The Most Comprehensive
Preparation App For All Exams

MENSURATION-3D

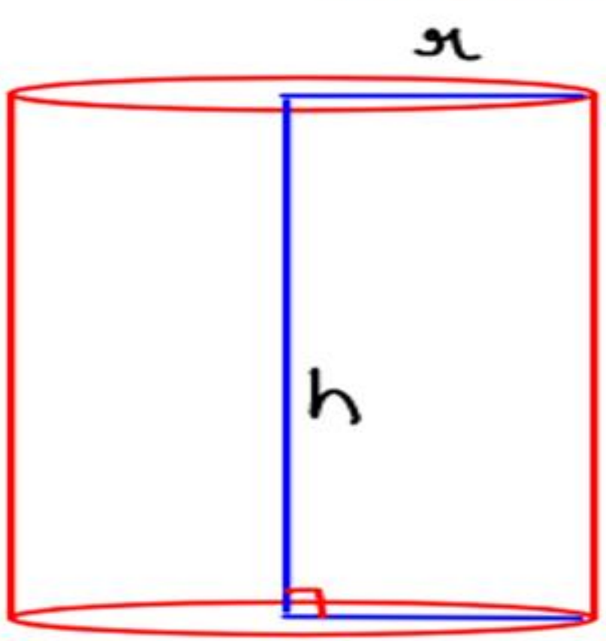
Part-4

Agenda

Right Circular Cylinder

→ (70 - 75) Min

RIGHT CIRCULAR CYLINDER



(i)

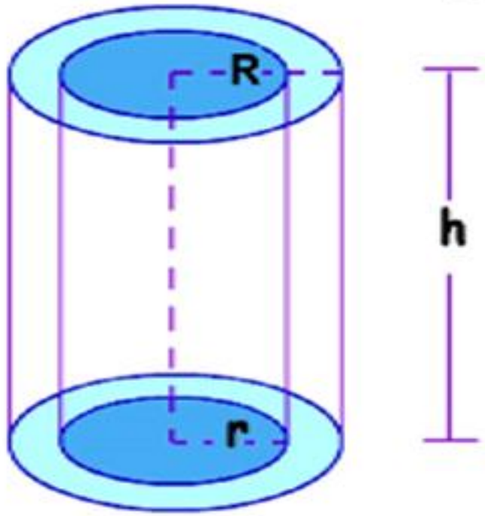
$CSA = 2\pi rh$

$TSA = 2\pi rh + 2\pi r^2$

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

$Volume = \pi r^2 h$

HOLLOW CYLINDER



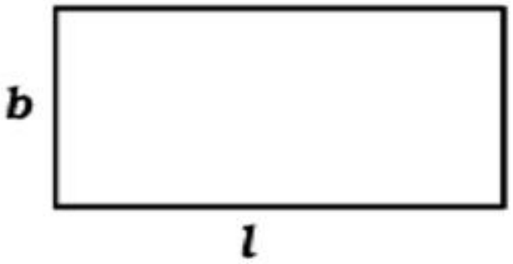
$$\text{CSA} = 2\pi Rh + 2\pi rh = 2\pi h\,(r+R)$$

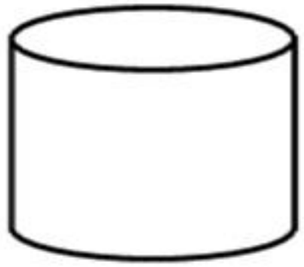
$$\text{TSA} = 2\pi h\,(R+r) + 2\pi\,(R^2 - r^2) = 2\pi\,(R + r)\,(R - r + h)$$

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

Volume of material of hollow cylinder
$= \pi(R^2 - r^2)\,h$

A RECTANGULAR SHEET IS FOLDED TO FORM A CYLINDER





Wherever question is on Folding

folded along length

breadth

(3)

Fold

length

breadth

$l = 2\pi r$

$b = h$

$b = 2\pi r$

$l = h$

A RECTANGULAR SHEET IS ROTATED/ REVOLVED

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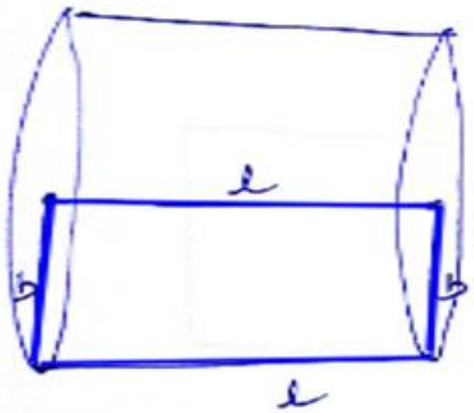
(4)

