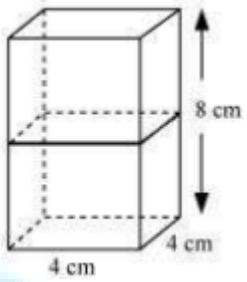
CBSE 10th

TEEVRA EDUTECH PVT. LTD.

Surface Areas and Volume
Exercise–13.1

Q.1 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboids.



Sol: Given that,

Volume of cubes $= 64\ cm^3$

$(\text{Edge})^3 = 64$

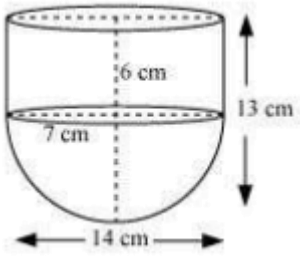
Edge $= 4$ cm

If cubes are joined end to end, the dimensions of the resulting cuboid will be 4 cm, 4 cm, 8 cm.

$$\therefore \text{Surface area of cuboids} = 2(lb + bh + lh)$$
$$= 2(4\times4 + 4\times8 + 4\times8)$$
$$= 2(18 + 32 + 32)$$
$$= 2(80) = 160\ cm^2$$

Q.2 A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Sol: It can be observed that radius (r) of the cylindrical part and the hemispherical part is the same (i.e., 7 cm).



Height of hemispherical part = Radius = 7 cm

Height of cylindrical part (h) $= 13 - 7 = 6$ cm

Inner surface area of the vessel = CSA of cylindrical part + CSA of hemispherical part = $2\pi rh - 2\pi r^2$

$$\text{Inner surface area of vessel} = 2\times\frac{22}{7}\times 7\times 6 + 2\times\frac{22}{7}\times 7\times 7$$
$$= 44(6+7) = 44\times 13$$
$$= 572\,\text{cm}^2$$

Q.3 A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Sol: It can be observed that the radius of the conical part and the hemispherical part is same (i.e., 3.5 cm).

Height of hemispherical part = Radius (r) = 3.5 = 7/2 cm

Height of conical part (h) = 15.5 −3.5 = 12 cm

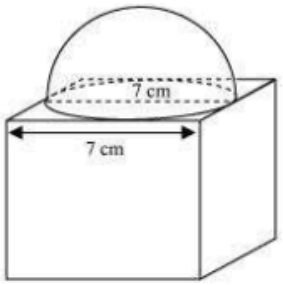
$$\text{Slant height } (l) \text{ of conical part} = \sqrt{r^2 + h^2}$$
$$= \sqrt{\left(\frac{7}{2}\right)^2 + (12)^2} = \sqrt{\frac{49}{4} + 144} = \sqrt{\frac{49+576}{4}}$$
$$= \sqrt{\frac{625}{4}} = \frac{25}{2}$$

Total surface area of toy = CSA of conical part + CSA of hemispherical part

$$= \pi rl + 2\pi r^2$$
$$= \frac{22}{7}\times\frac{7}{2}\times\frac{25}{2} + 2\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}$$
$$137.5 + 77 = 214.5\,\text{cm}^2$$

Q.4 A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Sol: From the figure, it can be observed that the greatest diameter possible for such hemisphere is equal to the cube's edge, i.e., 7cm.



Radius (r) of hemispherical part = 7/2 = 3.5cm

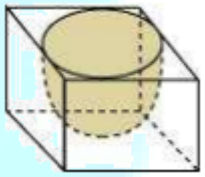
Total surface area of solid = Surface area of cubical part + CSA of hemispherical part − Area of base of hemispherical part

$$= 6(\text{Edge})^2 + 2\pi r^2 - \pi r^2 = 6(\text{Edge})^2 + \pi r^2$$

$$\text{Total surface area of solid} = 6(7)^2 + \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$$

$$= 294 + 38.5 = 332.5\,\text{cm}^2$$

Q.5 A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter l of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.



Sol: Diameter of hemisphere = Edge of cube = l

Radius of hemisphere = l/2

Total surface area of solid = Surface area of cubical part + CSA of hemispherical part − Area of base of hemispherical part

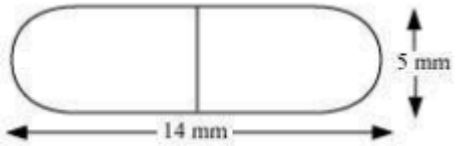
$$= 6\,(\text{Edge})^2 + 2\pi r^2 - \pi r^2 = 6\,(\text{Edge})^2 + \pi r^2$$

$$\text{Total surface area of solid} = 6l^2 + \pi \times \left(\frac{l}{2}\right)^2$$

