

NCERT Solutions for Class 10 Maths Chapter 13 Surface Area and Volume

EXERCISE 13.1:

Unless stated otherwise, use $\pi = \frac{22}{7}$.

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

Solution: Volume of cube = 64 cm^3

We know that,

$$\text{Side of cube} = \sqrt[3]{\text{volume}}$$

$$= \sqrt[3]{64}$$

$$= 4 \text{ cm}$$

Length of new cuboid = 8 cm

Height of new cuboid = 4 cm

Width of new cuboid = 4 cm

We know that:

$$\text{Surface Area} = 2(lb + lh + bh)$$

$$= 2(8*4 + 8*4 + 4*4)$$

$$= 2*80$$

$$= 160 \text{ cm}^2$$

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

Solution: According to the question,

Radius (r) of the cylindrical part = 7cm

And

Radius(r) of the hemispherical part = 7 cm

Height of hemispherical part = Radius = 7 cm

Height of cylindrical part (h) = 13 - 7

= 6 cm

Now,

Inner surface area of the vessel = CSA of cylindrical part + CSA of hemispherical part

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

$$\text{Inner surface area of vessel} = 2 * \frac{22}{7} * 7 * 6 + 2 * \frac{22}{7} * 7 * 7$$

$$= 44 (6 + 7)$$

$$= 44 * 13$$

$$= 572 \text{ cm}^2$$

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

Solution: As per the question:

The radius of the conical part = 3.5 cm

And,

Radius of the hemispherical part = 3.5 cm

Height of hemispherical part = Radius (r)

= 3.5

$$= \frac{7}{2} \text{ cm}$$

Height of conical part (h) = 15.5 - 3.5

$$= 12 \text{ cm}$$

$$\text{Slant height of the conical part}(l) = \sqrt{r * r + h * h} = \sqrt{\frac{7}{2} * \frac{7}{2} + 12 * 12}$$

$$= \sqrt{\frac{49}{4} + \frac{576}{4}}$$

$$= \sqrt{\frac{625}{4}}$$

$$= \frac{25}{2}$$

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

$$= \pi r l + 2\pi r^2$$

$$= \frac{22}{7} * \frac{7}{2} * \frac{25}{2} + 2 * \frac{22}{7} * \frac{7}{2} * \frac{7}{2}$$

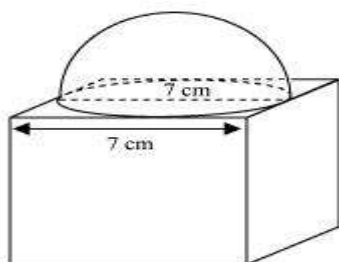
$$= 137.5 + 77$$

$$= 214.5 \text{ cm}^2$$

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

Solution: From the figure:

The greatest diameter possible for the hemisphere is equal to the cube's edge = 7 cm



$$\text{Radius (r) of hemispherical part} = \frac{7}{2}$$

$$= 3.5\text{cm}$$

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

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

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

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

$$= 294 + 38.5$$

$$= 332.5 \text{ cm}^2$$

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.

Solution: According to the question,

$$\text{Diameter of hemisphere} = \text{Edge of cube} = l$$

$$\text{Radius of hemisphere} = \frac{l}{2}$$

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

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

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

$$\text{TSA of Solid} = 6l^2 + \pi * \left(\frac{l}{2}\right)^2$$

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

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

6. A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends (see Fig. 13.10). The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area

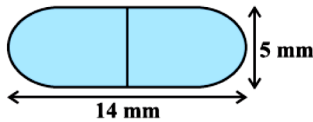


Fig. 13.10

Solution: According to the question,

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

$$= \frac{\text{Diameter of the capsule}}{2}$$

$$= \frac{5}{2}$$

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

$$= 14 - 5$$

$$= 9 \text{ cm}$$

Surface area of capsule = $2 \times \text{CSA of hemispherical part} + \text{CSA of cylindrical part}$

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

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

$$= 25\pi + 45\pi$$

$$= 70\pi$$

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

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

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 per m². (Note that the base of the tent will not be covered with canvas)

Solution: Given:

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) = 2.8 m

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

$$= \pi r l + 2\pi r h$$

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

$$= 2\pi [2.8 + 2 * 2.1]$$

$$= 2\pi [2.8 + 4.2]$$

$$= 2 * \frac{22}{7} * 7$$

$$= 44 \text{ m}^2$$

Cost of 1 m² canvas = Rs 500

Cost of 44 m² canvas = $44 \times 500 = \text{Rs } 22000$

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 cm²

Solution: Given:

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

Diameter of the cylindrical part = 1.4 cm

Radius (r) of the cylindrical part = 0.7 cm

Slant height of the cylindrical part (l) = $\sqrt{0.7 * 0.7 + 2.4 * 2.4}$

$$= \sqrt{0.49 + 5.76}$$

$$= \sqrt{6.25}$$

$$= 2.5$$

Total surface area of the remaining solid will be

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

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

$$= 2 * \frac{22}{7} * 0.7 * 2.4 + \frac{22}{7} * 0.7 * 2.5 + \frac{22}{7} * 0.7 * 0.7$$

$$= 4.4 * 2.4 + 2.2 * 2.5 + 2.2 * 0.7$$

$$= 10.56 + 5.50 + 1.54$$

$$= 17.60 \text{ cm}^2$$

9. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Fig. 13.11. 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

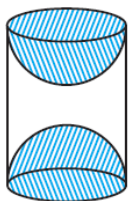


Fig. 13.11

Solution: Given:

Radius (r) of cylindrical part = 3.5 cm

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

$$= 2 \pi r h + 2 * 2 \pi r^2$$

$$= 2 \pi * 3.5 * 10 + 2 * 2 \pi * 3.5 * 3.5$$

$$= 70 \pi + 49 \pi$$

$$= 119 \pi$$

$$= 17 * 22$$

$$= 374 \text{ cm}^2$$

Hence, total surface of the article = 374 cm²

