



SpeedLabs

MATHS

CBSE 9th

TEEVRA EDUTECH PVT. LTD.

SURFACE AREAS AND VOLUMES

Exercise- 13.8

Q.1 Find the volume of a sphere whose radius is (i) 7 cm and (ii) 0.63 cm.

Ans - (i) Radius of sphere (r) = 7 cm

$$\begin{aligned}\text{Volume of sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 = \frac{4312}{3} \\ &= 1437\frac{1}{3} \text{ cm}^3\end{aligned}$$

(ii) Radius of sphere (r) = 0.63 m

$$\begin{aligned}\text{Volume of sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 0.63 \times 0.63 \times 0.63 \\ &= \frac{4}{3} \times \frac{22}{7} \times \frac{63}{100} \times \frac{63}{100} \times \frac{63}{100} \\ &= 1.047816 \text{ m}^3 = 1.05 \text{ m}^3 \text{ (approx.)}\end{aligned}$$

Q.2 Find the amount of water displaced by a solid spherical ball of diameter:

(i) 28 cm

(ii) 0.21 m

Ans - (i) Diameter of spherical ball

$$= 28 \text{ cm}$$

$$\text{Radius of spherical ball (r)} = \frac{28}{2}$$

$$= 14 \text{ cm}$$

According to question, Volume of water replaced = Volume of spherical ball

$$\begin{aligned}&= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14 = \frac{34496}{3} \\ &= 11498\frac{2}{3} \text{ cm}^3\end{aligned}$$

(ii) Diameter of spherical ball = 0.21

∴ Radius of spherical ball (r)

$$= \frac{0.21}{2} \text{ m}$$

According to question,

Volume of water replaced = Volume of spherical ball

$$\begin{aligned} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times \frac{0.21}{2} \times \frac{0.21}{2} \times \frac{0.21}{2} \\ &= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{200} \times \frac{21}{200} \times \frac{21}{200} \\ &= 11 \times \frac{441}{100 \times 100 \times 100} \\ &= 0.004851 \text{ m}^3 \end{aligned}$$

Q.3 The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the metal weighs 8.9 g per cm³?

Ans - Diameter of metallic ball = 4.2 cm

$$\therefore \text{Radius of metallic ball (r)} = \frac{4.2}{2}$$

$$= 2.1 \text{ cm}$$

$$\text{volume of metallic ball} = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1$$

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{10} \times \frac{21}{10} \times \frac{21}{10}$$

$$= 38.808 \text{ cm}^3$$

$$\text{Density of metal} = 8.9 \text{ g per cm}^3$$

$$\text{Mass of 1 cm}^3 = 8.9 \text{ g}$$

$$\text{Mass of 38.808 cm}^3 = 8.9 \times 38.808$$

$$= 345.3912 \text{ g} = 345.39 \text{ g (approx).}$$

Q.4 The diameter of the moon is approximately one-fourth the diameter of the earth. What fraction is the volume of the moon of the volume of the earth?

Ans - Let diameter of earth be x

$$\therefore \text{Radius of earth} =$$

$$\text{Now, Volume of earth} = \frac{4}{3} \pi r^3$$

[∵ Earth is considered to be a sphere]

$$= \frac{4}{3} \times \pi \times \frac{x}{2} \times \frac{x}{2} \times \frac{x}{2} = \frac{1}{8} \times \frac{4}{3} \pi x^3 \dots\dots (i)$$

According to question,

$$\text{Diameter of moon} = \frac{1}{4} \times \text{Diameter of earth} = \frac{1}{4} \times x = \frac{x}{4}$$

$$\therefore \text{Radius of moon (R)} = \frac{x}{8}$$

$$\text{Now, Volume of Moon} = \frac{4}{3} \pi R^3$$

[∵ Moon is considered to be a sphere]

$$= \frac{4}{3} \times \pi \times \frac{x}{8} \times \frac{x}{8} \times \frac{x}{8} = \frac{1}{512} \times \frac{4}{3} \pi x^3$$

$$= \frac{1}{64} \times \left[\frac{1}{8} \times \frac{4}{3} \pi x^3 \right] = \frac{1}{64} \times \text{Volume of Earth}$$

$$= \frac{1}{64} \times \text{Volume of Earth}$$

[From eq. (i)]

Volume of moon is $\frac{1}{64}$ th the volume of earth.

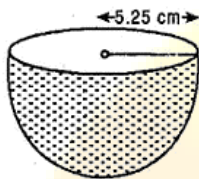
Q.5 How many litres of milk can a hemispherical bowl of diameter 10.5 hold?

