Short Answer Type Questions – I

[2 marks]

Que 1. A cone, hemisphere and a cylinder stand on equal bases and have the same height. What is the ration of their volumes?

Sol. Volume of a cone: Volume of a hemisphere: Volume of a cylinder

$$= \frac{1}{3}\pi r^2 h : \frac{2}{3}\pi r^3 : \pi r^2 h$$

$$= \frac{1}{3}\pi r^3 : \frac{2}{3}\pi r^3 : \pi r^3 \qquad (\because\ r = h)$$

$$= 1 : 2 : 3$$

Que 2. What is the ratio of the volume of a cube to that of a sphere which will fit inside it?

Sol. Let edge of the cube be 'a'.

Then, diameter of the sphere that will fit inside the given cube = a

$\therefore$ Volume of the cube: Volume of the sphere

$$= a^3 : \frac{4}{3}\pi\left(\frac{a}{2}\right)^3 = a^3 : \frac{4}{3}\times\frac{1}{8}\pi a^3 = a^3 : \frac{1}{6}\pi a^3 = 6 : \pi$$

Que 3. The slant height of the frustum of a cone is 5 cm. If the difference between the radii of its two circular ends is 4 cm, find the height of the frustum.

Sol. Let r and R be radii of the circular ends of the frustum of the cone.

Then, $R - r = 4$, $l = 5$

We know, $l^2 = (R - r)^2 + h^2$

$\Rightarrow$ $5^2 = 4^2 + h^2 \quad or \quad h^2 = 25 - 16 = 9$

$\Rightarrow$ h = 3 cm

Que 4. If the slant height of the frustum of a cone is 10 cm and the perimeters of its circular base are 18 cm and 28 cm respectively. What is the curved surface rea of the frustum?

Sol. Let r and R be the radii of the two circular ends of the frustum of the cone

Then, $2\pi r = 18$ and $2\pi R = 28$

$\Rightarrow$ $r = \frac{18}{2\pi}$ and $R = \frac{28}{2\pi}$

$\Rightarrow$ $r = \frac{9}{\pi}$ and $R = \frac{14}{\pi}$

Now, curved surface area of the frustum = $\pi(r + R)l$

$$= \pi\left(\frac{9}{\pi} + \frac{14}{\pi}\right) \times 10 = 23 \times 10 = 230 \text{ cm}^2$$

Que 5. The slant height of a frustum of a cone is 4 cm and the perimeters (circumference) of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

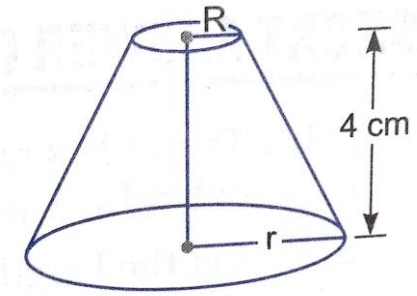

Fig. 13.6

Sol. We have, slant height, l = 4 cm

Let R and r be the radii of two circular ends respectively. Therefore, we have

$2\pi R = 18 \quad \Rightarrow \quad \pi R = 9$

$2\pi R = 6 \quad \Rightarrow \quad \pi r = 3$

∴ Curved surface area of the frustum = $(\pi R + \pi r)\, l$

$= (9 + 3) \times 4 = 12 \times 4 = 48 \text{ cm}^2$

Que 6. A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.

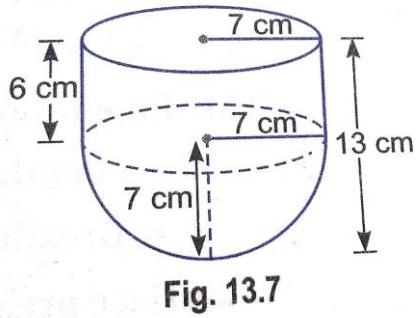

Fig. 13.7

Sol. Here, radius of hemisphere = radius of cylinder = r cm = 7 cm

And height of cylinder, h = (13 – 7) cm = 6 cm

Now, inner surface area of the vessel

= Curved surface area of the cylindrical part + Curved surface area of hemispherical part

$$= 2 \times \frac{22}{7} \times 7 \times (6 + 7) \; = 2 \times 22 \times 13 = \; 572\; cm^2$$

Que 7. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of

the solid in terms of π.

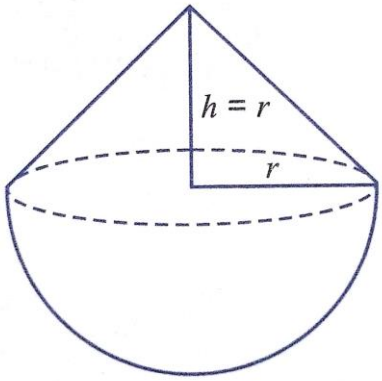

Fig. 13.8

Sol. We have,

Height of cone is equal to its radius

i.e., h = r = 1 cm (Given)

Also, radius of hemisphere = r = 1 cm

Now, Volume of the solid

= Volume of the cone + Volume of the hemisphere

$$= \frac{1}{2}\pi r^2 h + \frac{2}{3}\pi r^3$$

$$= \frac{1}{3}\pi r^2 \times r + \frac{2}{3}\pi r^3 \qquad [\because \quad h = r]$$

$$= \frac{\pi r^3}{3} + \frac{2}{3}\pi r^3 = \pi r^3 = \pi(1)^3 = \pi \text{cm}^3$$

Que 8. If the total surface area of a solid hemisphere is 462 cm^2, find its volume. $\left[\textbf{Take}\pi = \frac{22}{7}\right]$

Sol. Given, total surface area of solid hemisphere = 462 cm^2

$$\Rightarrow \qquad 3\pi r^2 = 462 \text{ cm}^2$$

$$3 \times \frac{22}{7} \times r^2 = 462$$

$$r^2 = 49 \Rightarrow r = 7\ cm$$

Volume of solid hemisphere = $\frac{2}{3}\pi r^3$

$$= \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 = 718.66\ cm^3$$