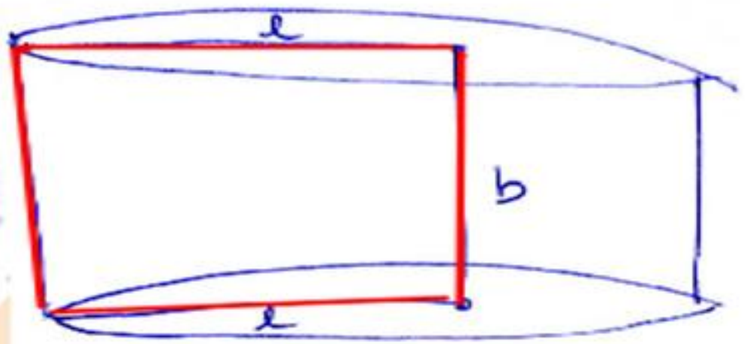
REVOLVE ALONG LENGTH



$l = h$

$b = r$

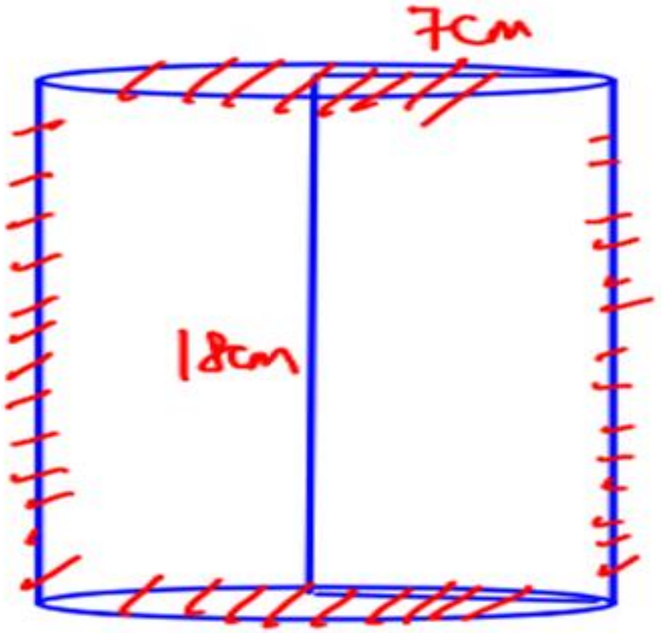
REVOLVE ALONG BREADTH

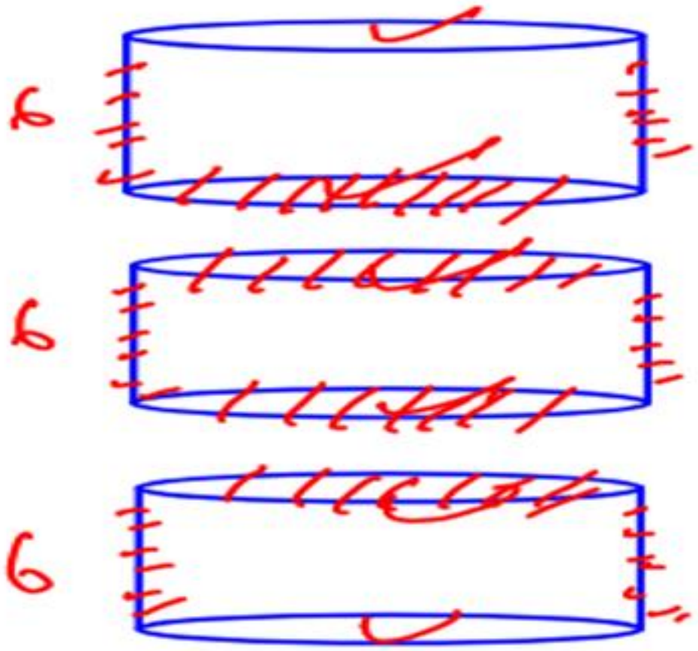


$$l = r$$

$$b = h$$

Eg1. A right circular cylinder has height as 18 cm and r = 7 cm. The cylinder is cut in 3 equal parts (by 2 cuts parallel to the base). What is the % increase in TSA?





