

CBSE Class 9 Mathematics
NCERT Solutions
CHAPTER 13
Surface Areas and Volumes(Ex. 13.4)

Assume $\pi = \frac{22}{7}$ unless stated otherwise.

1. Find the surface area of a sphere of radius:

(i) 10.5 cm

(ii) 5.6 cm

(iii) 14 cm

Ans. (i) Radius of sphere = 10.5 cm

$$\text{Surface area of sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times 10.5 \times 10.5 = 1386 \text{ cm}^2$$

(ii) Radius of sphere = 5.6 cm

$$\text{Surface area of sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times 5.6 \times 5.6 = 394.24 \text{ cm}^2$$

(iii) Radius of sphere = 14 cm

$$\text{Surface area of sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times 14 \times 14 = 2464 \text{ cm}^2$$

2. Find the surface area of a sphere of diameter:

(i) 14 cm

(ii) 21 cm

(iii) 3.5 cm

Ans. (i) Diameter of sphere = 14 cm,

$$\text{Therefore Radius of sphere} = \frac{14}{2} = 7 \text{ cm}$$

$$\text{Surface area of sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times 7 \times 7 = 616 \text{ cm}^2$$

(ii) Diameter of sphere = 21 cm

$$\therefore \text{Radius of sphere} = \frac{21}{2} \text{ cm}$$

$$\text{Surface area of sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = 1386 \text{ cm}^2$$

(iii) Diameter of sphere = 3.5 cm

$$\therefore \text{Radius of sphere} = \frac{3.5}{2} = 1.75 \text{ cm}$$

$$\text{Surface area of sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times 1.75 \times 1.75 = 38.5 \text{ cm}^2$$

3. Find the total surface area of a hemisphere of radius 10 cm. (Use $\pi = 3.14$)

Ans. Radius of hemisphere (r) = 10 cm

$$\text{Total surface area of hemisphere} = 3\pi r^2$$

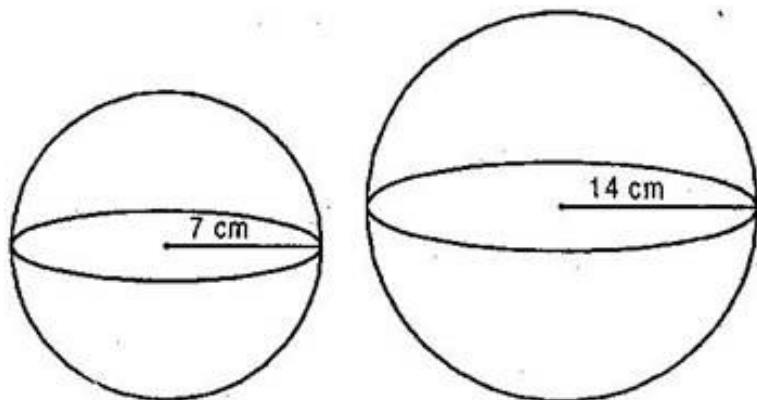
$$= 3 \times 3.14 \times 10 \times 10 = 942 \text{ cm}^2$$

Hence total surface area of hemisphere is 942 cm^2 .

4. The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.

Ans. Case I: Radius of balloon (r) = 7 cm

$$\text{Surface area of balloon} = 4\pi r^2 = 4\pi \times 7 \times 7 \text{ cm}^2 \dots\dots\dots(i)$$



Case II: Radius of balloon (R) = 14 cm

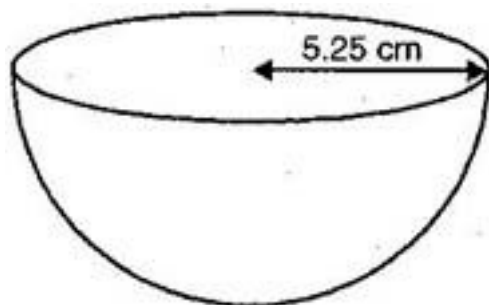
$$\text{Surface area of balloon} = 4\pi R^2 = 4\pi \times 14 \times 14 \text{ cm}^2 \dots\dots(ii)$$

Now, Required Ratio [from eq. (i) and (ii)],

$$\frac{\text{CSA in first case}}{\text{CSA in second case}} = \frac{4\pi \times 7 \times 7}{4\pi \times 14 \times 14} = \frac{1}{4}$$

Hence, required ratio = 1 : 4

5. A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin-plating it on the inside at the rate of Rs. 16 per 100 cm².



Ans. Inner diameter of bowl = 10.5 cm

$$\therefore \text{Inner radius of bowl } (r) = \frac{10.5}{2} = 5.25 \text{ cm}$$

Now, Inner surface area of bowl = $2\pi r^2$

$$= 2 \times \frac{22}{7} \times 5.25 \times 5.25 = 2 \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} = \frac{693}{4} \text{ cm}^2$$

