1. A drainage tile is a cylindrical shell 21 cm long. The inside and outside diameters are 4.5 cm and 5.1 cm respectively. What is the volume of the clay required for the tile?

6.96π cubic cm

6.76π cubic cm

5.76π cubic cm

None of the above

Answer (d)

Inner radius r = 4.5/2 cm = 9/4 cm
Outer radius R = 5.1/2 cm = 51/20 cm
Height h = 21 cm
Volume = π(R + r) (R - r)h

$$= \pi \times \frac{51}{20} + \frac{45}{20} \times \frac{51}{20} - \frac{45}{20} \times 21$$

$$= \pi \times \frac{96}{20} \times \frac{6}{20} \times 21 = 30.24\pi \text{ cm}^3$$

$= \pi \times 96/20 \times 6/20 \times 21 \text{ cm}^3 = 30.24 \pi \text{ cm}^3$

2. A cylinder is surmounted by a cone at one end, a hemisphere at the other end. The common radius is 3.5 cm, the height of the cylinder is 6.5 cm and the total height of the structure is 12.8 cm. The volume V of the structure lies between

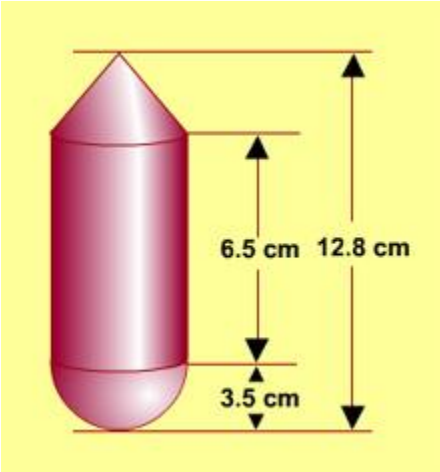
370 cm^3 and 380 cm^3

380 cm^3 and 390 cm^3

390 cm^3 and 400 cm^3

None of the above

Answer (a)



Height of the conical portion = 12.8 - (6.5 + 3.5) = 2.8 cm
Volume of the structure = Volume of the cone + volume of the cylinder + volume of the hemisphere

$$\Rightarrow \frac{\pi r^2 H}{3} + \pi r^2 h + \frac{2\pi r^3}{3}$$

$$\Rightarrow \frac{1}{3}\pi r^2(H + 3h + 2r)$$

$$\Rightarrow \frac{1 \times 22 \times 7 \times 7}{3 \times 7 \times 2 \times 2}(2.8 + 19.5 + 7)\ cm^2$$

$= 1/3 \times 22/7 \times 49/4 \times 29.3\ cm^2 = 376.01$
$370 < 376 < 380$
Therefore Option (a) is correct.

3. If x is the curved surface area and y is the volume of a right circular cylinder, then which one of the following is correct?

The ratio of height to radius of the cylinder is independent of x only

The ratio of height to radius of the cylinder is independent of y only

Either (a) or (b)

Neither (a) nor (b)

Answer (d)

$x = 2\pi rh$, $y = \pi r^2 h$

$$\frac{x}{y} = \frac{2\pi rh}{\pi r^2 h} = \frac{2}{r}$$

$\Rightarrow r = 2y/x$

$x^2/y = 4\pi^2 r^2 h^2/\pi r^2 h = 4\pi h \Rightarrow h = x^2/4\pi y$

Now $r/h = 2y/x \times 4\pi y/x^2 = 8\pi y^2/x^3$

Therefore r : h is not independent of x and y both.

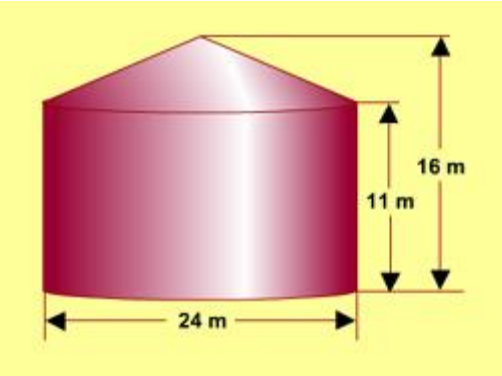
4. A tent is in the form of a right circular cylinder surmounted by a cone. The diameter of the cylinder is 24 m. The height of the cylindrical portion is 11 m, while the vertex of the cone is 16 m above the ground. What is the area of the curved surface for conical portion?

3434/9 square metre

3431/8 square metre

3432/7 square metre

3234/7 square metre



Answer (c)

radius of the cone = 12 m, height of the cone = 16 - 11 = 5m
Slant height of the cone = $\sqrt{(5^2 + 12^2)}$ = 13 m
Curves surface area of the cone = π x radius x slant height
= (22 x 12 x 13)/7 = 3432/7 m^2

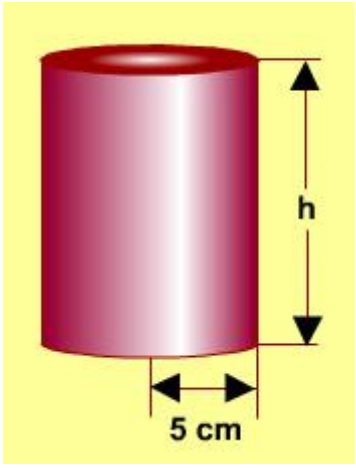
5. What is the height of a solid cylinder of radius 5 cm and total surface area is 660 cm^2?

10 cm

12 cm

15 cm

16 cm



Answer (d)

Total surface area of a cylinder = $2\pi r(h + r)$
$\Rightarrow [2 \times 22 \times 5 \times (5 + h)]/7 = 660$
$\Rightarrow 220 \times (5 + h) = 660 \times 7$ cm
$\Rightarrow 5 + h = 21$ or $h = 16$ cm