$$\frac{2 \cancel{4\pi} \cdot 7^{2}}{\cancel{2\pi} \cdot \cancel{7}(7+18)} \times 100 = \frac{14}{25} \times 100^{4}$$

$$= 56\%$$

BYJU'S ExamPrep

$H = 18$

$R = 7$ $\longrightarrow$

$$\frac{\cancel{4\pi R^2}\, 2R}{\cancel{2\pi R}(R+H)} \times 100$$

$$\frac{2 \cdot 7}{\cancel{7+18}} \times \overset{4}{\cancel{100}} = 56\%$$

Ans. 56%

Eg2. The radii of two cylinders are in the ratio 2 : 3 and their curved surface areas are in the ratio 5 : 3. What is the ratio of their volumes ?

(a) 20 : 27 (b) 10 : 9

(c) 9 : 10 (d) 27 : 20

$$\left.\begin{array}{l} R_1 : R_2 = 2:3 \\ R_1H_1 : R_2H_2 = 5:3 \end{array}\right\}$$

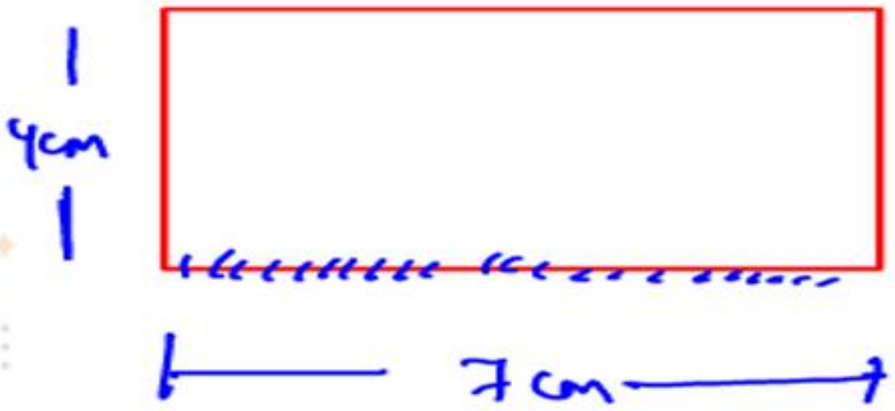
$$R_1^2H_1 : R_2^2H_2 = 10 : 9$$

Ans. (b)

Eg3. A figure is formed by revolving a rectangular sheet of dimensions 7 cm × 4 cm about its length. What is the volume of the figure, thus formed ?

(a) 352 cu cm
(b) 296 cu cm
(c) 176 cu cm
(d) 616 cu cm

75sec



$h = 7$

$r = 4$

$\frac{22}{7} \times 4 \times 4 \times 7$

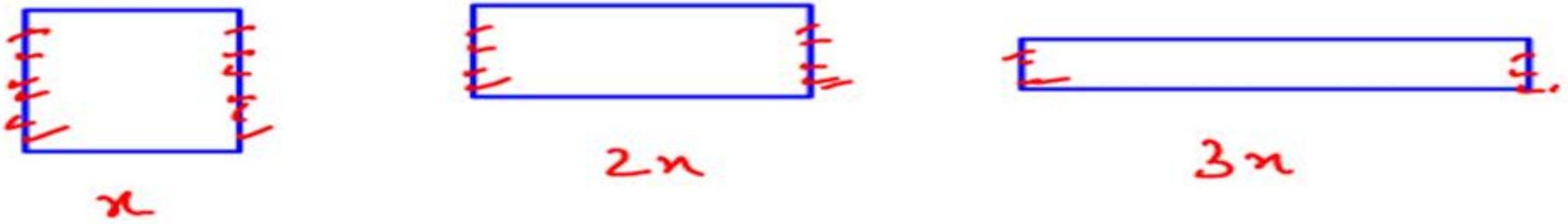
$= 352 \text{ cm}^3$

Ans. (a)

Eg4. S_1, S_2 and S_3 are three rectangular sheets of identical areas with their lengths in the ratio 1 : 2 : 3. If each is converted into a right circular cylinder open at both ends by joining its shorter parallel sides, then what is the ratio of the volumes of the three cylinders, S_1, S_2 and S_3 respectively, so formed?

