2. A cylindrical sausage is 11 cm long and has a base radius of 1 cm. Find its volume and total surface area.

Solution

Volume of the sausage $= \pi \times 1^2 \times 11$
$= 11\pi \text{ cm}^3$
Total surface area of the sausage
$= 2\pi \times 1 \times 11 + 2 \times \pi \times 1^2$
$= 24\pi \text{ cm}^2$

3. A metal cylindrical disc is 3 cm thick and its diameter is 14 cm. Find its volume and total surface area.

Solution

Volume of the disc $= \pi \times 7^2 \times 3$
$= 147\pi \text{ cm}^3$
Total surface area of the disc
$= 2\pi \times 7 \times 3 + 2 \times \pi \times 7^2$
$= 140\pi \text{ cm}^2$

4. The external base radius of a cylindrical glass is 4 cm and its height is 9 cm. Find
(a) its volume,
(b) its external surface area.
(*Hint:* A glass is open at the top.)

Solution

(a) Volume of the glass $= \pi \times 4^2 \times 9$
$= 144\pi \text{ cm}^3$

(b) External surface area of the glass
$= 2\pi \times 4 \times 9 + \pi \times 4^2$
$= 88\pi \text{ cm}^2$

Further Practice

5. Find the height of a cylinder if its
(a) volume = $63\pi \text{ cm}^3$, base radius = 3 cm,
(b) volume = 100 cm^3, base radius = 2 cm.

Solution

(a) Let the height of the cylinder be h cm.
$\pi \times 3^2 \times h = 63\pi$
$h = 7$
The height of the cylinder is 7 cm.

(b) Let H cm be the height of the cylinder.
$\pi \times 2^2 \times H = 100$
$H = \frac{25}{\pi}$
$= 7.96$ (correct to 3 sig. fig.)
The height of the cylinder is 7.96 cm.

6. Find the base radius of a cylinder if its
(a) volume = $150\pi \text{ cm}^3$, height = 6 cm,
(b) volume = 400 cm^3, height = 8 cm.

Solution

(a) Let the base radius of the cylinder be r cm.
$\pi \times r^2 \times 6 = 150\pi$
$r^2 = 25$
$r = 5$
The base radius of the cylinder is 5 cm.

(b) Let the base radius of the cylinder be R cm.
$\pi \times R^2 \times 8 = 400$
$R = \sqrt{\frac{50}{\pi}}$
$= 3.99$ (correct to 3 sig. fig.)
The base radius of the cylinder is 3.99 cm.

7. Find the circumference of a solid cylinder if its
(a) curved surface area = 660 cm^2, height = 10 cm,
(b) curved surface area = 1200 cm^2, height = 15 cm.

Solution

(a) Circumference × height = curved surface area
Circumference of the cylinder $= \frac{660}{10}$
$= 66$ cm

(b) Circumference of the cylinder $= \frac{1200}{15}$
$= 80$ cm

8. A metal cylinder of base radius 6 cm and height 5 cm is melted and recast into a cylindrical metal bar of base radius 2 cm. Find
(a) the length of the bar formed,
(b) the ratio of the total surface area of the original cylinder to that of the bar.

Solution

(a) Let y cm be the length of the bar formed.
$\pi \times 2^2 \times y = \pi \times 6^2 \times 6^2$
$4y = 180$
The length of the bar is 45 cm.

(b) Total surface area of the original cylinder
$= 2\pi \times 6 \times 5 + 2 \times \pi \times 6^2$
$= 132\pi \text{ cm}^2$
Total surface area of the bar
$= 2\pi \times 2 \times 45 + 2 \times \pi \times 2^2$
$= 188\pi \text{ cm}^2$
The required ratio $= 132\pi : 188\pi$
$= 33 : 47$