Ex - 13.8

Q1. Find the volume of a sphere whose radius is
(i) 7 cm (ii) 0.63 m

Sol. (i) r = 7 cm

Volume = $\frac{4}{3}\times\frac{22}{7}\times(7)^3\ cm^3 = 1437\frac{1}{3}\ cm^3$

(ii) r = 0.63 m

Volume = $\frac{4}{3}\times\frac{22}{7}\times(0.63)^3\ m^3 = 1.047816\ m^3 = 1.05\ m^3$ (approx)

Q2. (i) Find the amount of water displaced by a solid spherical ball of diameter 28 cm.

Sol. Diameter = 28 cm

$\therefore$ Radius (r) = $\frac{28}{2}$ cm = 14 cm

$\therefore$ Amount of water displaced

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\times\frac{22}{7}\times(14)^3 = \frac{34496}{3}\ cm^3$

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

Q3. The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm^3 ?

Sol. Density = $\frac{\text{mass}}{\text{volume}}$

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

$= \frac{4}{3}\times\frac{22}{7}\times(4.2)^3 = 310.46 cm^3$

mass = density × Volume

$8.9 g/cm^3 \times 310.46 cm^3$

= 2763.12gm=2.7kg

Q4. The diameter of the moon is approximately one-fourth the diameter of the earth. What fraction of the volume of the earth is the volume of the moon?

Sol. Let d_1 and d_2 be the diameters of the moon and the earth respectively. Then, $d_1 = \frac{1}{4}d_2$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{4}$; $\frac{\text{Volume of moon}}{\text{Volume of earth}} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \left(\frac{r_1}{r_2}\right)^3$] Ans. $\frac{1}{64}$

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

Sol. $r = \frac{10.5}{2} = \frac{21}{4}$ cm

Capacity of the bowl = $\frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} \times \frac{21}{4} \text{cm}^3 = \frac{4851}{16} \text{cm}^3$

$= 303.2 \text{ cm}^3$ (approx.)

$= \frac{303.2}{1000}$ lit. $= 0.303$ lit. (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.

Sol. Inner radius (r) = 1 m

Thickness of iron sheet = 1 cm = 0.01 m

$\therefore$ Outer radius (R) = Inner radius (r) + Thickness of iron sheet = 1 m + 0.01 m = 1.01 m

$\therefore$ Volume of the iron used to make the tank

$= \frac{2}{3}\pi(R^3 - r^3) = \frac{2}{3} \times \frac{22}{7} \times \{(1.01)^3 - 1^3\}$

$= 0.06348 \text{ m}^3$ (Approx).

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

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

$\Rightarrow r^2 = \frac{49}{4} \Rightarrow r = \frac{7}{2}$ cm

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

$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} \text{cm}^3 = \frac{539}{3} \text{cm}^3$

$= 179\frac{2}{3} \text{cm}^3$

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 Rs. 2.00 per square metre, find the
(i) Inside surface area of the dome,
(ii) Volume of the air inside the dome.

Sol. (i) Total cost of white washing = Rs 498.96
Cost of 1 m^2 of white washing = Rs 2
$\therefore$ Inside surface Area = 498.96 = 249.48 m^2
$\therefore$ Inside surface area = $2\pi r^2$
$\Rightarrow 2\pi r^2 = 249.48$

$$\Rightarrow 2 \times \frac{22}{7} \times r^2 = \frac{24948}{100}; r^2 = \frac{3969}{100}$$

$$\Rightarrow r = \left(\frac{63}{10}\right)^2 m \Rightarrow r = \frac{63}{10} = 6.3 \text{ m}$$

(ii) The volume of air in the dome

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

$$= \frac{2}{3} \times \frac{22}{7} \times (6.3)^3 \text{ m}^3$$

$$= \frac{523908}{1000} m^3 = 523.9 \text{ m}^3 \text{ (approx)}$$

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'.

Sol. Volume of 27 solid iron sphere each of radius r = volume of new sphere of radius R.

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

$\Rightarrow$ R = 3r
$S = 4\pi r^2$
$S' = 4\pi(3r)^2]$
Ans. 3r ; 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?

Sol. $r = \frac{3.5}{2} mm$

$$\text{Capacity of the capsule} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2} \times \frac{3.5}{2} mm^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times \frac{7}{4} mm^3 = \frac{11}{24} \times 49 \text{ mm}^3$$

$$= \frac{539}{24} mm^3 = 22.346 \text{ mm}^3$$