(a) 1 : 1 : 1
(b) 4 : 2 : 3
(c) 1 : 2 : 3
(d) 6 : 3 : 2

Shorter || sides → breadth



$S_1 : S_2 : S_3$

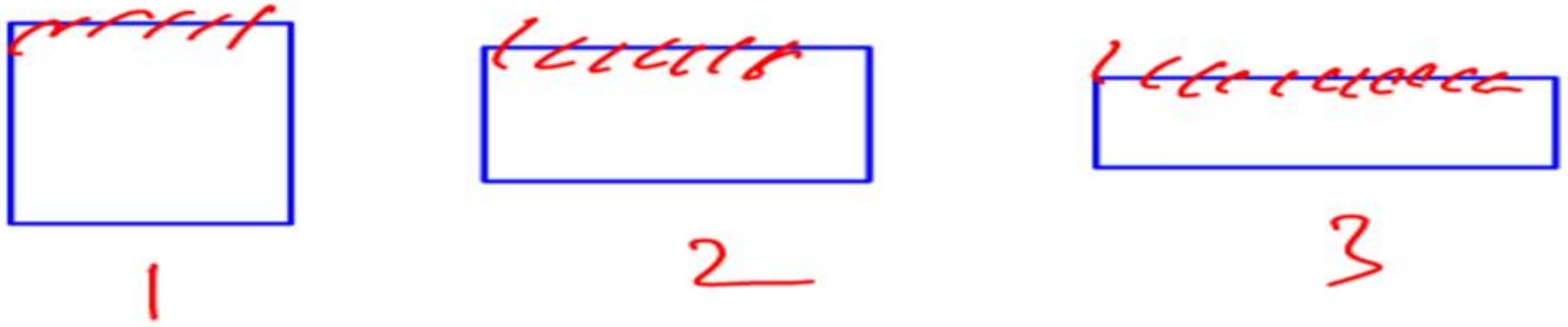
$2\pi r$ $\quad l \quad$ $1 : 2 : 3$

$h \quad b \quad 6 \quad 3 \quad 2$

$1^2 \cdot 6 \quad 2^2 \cdot 3 \quad 3^2 \cdot 2$

$1 : 2 : 3$

Ans. (c)



$x_1 h_1 \rightarrow$ Constant

$x_1^2 h_1 \rightarrow x_1 \cdot (x_1 \cdot h_1)$

$x_1 : x_2 : x_3$

$1 : 2 : 3$

Eg5. Water flows at the rate of 10 metres per minute from a cylindrical pipe 5 mm in diameter. How long it take to fill up a conical vessel whose diameter at the base is 30 cm and depth 24 cm ?

(a) 28 minutes 48 seconds
(b) 51 minutes 12 seconds
(c) 51 minutes 24 seconds
(d) 28 minutes 36 seconds

