0.07 + 1)$$

$$= 2 \times \frac{22}{100} (1.07)$$

$$= \frac{47.08}{100} = 0.4708 m^3$$ Ans

7 Sum 13.6 : 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



Sol:

$D = 7\,mm = \frac{7}{10}\,cm$

$d = 1\,mm = \frac{1}{10}\,cm$

height = 14 cm

$R = \frac{7}{10 \times 2} = \frac{7}{20}\,cm$

$r = \frac{1}{10 \times 2} = \frac{1}{20}\,cm$

Volume of wood = Volume of pencil − Volume of graphite

$= \pi R^2 h - \pi r^2 h$

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

$= \frac{22}{7} \times 14 \left[\left(\frac{7}{20}\right)^2 - \left(\frac{1}{20}\right)^2\right]$

$= 44 \left\{\frac{49}{400} - \frac{1}{400}\right\}$

$= 44 \left(\frac{49-1}{400}\right)$

$= 44 \times \frac{48}{400}\,cm^3$

$= \frac{528}{100}\,cm^3$

$= 5.28\,cm^3$

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

$= \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 14 = \frac{11}{100} = 0.11\,cm^3$

Example 7. 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 4 cm, how much soup the hospital has to prepare daily to serve 250 patients?

Sol:

Diameter of cylindrical bowl = 7 cm

radius of cylindrical bowl = $\frac{7}{2}$ cm

height = 4 cm

Volume of soup for 1 Patient =

$$= \pi r^2 h$$

$$= \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 4$$

$$= \frac{22}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{7}{\cancel{2}} \times \cancel{4}^{2}$$

$$= 154 \text{ cm}^3$$

Volume of soup for 250 patients = $250 \times 154 \text{ cm}^3$

$= 38500 \text{ cm}^3$ Ans