

Chapter 20. Mensuration II

Ex 20.1

Answer 1.

i) Height = 12 cm, radius = 5 cm

$$\begin{aligned}\text{Curved surface area} &= (\pi r \sqrt{h^2 + r^2}) \\ &= \frac{22}{7} \times 5 \times \sqrt{12^2 + 5^2} \\ &= \frac{22}{7} \times 5 \times \sqrt{169} \\ &= \frac{22}{7} \times 5 \times 13 \\ &= 204.29\end{aligned}$$

$$\text{Curved surface area} = 204.29 \text{ cm}^2$$

Total surface area = area of circular base + curved surface area

$$\begin{aligned}&= \pi r^2 + (\pi r \sqrt{h^2 + r^2}) \\ &= \frac{22}{7} \times 5 \times 5 + 204.29 \\ &= 78.57 + 204.29 \\ &= 282.86\end{aligned}$$

$$\text{Total surface area} = 282.86 \text{ cm}^2$$

$$\begin{aligned}\text{Volume} &= \frac{1}{3} \times (\pi r^2) \times h \\ &= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 \\ &= 314.29\end{aligned}$$

$$\text{Volume of the cone} = 314.29 \text{ cm}^3$$

ii) Height = 15 cm, radius = 8 cm

$$\text{Curved surface area} = (\pi r \sqrt{h^2 + r^2})$$

$$= \frac{22}{7} \times 8 \times \sqrt{15^2 + 8^2}$$

$$= \frac{22}{7} \times 8 \times \sqrt{289}$$

$$= \frac{22}{7} \times 8 \times 17$$

$$= 427.43$$

$$\text{Curved surface area} = 427.43 \text{ cm}^2$$

Total surface area = area of circular base + curved surface area

$$= \pi r^2 + (\pi r \sqrt{h^2 + r^2})$$

$$= \frac{22}{7} \times 8 \times 8 + 427.43$$

$$= 201.14 + 427.43$$

$$= 628.57$$

$$\text{Total surface area} = 628.57 \text{ cm}^2$$

$$\text{Volume} = \frac{1}{3} \times (\pi r^2) \times h$$

$$= \frac{1}{3} \times \frac{22}{7} \times 8 \times 8 \times 15$$

$$= 1005.71$$

$$\text{Volume of the cone} = 1005.71 \text{ cm}^3$$

iv) Height = 8 cm, diameter = 12 cm

Diameter = 12 cm \Rightarrow r=6 cm

$$\text{Curved surface area} = (\pi r \sqrt{h^2 + r^2})$$

$$= \frac{22}{7} \times 6 \times \sqrt{8^2 + 6^2}$$

$$= \frac{22}{7} \times 6 \times \sqrt{100}$$

$$= \frac{22}{7} \times 6 \times 10$$

$$= 188.57$$

Curved surface area = 188.57 cm²

Total surface area = area of circular base + curved surface area

$$= \pi r^2 + (\pi r \sqrt{h^2 + r^2})$$

$$= \frac{22}{7} \times 6 \times 6 + 188.57$$

$$= 113.14 + 188.57$$

$$= 301.71$$

Total surface area = 301.71 cm²

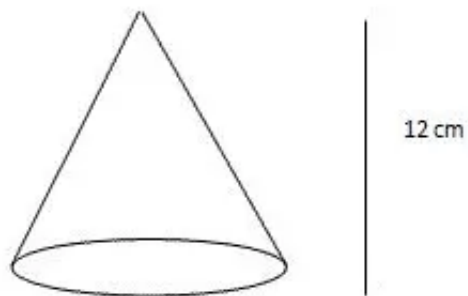
$$\text{Volume} = \frac{1}{3} \times (\pi r^2) \times h$$

$$= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 8$$

$$= 301.71$$

Volume of the cone = 301.71 cm³

Answer 2.



$$\text{Volume of the cone} = 154 \text{ cm}^3$$

$$\Rightarrow \frac{1}{3} \times (\pi r^2) \times h = 154$$

$$\Rightarrow \frac{1}{3} \times (\pi r^2) \times 12 = 154$$

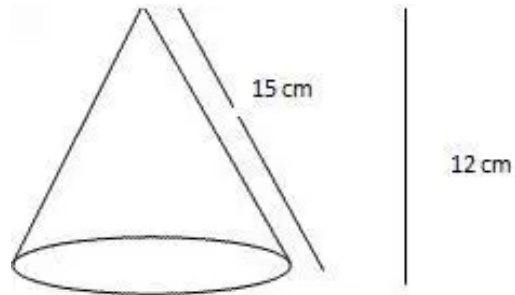
$$\Rightarrow r^2 = \frac{154 \times 3 \times 7}{12 \times 22}$$

$$\Rightarrow r^2 = 12.25$$

$$\Rightarrow r = 3.5 \text{ cm}$$

Radius of the circular base of the cone is 3.5 cm

Answer 3.