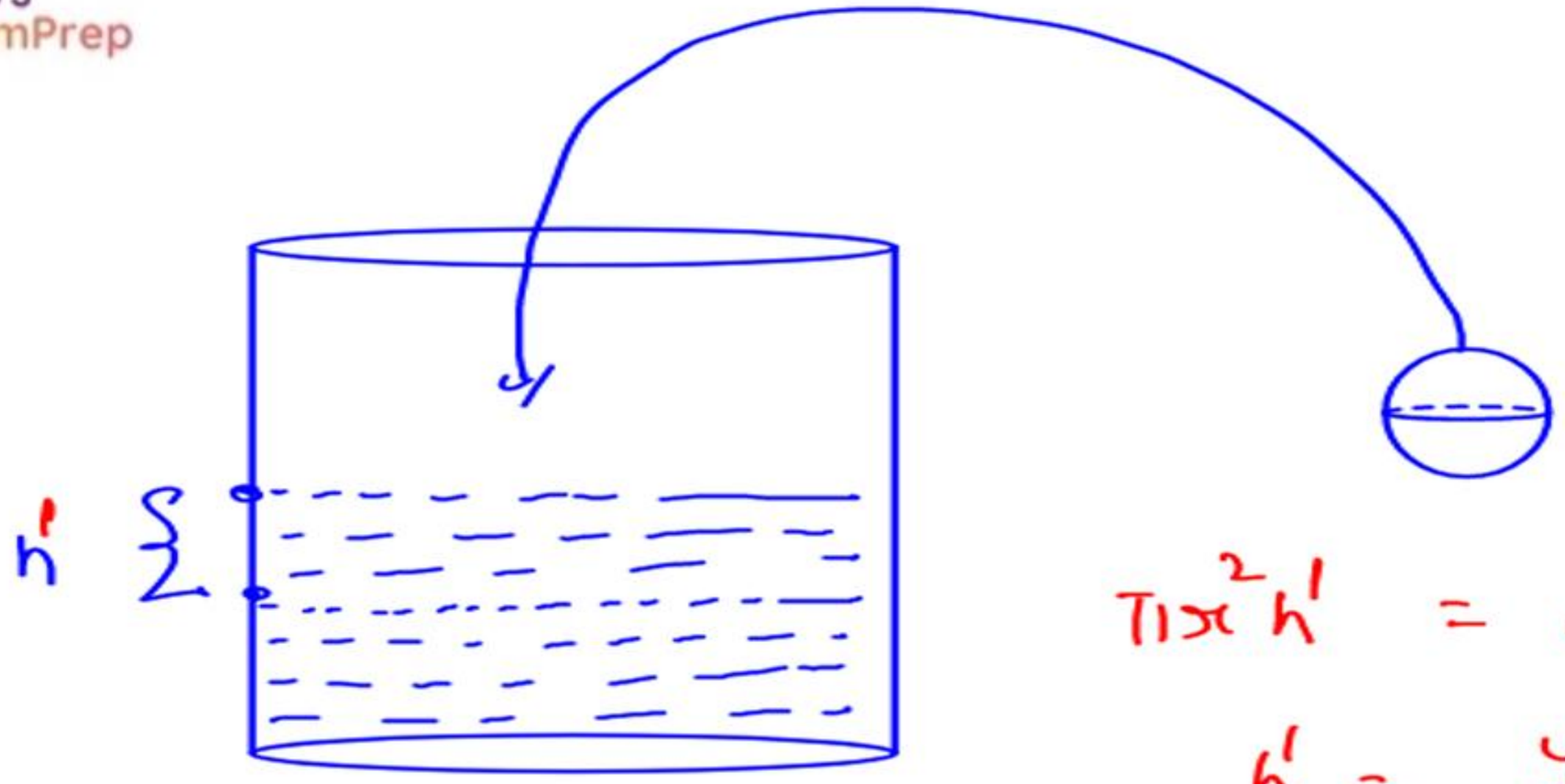
$$\pi \cdot \left(\frac{5}{20}\right)^2 \cdot (1000)\, x = \frac{1}{3}\pi \cdot 15 \cdot 15 \cdot 24$$

$$\frac{5}{2} \cdot \frac{5}{2} \cdot 100 \cdot x = 5 \cdot 15 \cdot 24$$

$$x = \frac{72 \cdot 4}{10} = 28.8 \text{ min}$$

28 min 48 sec

Ans. (a)



$$\pi x^2 h' = \frac{4}{3}\pi x^3$$

$$h' = \frac{\frac{4}{3}\pi x^3}{\pi x^2}$$

Rise in water level = $\frac{\text{Volume of Obj immersed}}{\text{Area of Box in which it is immersed}}$

Eg6. A cylindrical vessel of diameter 24 cm filled up with sufficient quantity of water, a solid spherical ball of radius 6 cm is completely immersed. The increase in height of water level is :

(a) 1.5 cm (b) 2 cm

(c) 3 cm (d) 4.2 cm

$$h' = \frac{\frac{4}{3}\pi \cdot 6 \cdot 6 \cdot 6}{\pi \cdot 12 \cdot 12}$$

$$= 2\text{ cm}$$

Ans. (b)

Eg7. Half of a large cylindrical tank open at the top is filled with water and identical heavy spherical balls are to be dropped into the tank without spilling water out. If the radius and the height of the tank are equal and each is four times the radius of a ball, then what is the maximum number of balls that can be dropped ?

(a) 12 (b) 24

(c) 36 (d) 48

90sec

$$\frac{1}{2}\pi(4x)^2\cdot(4x) = n\cdot\frac{4}{3}\pi x^3$$

$$n = 24$$

Ans. (b)

Eg8. The volume of the metal of a cylindrical pipe is 748 cm^3. The length of the pipe is 14 cm and its external radius is 9 cm. Its thickness is (Take $\pi = 22/7$)

(a) 1 cm (b) 5.2 cm
(c) 2.3 cm (d) 3.7 cm

$$\pi (R^2 - r^2) h = 748$$

$$\frac{22}{7} (9^2 - r^2) \cdot 14 = 748$$

$$r^2 = 64$$

$$\boxed{r = 8}$$

thickness $\rightarrow$ $R - r = 1$ cm

Ans. (a)