\therefore Cost of tin-plating per 100 cm² = Rs. 16

$$\therefore \text{Cost of tin-plating per 1 cm}^2 = \frac{16}{100}$$

$$\therefore \text{Cost of tin-plating per } \frac{693}{4} \text{ cm}^2$$

$$= \frac{16}{100} \times \frac{693}{4} = \text{Rs. } 27.72$$

6. Find the radius of a sphere whose surface area is 154 cm^2 .

Ans. Surface area of sphere = 154 cm^2

$$\Rightarrow 4\pi r^2 = 154$$

$$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 154$$

$$\Rightarrow r^2 = \frac{154 \times 7}{22 \times 4}$$

$$\Rightarrow r^2 = \frac{49}{4}$$

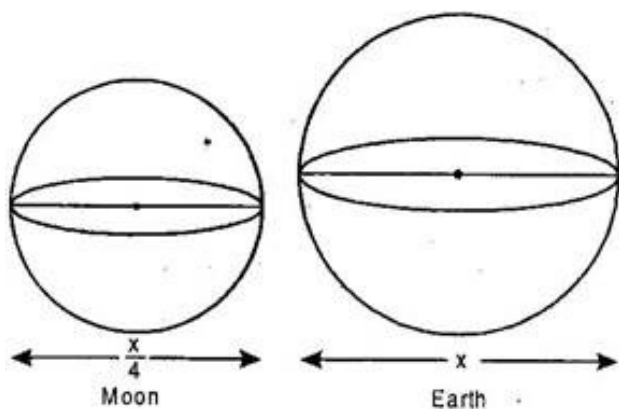
$$\Rightarrow r = \frac{7}{2} = 3.5 \text{ cm}$$

7. The diameter of the moon is approximately one fourth the diameter of the earth. Find the ratio of their surface areas.

Ans. Let diameter of Earth = x

$$\therefore \text{Radius of Earth } (r) = \frac{x}{2}$$

$$\therefore \text{Surface area of Earth} = 4\pi r^2 = 4\pi \times \frac{x}{2} \times \frac{x}{2} = \pi x^2$$



$$\text{Now, Diameter of Moon} = \frac{1}{4} \text{th of diameter of Earth} = \frac{x}{4}$$

$$\therefore \text{Radius of Moon } (r) = \frac{x}{8}$$

$$\text{Surface area of Moon} = 4\pi r^2 = 4\pi \times \frac{x}{8} \times \frac{x}{8} = \frac{\pi x^2}{16}$$

$$\text{Now, Ratio} = \frac{\text{Surface area of Moon}}{\text{Surface area of Earth}}$$

$$= \frac{\frac{\pi x^2}{16}}{\pi x^2} = \frac{\pi x^2}{16} \times \frac{1}{\pi x^2} = \frac{1}{16}$$

$$\therefore \text{Required ratio} = 1 : 16$$

8. A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5 cm. Find the outer curved surface area of the bowl.

Ans. Inner radius of bowl $(r) = 5$ cm

Thickness of steel $(t) = 0.25$ cm

$$\therefore \text{Outer radius of bowl } (R) = r + t = 5 + 0.25 = 5.25 \text{ cm}$$

$$\therefore \text{Outer curved surface area of bowl} = 2\pi R^2 = 2 \times \frac{22}{7} \times 5.25 \times 5.25$$

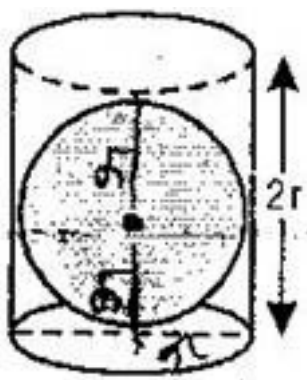
$$= 2 \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} = \frac{693}{4} = 173.25 \text{ cm}^2$$

9. A right circular cylinder just encloses a sphere of radius r (See figure). Find:

(i) Surface area of the sphere.

(ii) Curved surface area of the cylinder.

(iii) Ratio of the areas obtained in (i) and (ii).



Ans. (i) \therefore The cylinder just encloses the sphere in it.

\therefore The height of cylinder will be equal to diameter of sphere = $2r$

And The radius of cylinder will be equal to radius of sphere = r

Radius of sphere = r

\therefore Surface area of sphere = $4\pi(radius)^2 = 4\pi r^2$

(ii) \therefore Curved surface area of cylinder

$$= 2\pi rh = 2\pi r \times 2r [\because h = 2r] = 4\pi r^2$$

$$(iii) \frac{\text{Surface area of sphere}}{\text{Curved surface area of cylinder}} = \frac{4\pi r^2}{4\pi r^2} = \frac{1}{1}$$

\therefore Required ratio = 1 : 1