

CHAPTER 11 SURFACE AREAS AND VOLUMES

Exercise 11.2

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1. Find the surface area of a sphere of radius

(i) 10.5cm (ii) 5.6cm (iii) 14cm

(Assume $\pi=22/7$)

Solution:

Formula: Surface area of a sphere (SA) = $4\pi r^2$

(i) Radius of a sphere, $r = 10.5$ cm

$$SA = 4 \times (22/7) \times 10.5^2 = 1386$$

Surface area of a sphere is 1386 cm²

(ii) Radius of a sphere, $r = 5.6\text{cm}$

Using formula, $SA = 4 \times \left(\frac{22}{7}\right) \times 5.6^2 = 394.24$

Surface area of a sphere is 394.24 cm^2

(iii) Radius of a sphere, $r = 14\text{cm}$

$$SA = 4\pi r^2$$

$$= 4 \times \left(\frac{22}{7}\right) \times (14)^2$$

$$= 2464$$

Surface area of a sphere is 2464 cm^2

2. Find the surface area of a sphere of diameter

(i) 14cm (ii) 21cm (iii) 3.5cm

(Assume $\pi = \frac{22}{7}$)

Solution:

(i) Radius of sphere, $r = \text{diameter}/2 = 14/2\text{ cm} = 7\text{ cm}$

Formula for the surface area of sphere = $4\pi r^2$

$$= 4 \times \left(\frac{22}{7}\right) \times 7^2 = 616$$

Surface area of a sphere is 616 cm^2

(ii) Radius (r) of sphere = $21/2 = 10.5\text{ cm}$

Surface area of a sphere = $4\pi r^2$

$$= 4 \times (22/7) \times 10.5^2 = 1386$$

Surface area of a sphere is 1386 cm²

Therefore, the surface area of a sphere having a diameter 21 cm is 1386 cm²

$$\text{(iii) Radius}(r) \text{ of a sphere} = 3.5/2 = 1.75 \text{ cm}$$

Surface area of a sphere = $4\pi r^2$

$$= 4 \times (22/7) \times 1.75^2 = 38.5$$

Surface area of a sphere is 38.5 cm²

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

Solution:

Radius of the hemisphere, $r = 10\text{cm}$

Formula: Total surface area of the hemisphere = $3\pi r^2$

$$= 3 \times 3.14 \times 10^2 = 942$$

The total surface area of the given hemisphere is 942 cm².

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

Solution:

Let r_1 and r_2 be the radii of the spherical balloon and spherical balloon when air is pumped into it, respectively. So,

$$r_1 = 7 \text{ cm}$$

$$r_2 = 14 \text{ cm}$$

Now, Required ratio = (initial surface area)/(Surface area after pumping air into balloon)

$$= \frac{4\pi r_1^2}{4\pi r_2^2}$$

$$= \left(\frac{r_1}{r_2}\right)^2$$

$$= \left(\frac{7}{14}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

Therefore, the ratio between the surface areas is 1:4.

5. A hemispherical bowl made of brass has an inner diameter 10.5cm.

Find the cost of tin-plating it on the inside at the rate of Rs 16 per 100 cm².

(Assume $\pi = 22/7$)

Solution:

Inner radius of hemispherical bowl, say $r = \text{diameter}/2 = (10.5)/2 \text{ cm} = 5.25 \text{ cm}$

Formula for the surface area of hemispherical bowl = $2\pi r^2$

$$= 2 \times \left(\frac{22}{7}\right) \times (5.25)^2 = 173.25$$

Surface area of the hemispherical bowl is 173.25 cm²

Cost of tin-plating 100 cm² area = Rs 16

Cost of tin-plating 1 cm² area = Rs 16 /100

Cost of tin-plating 173.25 cm² area = Rs. (16×173.25)/100 = Rs 27.72

Therefore, the cost of tin-plating the inner side of the hemispherical bowl at the rate of Rs 16 per 100 cm² is Rs **27.72**.

6. Find the radius of a sphere whose surface area is 154 cm². (Assume $\pi = 22/7$)

Solution:

Let the radius of the sphere be r.

Surface area of sphere = 154 (given)

Now,

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

$$r^2 = (154 \times 7) / (4 \times 22) = (49/4)$$

$$r = (7/2) = 3.5$$

The radius of the sphere is 3.5 cm.

7. The diameter of the moon is approximately one-fourth of the diameter of the earth.

Find the ratio of their surface areas.

Solution:

If the diameter of the earth is said d , then the diameter of the moon will be $d/4$ (as per the given statement).

$$\text{Radius of earth} = d/2$$

$$\text{Radius of moon} = \frac{1}{2} \times d/4 = d/8$$

$$\text{Surface area of moon} = 4\pi(d/8)^2$$

$$\text{Surface area of earth} = 4\pi(d/2)^2$$

$$\text{Ratio of their Surface areas} = \frac{4\pi \left(\frac{d}{8}\right)^2}{4\pi \left(\frac{d}{2}\right)^2} = 4/64 = 1/16$$

The ratio between their surface areas is 1:16.

8. A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5cm. Find the outer curved surface of the bowl. (Assume $\pi = 22/7$)

Solution:

Given:

Inner radius of the hemispherical bowl = 5cm

Thickness of the bowl = 0.25 cm

Outer radius of the hemispherical bowl = $(5+0.25)$ cm = 5.25 cm

Formula for outer CSA of the hemispherical bowl = $2\pi r^2$, where r is the radius of the hemisphere.

$$= 2 \times \left(\frac{22}{7}\right) \times (5.25)^2 = 173.25 \text{ cm}^2$$

Therefore, the outer curved surface area of the bowl is 173.25 cm^2 .

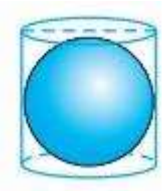
9. A right circular cylinder just encloses a sphere of radius r (see fig. 11.10).

Find

(i) surface area of the sphere,

(ii) curved surface area of the cylinder,

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



Solution:

(i) Surface area of the sphere = $4\pi r^2$, where r is the radius of sphere

(ii) Height of the cylinder, $h = r + r = 2r$

The radius of the cylinder = r

CSA of the cylinder formula = $2\pi r h = 2\pi r(2r)$ (using value of h)

$$= 4\pi r^2$$

(iii) Ratio between areas = (Surface area of sphere)/(CSA of Cylinder)

$$= \frac{4\pi r^2}{4\pi r^2} = 1/1$$

The ratio of the areas obtained in (i) and (ii) is 1:1.