Eg9. A hollow iron pipe is 21 cm long and its exterior diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weight 8g/cm^3, then the weight of the pipe is (Take $\pi = 22/7$)

(a) 3.696 kg (b) 3.6 kg

(c) 36 kg (d) 36.9 kg

Sol^n $h = 21$ $R = 4\text{cm}$ $r = 3$

$$\text{Volume} = \frac{22}{7}\left(4^2 - 3^2\right) \times 21$$

$$\text{Weight} = 22 \times 7 \times 3 \times 8$$

$$= 3696 \text{ gm}$$

462 x 8

Ans. (a)

Eg10. A copper rod of 1 cm diameter and 8 cm length is drawn into a wire of uniform diameter and 18 m length. The radius (in cm) of the wire is:

(a) 1/15 (b) 1/30 (c) 2/15 (d) 15

Wire $\rightarrow$ Cylindrical

$$\left(\frac{1}{2}\right)^2 \cdot 8 = x^2 \cdot (1800)$$

$$x^2 = \frac{1}{900}$$

$$x = \frac{1}{30} \text{ cm}$$

Ans. (b)

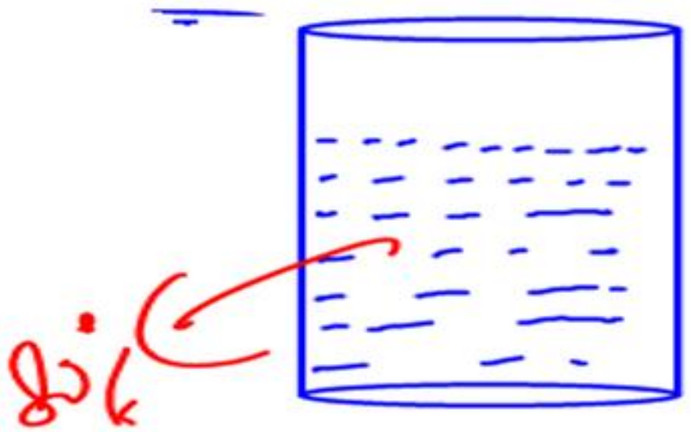
Eg11. A cylinder is filled to 4/5th of volume. It is then tilted so that the level of water coincides with one edge of its bottom and top edge of the opposite side. In this process, 30 litre of the water is spilled. What is the volume of the cylinder ?

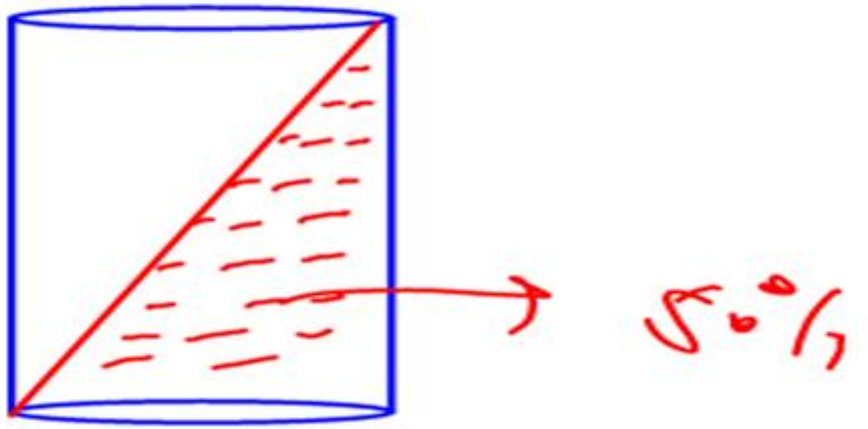
(a) 75 litre
(b) 96 litre
(c) Data insufficient
(d) 100 litre

$\frac{4}{5} \rightarrow 80\%$

30% of V = 30 l

V = 100 l





Ans. (d)

Eg12. The curved surface of a cylinder is 1000 sq cm. A wire of diameter 5 mm is wound around it, so as to cover it completely. What is the length of the wire used ?

(a) 22 m
(b) 20 m
(c) 18 m
(d) None of these

$1000 = (l)\left(\frac{5}{10}\right)$ cm

$l = 2000$ cm

$l = 20$ m

Ans. (b)

PRACTICE QUESTIONS

Q1. The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3. Find the ratio of its diameter to its height.