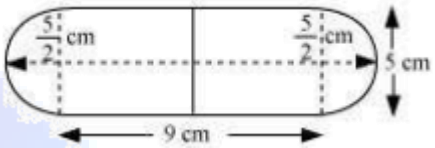
$$= 6l^2 + \frac{\pi l^2}{4}$$

$$= \frac{1}{4}(24 + \pi)l^2 \text{ unit}^2$$

Q.6 A medicine capsule is in the shape of cylinder with two hemispheres stuck to each of its ends (see the given figure). The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area. $\left[\text{Use } \pi = \frac{22}{7}\right]$



Sol: It can be observed that



Radius (r) of cylindrical part = Radius (r) of hemispherical part

$$= \frac{\text{Daimeter of the capsule}}{2} = \frac{5}{2}$$

Length of cylindrical part (h) = Length of the entire capsule $- 2 \times$ r

$= 14 - 5 = 9$ cm

Surface area of capsule = 2 × CSA of hemispherical part + CSA of cylindrical part

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

$= 4\pi\left(\frac{5}{2}\right)^2 + 2\pi\left(\frac{5}{2}\right)^2 (9)$

$25\pi + 45\pi = 70\pi \text{ mm}^2$

$= 70 \times \frac{22}{7}$

$= 220\,\text{mm}^2$

Q.7 A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500/ m^2. (Note that the base of the tent will not be covered with canvas.) $\left[\text{Use } \pi = \frac{22}{7}\right]$

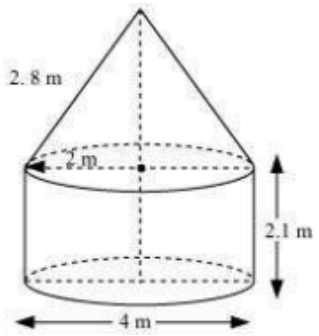
Sol: Given that,

Height (h) of the cylindrical part = 2.1 m

Diameter of the cylindrical part = 4 m

Radius of the cylindrical part = 2 m

Slant height (l) of conical part = 2.8 m



Area of canvas used = CSA of conical part + CSA of cylindrical part

$= \pi rl + 2\pi rh$

$= \pi \times 2 \times 2.8 + 2\pi \times 2 \times 2.1$

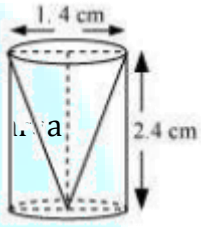
$= 2\pi\left[2.8 + 2 \times 2.1\right] = 2\pi\left[2.8 + 4.2\right]$ Cost of 1 m^2 canvas = Rs 500

$= 2 \times \frac{22}{7} \times 7 = 44 m^2$

Cost of 44 m^2 canvas = 44 × 500 = 22000

Therefore, it will cost Rs 22000 for making such a tent.

Q.8 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. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Sol: Given that,

Height (h) of the conical part = Height (h) of the cylindrical part = 2.4 cm

Diameter of the cylindrical part = 1.4 cm

Therefore, radius (r) of the cylindrical part = 0.7 cm

$$\text{Slant height } (l) \text{ of conical part} = \sqrt{r^2 + h^2}$$

$$= \sqrt{(0.7)^2 + (2.4)^2} = \sqrt{0.49 + 5.76}$$

$$= \sqrt{6.25} = 2.5$$

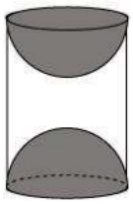
Total surface area of the remaining solid will be

= CSA of cylindrical part + CSA of conical part + Area of cylindrical base

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

$$= 2 \times \frac{22}{7} \times 0.7 \times 2.4 + \frac{22}{7} \times 0.7 \times 2.5 + \frac{22}{7} \times 0.7 \times 0.7$$
$$= 4.4 \times 2.4 \times 2.2 + 2.5 \times 2.2 \times 0.7$$
$$= 10.56 + 5.50 + 1.54 = 17.60\,\text{cm}^2$$

The total surface area of the remaining solid to the nearest cm^2 is 18 cm^2.



Q.9 A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in given figure. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Sol: Given that,

Radius (r) of cylindrical part = Radius (r) of hemispherical part = 3.5 cm

Height of cylindrical part (h) = 10 cm

Surface area of article = CSA of cylindrical part + 2 × CSA of hemispherical part

$$= 2\pi rh + 2 \times 2\pi r^2$$
$$= 2\pi \times 3.5 \times 10 \times 2 \times 2\pi \times 3.5 \times 3.5$$
$$= 70\pi + 49\pi$$
$$= 119\pi$$
$$= 17 \times 22 = 374\,\text{cm}^2$$