Ans - Diameter of hemispherical bowl

$$= 10.5 \text{ cm}$$

Radius of hemispherical bowl (r)

$$= \frac{10.5}{2} = 5.25$$



Volume of milk in hemispherical bowl

$$= \frac{2}{3} \pi r^3$$

$$= \frac{2}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 5.25$$

$$= \frac{2}{3} \times \frac{22}{7} \times \frac{525}{100} \times \frac{525}{100} \times \frac{525}{100}$$

$$= 11 \times \frac{21}{4} \times \frac{21}{4} = 303.187 \text{ cm}^3$$

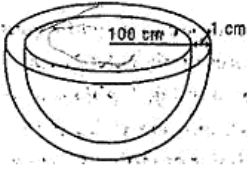
$$= \frac{303.187}{1000} \text{ liters [} \because 1000 \text{ cm}^3 = 1\text{]}]$$

$$= 0.303187 \text{ liters}$$

$$= 0.303 \text{ liters (approx.)}$$

Q.6 A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.

Ans - Inner radius of hemispherical tank (r) = 1 m = 100 cm



Thickness of sheet = 1 cm

\therefore Outer radius of hemispherical tank (R) = 100 + 1 = 101 cm

Volume of iron of hemisphere

$$\begin{aligned} &= \frac{2}{3} \pi [R^3 - r^3] \\ &= \frac{2}{3} \times \frac{22}{7} \times [(101)^3 - (100)^3] \\ &= \frac{44}{21} [1030301 - 1000000] \\ &= 63487.81 \text{ cm}^3 \\ &= 0.06348 \text{ m}^3 \end{aligned}$$

Q.7 Find the volume of a sphere whose surface area is 154 cm^2 .

Ans - Surface area of sphere = 154 cm^2

$$\begin{aligned} \Rightarrow 4\pi r^2 &= 154 \\ \Rightarrow 4 \times \frac{22}{7} \times r^2 &= 154 \\ \Rightarrow r^2 &= \frac{154 \times 7}{4 \times 22} = \frac{49}{4} \\ \Rightarrow r &= \frac{7}{2} \text{ cm} \end{aligned}$$

Now, Volume of sphere

$$\begin{aligned} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} \\ &= \frac{1}{3} \times 11 \times 49 = \frac{179}{3} = 179\frac{2}{3} \text{ cm}^3 \end{aligned}$$

Q.8 A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of Rs. 498.96. If the cost of white-washing is at the rate of Rs. 2.00 per square meter, find:

- (i) the inner surface area of the dome.
- (ii) the volume of the air inside the dome.

Ans - Cost of white washing from inside = Rs. 498.96

Rate of white washing = Rs. 2

$$\begin{aligned} \therefore \text{Area white washed} \\ &= \frac{498.96}{2} = 249.48 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Inside surface area of the dome} \\ &= 249.48 \text{ cm}^2 \end{aligned}$$

$$\Rightarrow 2\pi r^2 = 249.48$$

$$\Rightarrow r^2 = \frac{249.48 \times 7}{2 \times 22}$$

$$= 5.65 \times 7$$

$$\Rightarrow r = 6.3$$

So, Volume of the dome

$$\begin{aligned} &= \frac{2}{3} \pi r^2 = \frac{2}{3} \times \frac{22}{7} \times 6.3 \times 6.3 \times 6.3 \\ &= 523.9 \text{ cm}^3 \end{aligned}$$

Q.9 Twenty seven solid iron spheres, each of radius and surface area S are melted to form a sphere with surface area S'. Find the:

- (i) radius r' of the new sphere.
- (ii) ratio of S and S'.

Ans - (i) Let radius of sphere beand radius of new sphere be R.

27 × Volume of sphere = Volume of new sphere

$$\Rightarrow 27 \times \frac{4}{3} \pi r^3 = \frac{4}{3} \pi R^3$$

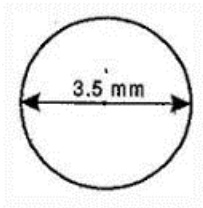
$$\Rightarrow \sqrt[3]{3^3 \times r^3} = R$$

$$\text{(ii) } \frac{\text{surface area of sphere (S)}}{\text{surface area of sphere (S')}} = \frac{4\pi r^2}{4\pi R^2}$$

$$= \frac{r^2}{R^2} = \frac{r^2}{(3r)^2} = \frac{r^2}{9r^2} = \frac{1}{9}$$

Q.10 a capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in mm³) is needed to fill this capsule?

Ans - Diameter of spherical capsule = 3.5 mm



∴ Radius of spherical capsule

$$= \frac{3.5}{2} = \frac{35}{20} = \frac{7}{4} \text{ mm}$$

Medicine needed to fill the capsule

$$= \text{Volume of sphere} = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times \frac{7}{4}$$

$$= \frac{11 \times 7 \times 7}{3 \times 2 \times 4} = \frac{539}{4} \text{ mm}^3$$

$$= 22.46 \text{ mm}^3 \text{ (Approx.)}$$