(Take $\pi = 22/7$)

(a) 7 : 6 (b) 6 : 7

(c) 3 : 7 (d) 7 : 3

Ans. (d)

Q2. Water flows into a tank which is 200 m long and 150 m wide, through a pipe of cross-section 0.3m × 0.2m at 20 km/hour. The time (in hours) for the water level in the tank to reach 8 m is

(a) 50 (b) 120

(c) 150 (d) 200

Ans. (d)

Q3. The outer and inner diameters of a circular pipe are 6 cm and 4 cm, respectively. If its length is 10 cm, then what is the total surface area is sq. cm. ?

(a) 35π (b) 110π

(c) 510π (d) None of these

Ans. (b)

Q4. The area of the curved surface and the area of the base of right circular cylinder area a cm^2 and b cm^2 respectively. The height of the cylinder is

(a) $\frac{2a}{\sqrt{\pi b}}$ cm

(b) $\frac{a\sqrt{b}}{2\sqrt{\pi}}$ cm

(c) $\frac{a}{2\sqrt{\pi b}}$ cm

(d) $\frac{a\sqrt{\pi}}{2\sqrt{b}}$ cm

Ans. (d)

Q5. A cylindrical tank of diameter 35 cm is full of water. If 11 litres of water is drawn off the water level in the tank will drop by : (Take $\pi = 22/7$)

(a) $10\frac{1}{2}$ cm

(b) $12\frac{6}{7}$ cm

(c) 14 cm

(d) $11\frac{3}{7}$ cm

Ans. (c)

Q6. A solid cylinder has total surface area of 462 sq. cm. its curved surface area is 1/3rd of the total surface area. Then the radius of the cylinder is

(a) 7 cm (b) 3.5 cm

(c) 9 cm (d) 11 cm

Ans. (a)

Q7. The radii of the base of two cylinders A and B are in the ratio 3 : 2 and their height in the ratio n : 1. If the volume of cylinder A is 3 times that of cylinder B, the value of n is:

(a) $\frac{4}{3}$ (b) $\frac{2}{3}$

(c) $\frac{3}{4}$ (d) $\frac{3}{2}$

Ans. (a)

Q8. The radius of a cylinder is 10 cm and height is 4 cm. The number of centimetres that my be added either to the radius or to the height to get the same increase in the volume of the cylinder is

(a) 5 cm (b) 4 cm

(c) 25 cm (d) 16 cm

Ans. (a)

Q9. The barrel of a fountain-pen, cylindrical in shape, is 7 cm long and 5 mm is diameter. A full barrel of ink in the pen will be used up on writing 330 words on an average. How many words would use up a bottle of ink containing one fifth of a litre ?

(a) 48000
(b) 42000
(c) 56000
(d) 28000

Ans. (a)

Q10. 16 cylindrical cans, each with a radius of 1 unit, are placed inside a cardboard box four in a row. If the cans touch the adjacent cans and all the walls of the box, then which of the following could be the interior area of the bottom of the box in square units ?

(a) 16 (b) 32

(c) 64 (d) 128

Ans. (c)

Q11. Two cylindrical vessels with radii 15 cm and 10 cm and heights 35 cm and 15 cm respectively are filled with water. If this water is poured into a cylindrical vessel 15 cm in height, then the radius of the vessel is :

(a) 25 cm
(b) 20 cm
(c) 17.5 cm
(d) 18 cm

Ans. (a)

Q12. If the height of a cylinder is increased by 15 percent and the radius of its base is decreased by 10 percent then by what percent will its curved surface area change ?

(a) 3.5 percent decrease
(b) 3.5 percent increase
(c) 5 percent increase
(d) 5 percent decrease

Ans. (b)

Q13. If V_1, V_2, V_3 be the volumes of a right circular cone, a sphere and a right circular cylinder having the same radius and same height, then

(a) $V_1 = \frac{V_2}{2} = \frac{V_3}{3}$ (b) $\frac{V_1}{2} = \frac{V_2}{3} V_3$

(c) $\frac{V_1}{3} = \frac{V_2}{2} = V_3$ (d) $\frac{V_1}{3} = V_2 = \frac{V_3}{2}$

Ans. (a)

Q14. From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest cm^2.

(a) 15 cm^2 (b) 16 cm^2

(c) 17 cm^2 (d) 18 cm^2

Ans. (d)