

Case Study Questions

Question 1:

Nakul was doing an experiment to find the radius r of a ball. For this he took a cylindrical container with radius $R = 7$ cm and height 10 cm. He filled the container almost half by water as shown in the figure-1. Now he dropped the ball into the container as in figure-2.

He observed that in figure-2, the water level in the container raised from P to Q i.e, to 3.4 cm.

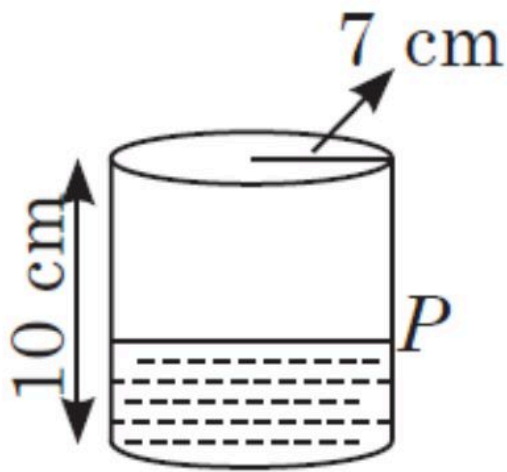


Figure - 1

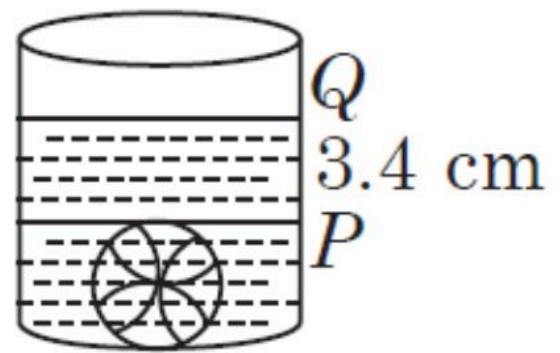


Figure - 2

(i) What is the approximate radius of the ball?

- (a) 3 cm
- (b) 5 cm
- (c) 7 cm
- (d) 9 cm

(ii) What is the volume of the cylinder?

- (a) 1260 cm^2
- (b) 540 cm^3
- (c) 1620 cm^3
- (d) 1540 cm^3

(iii) What is the volume of the spherical ball?

- (a) 620 cm^3
- (b) 824.26 cm^3
- (c) 523.81 cm^3
- (d) 430.1 cm^3

(iv) How many litres of water can be filled in the full container ?

- (a) 1.54 litres
- (b) 2 litres
- (c) 5 litres
- (d) 7.5 litres

(v) What is the total surface area of the spherical ball?

- (a) 441.34 cm^2
- (b) 314.29 cm^2
- (c) 620 cm^2
- (d) 816 cm^2

Answer:

(b) : Volume of ball = Increased volume of water

$$\Rightarrow \frac{4}{3}\pi r^3 = \pi(7)^2 \times 3.4$$

$$\Rightarrow r^3 = \frac{7 \times 7 \times 3.4 \times 3}{4} = 124.95 \Rightarrow r \approx 5 \text{ cm.}$$

(d) : Volume of cylinder = $\pi R^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 10 = 1540 \text{ cm}^3$$

(c) : Volume of spherical ball = $\frac{4}{3}\pi r^3$

$$= \frac{4}{3} \times \frac{22}{7} \times 5 \times 5 \times 5 = \frac{11000}{21} = 523.81 \text{ cm}^3$$

(a) : Volume of cylinder = 1540 cm^3

$$= \frac{1540}{1000} \text{ litres} \quad [\because 1l = 1000 \text{ cm}^3]$$

$$= 1.54 \text{ litres}$$

(b) : Total surface area of spherical ball = $4\pi r^2$

$$= 4 \times \frac{22}{7} \times 5 \times 5 = 314.29 \text{ cm}^2$$