NCERT solutions for class-9 maths surface areas and volumes Ex 13.8

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

Q1. 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

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

$= \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 = \frac{4312}{3}$

$= 1437\frac{1}{3}$ cm^3

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

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

$= \frac{4}{3} \times \frac{22}{7} \times 0.63 \times 0.63 \times 0.63$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{63}{100} \times \frac{63}{100} \times \frac{63}{100}$

$= 1.047816$ m^3 $= 1.05$ m^3 (approx.)

Q2. 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

$= 28$ cm

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

$= 14$ cm

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

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14 = \frac{34496}{3}$

$= 11498\frac{2}{3}$ cm^3

(ii) Diameter of spherical ball = 0.21 m

$\therefore$ Radius of spherical ball (r)

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

According to question,

Volume of water replaced = Volume of spherical ball

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{0.21}{2} \times \frac{0.21}{2} \times \frac{0.21}{2}$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{200} \times \frac{21}{200} \times \frac{21}{200}$

$= 11 \times \frac{441}{100 \times 100 \times 100}$

$= 0.004851 \text{ m}^3$

Q3. 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 cm^3?

Ans: Diameter of metallic ball = 4.2 cm

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

= 2.1 cm

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

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

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

$= 38.808 \text{ cm}^3$

Density of metal = 8.9 g per cm^3

$\because$ Mass of 1 cm^3 = 8.9 g

$\therefore$ Mass of 38.808 cm^3 = 8.9 x 38.808

= 345.3912 g = 345.39 g (approx).

Q4. 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

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

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

[$\because$ Earth is considered to be a sphere]

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

According to question,

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

$\frac{1}{4} \times x = \frac{x}{4}$

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

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

[$\because$ Moon is considered to be a sphere]

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

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

[From eq. (i)]

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

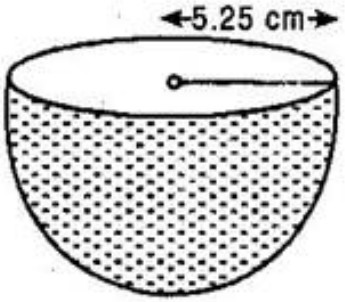
Q5. How many litres of milk can a hemispherical bowl of diameter 10.5 hold?

Ans: Diameter of hemispherical bowl

= 10.5 cm

$\therefore$ Radius of hemispherical bowl (r)

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



Volume of milk in hemispherical bowl

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

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

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

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

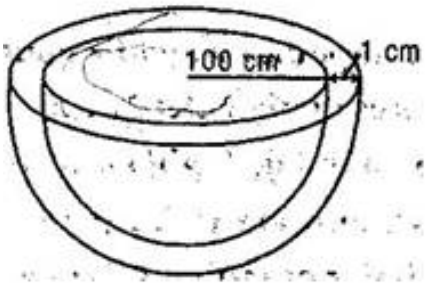
$$= \frac{303.187}{1000} \text{ liters} \left[\because 1000 \text{ cm}^3 = 1l\right]$$

= 0.303187 liters

= 0.303 liters (approx.)

Q6. 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

$$= \frac{2}{3}\pi\left[R^3 - r^3\right]$$

$$= \frac{2}{3} \times \frac{22}{7} \times \left[(101)^3 - (100)^3\right]$$

$$= \frac{44}{21}[1030301 - 1000000]$$

$$= 63487.81 \text{ cm}^3$$

$$= 0.06348 \text{ m}^3$$

Q7. Find the volume of a sphere whose surface area is 154 cm^2.

Ans: Surface area of sphere = 154 cm^2

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

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

$$\Rightarrow r^2 = \frac{154 \times 7}{4 \times 22} = \frac{49}{4}$$

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

Now, Volume of sphere

$$= \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$$

$$= \frac{1}{3} \times 11 \times 49 = \frac{539}{3} = 179\frac{2}{3} \text{ cm}^3$$

Q8. 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

$\therefore$ Area white washed

$$= \frac{498.96}{2} = 249.48 \text{ cm}^2$$

Inside surface area of the dome

$= 249.48\ cm^2$

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

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

$= 5.67 \text{ x } 7$

$\Rightarrow r = 6.3$

So, Volume of the dome

$= \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times 6.3 \times 6.3 \times 6.3$

$= 523.9\ cm^3$

Q9. Twenty seven solid iron spheres, each of radius r 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 be r and radius of new sphere be R.

27 x Volume of sphere = Volume of new sphere

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

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

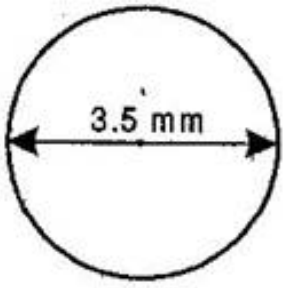
$\Rightarrow 3r = R$

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

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

Q10. a capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in mm^3) is needed to fill this capsule?

Ans: Diameter of spherical capsule = 3.5 mm



$\therefore$ Radius of spherical capsule (r)

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

Medicine needed to fill the capsule

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

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

$= \frac{11 \times 7 \times 7}{3 \times 2 \times 4} = \frac{539}{34}$ mm^3

$= 22.46$ mm^3 (Approx.)

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