Slant length = l = 15 cm

Height = h = 12 cm

Radius of the base = r

We know,

$$\begin{aligned}l^2 &= h^2 + r^2 \\ \Rightarrow r^2 &= l^2 - h^2 \\ \Rightarrow r &= \sqrt{l^2 - h^2} \\ \Rightarrow r &= \sqrt{15^2 - 12^2} \\ \Rightarrow r &= 9\text{cm}\end{aligned}$$

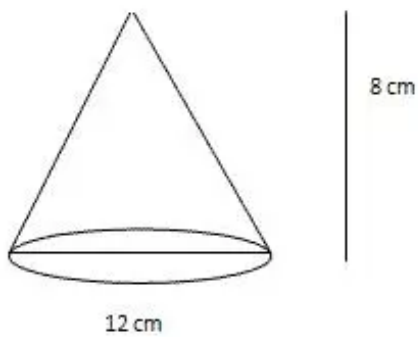
Radius = 9 cm

$$\text{Volume} = \frac{1}{3} \times (\pi r^2) \times h$$

$$\begin{aligned}&= \frac{1}{3} \times 3.14 \times 9 \times 9 \times 12 \\ &= 1017.36\text{cm}^3\end{aligned}$$

Volume of the cone = 1017.36 cm³

Answer 4.

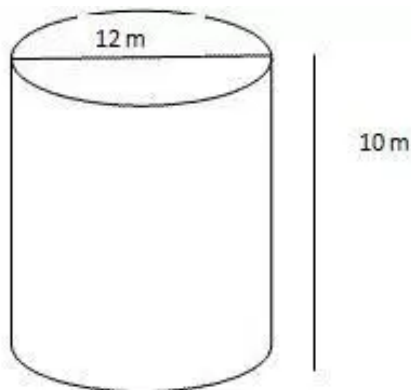


$$\text{Diameter} = 12 \text{ cm} \Rightarrow r = 6 \text{ cm}$$

$$\begin{aligned} \text{Curved surface area} &= (\pi r \sqrt{h^2 + r^2}) \\ &= \frac{22}{7} \times 6 \times \sqrt{8^2 + 6^2} \\ &= \frac{22}{7} \times 6 \times \sqrt{100} \\ &= \frac{22}{7} \times 6 \times 10 \\ &= 188.57 \end{aligned}$$

$$\text{Curved surface area} = 188.57 \text{ cm}^2$$

Answer 5.



Diameter of the cylinder = 12 m \Rightarrow radius = 6 m

Curved surface area = circumference of the base \times height

$$\begin{aligned} &= 2\pi r \times h \\ &= 2 \times \frac{22}{7} \times 6 \times 10 \\ &= 377.14\text{m}^2 \end{aligned}$$

Curved Surface Area = 377.14 m²

Total surface area = Curved surface area + (2 \times base area)

$$\begin{aligned} &= 2\pi r h + 2\pi r^2 \\ &= 2\pi r(h + r) \\ &= 2 \times \frac{22}{7} \times 6 \times (10 + 6) \\ &= 2 \times \frac{22}{7} \times 6 \times 16 \\ &= 603.42\text{m}^2 \end{aligned}$$

Total Surface Area = 603.42 m²

Answer 6.

Let radius of first cone be $3r$ and height be h , then radius of second cone will be r and height will be $3h$.

$$\text{Volume of cone} = \frac{1}{3} \times (\pi r^2) \times h$$

$$\text{Ratio of volumes of cone} = \frac{\text{Volume of first cone}}{\text{Volume of second cone}}$$

$$\begin{aligned} &= \frac{\frac{1}{3} \times (\pi(3r)^2) \times h}{\frac{1}{3} \times (\pi r^2) \times 3h} \\ &= \frac{\frac{1}{3} \pi 9r^2 h}{\frac{1}{3} \pi r^2 3h} \\ &= \frac{3}{1} \end{aligned}$$

$$\text{Ratio of volumes of cone} = 3:1$$

Answer 7.

The base circumferences of the cones are equal, therefore the radius of base are equal.

Let radius be r .

Ratio between slant heights = $5:4$

Let slant height of first cone = $5x$ and of second cone = $4x$

Curved surface area of cone = $\pi r l$ (where l = slant height)

Ratio of curved surface areas =

$$\begin{aligned} &= \frac{\pi \times 5x}{\pi r \times 4x} \\ &= \frac{5}{4} \end{aligned}$$

$$\text{Ratio of curved surface areas} = 5:4$$

Answer 8.

$$\text{Volume of cone} = \frac{1}{3} \times (\pi r^2) \times h$$

$$\Rightarrow 75\pi = \frac{1}{3} \times \pi \times 5 \times 5 \times h$$

$$\Rightarrow h = \frac{225}{25}$$

$$\Rightarrow h = 9\text{cm}$$

Height of the cone = 9 cm

Answer 9.

$$\text{Curved surface area} = 710 \text{ cm}^2$$

$$\text{Radius (r) of base} = 11.3 \text{ cm}$$

Let slant height be l.

$$\therefore \pi r l = 710$$

$$\Rightarrow \frac{22}{7} \times 11.3 \times l = 710$$

$$\Rightarrow l = \frac{710 \times 7}{11.3 \times 22}$$

$$\Rightarrow l = 19.99\text{cm} = 20\text{cm}$$

The slant height is 20 cm.

Answer 10.

Curved surface area of the tent = 264 m^2

Slant height (l) = 12 m.

$$\Rightarrow \pi r l = 264$$

$$\Rightarrow \frac{22}{7} \times r \times 12 = 264$$

$$\Rightarrow r = \frac{264 \times 7}{22 \times 12}$$

$$\Rightarrow r = 7 \text{ m}$$

Radius of cone = 7 m

Let h be the vertical height.

We know,

$$l^2 = r^2 + h^2$$

$$\Rightarrow h = \sqrt{l^2 - r^2}$$

$$\Rightarrow h = \sqrt{12^2 - 7^2}$$

$$\Rightarrow h = \sqrt{144 - 49} = \sqrt{95}$$

$$\Rightarrow h = 9.75 \text{ m}$$

Vertical height of cone = 9.75 m

Answer 11.

Circular base = 160m^2

$$\pi r^2 = 160$$

$$\Rightarrow r = \sqrt{\frac{160 \times 7}{22}}$$

$$\Rightarrow r = \sqrt{50.909} = 7.134\text{m}$$

Therefore, radius = 7.134 m

Capacity or volume of the tent = 600 m^3

$$\frac{1}{3} \pi r^2 h = 600$$

$$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times 7.13 \times 7.13 \times h = 600$$

$$\Rightarrow h = \frac{600 \times 3 \times 7}{7.13 \times 7.13 \times 22}$$

$$\Rightarrow h = 11.265\text{m}$$

Therefore, vertical height = 11.265 m

Now slant height (l) =

$$l = \sqrt{r^2 + h^2}$$

$$\Rightarrow l = \sqrt{7.134^2 + 11.265^2}$$

$$\Rightarrow l = \sqrt{177.624} = 13.327$$

Therefore, slant height = 13.327 m

The curved surface area =

$$\pi r l = \frac{22}{7} \times 7.134 \times 13.327 = 298.9\text{m}^2$$

Hence, the area of the canvas = 298.9 m^2

Answer 12.

Internal radius of the hollow cylinder = $r = 3.5$ cm

Height = $h = 21$ cm

Thickness of the metal = 0.5 cm

Therefore, Outer radius = $R = (3.5 + 0.5)$ cm = 4 cm

Now, Volume of metal used = $\pi(R^2 - r^2)h$

$$\begin{aligned} &= \frac{22}{7} \times 21 \times (4^2 - 3.5^2) \\ &= \frac{22}{7} \times 21 \times (16 - 12.25) \\ &= \frac{22}{7} \times 21 \times 3.75 \\ &= 247.5 \text{ cm}^3 \end{aligned}$$

Volume of metal used = 247.5 cm³

Therefore, Volume of cone = 247.5 cm³ and height = 7 cm

Let r_1 be the radius of cone.

$$\therefore \text{Volume} = \frac{1}{3} \pi r_1^2 h$$

$$\Rightarrow \frac{1}{3} \pi r_1^2 h = 247.5$$

$$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r_1^2 \times 7 = 247.5$$

$$\Rightarrow r_1^2 = \frac{247.5 \times 3 \times 7}{22 \times 7}$$

$$\Rightarrow r_1^2 = 33.75$$

$$\Rightarrow r_1 = 5.8 \text{ cm}$$

Radius of the cone = 5.8 cm

Answer 13.

height of the cylindrical part = $H = 8$ m

Height of the conical part = $h = 4$ m

Diameter = 14 m \Rightarrow radius = $r = 7$ m

Slant height of the cone = $l =$

$$l = \sqrt{r^2 + h^2}$$

$$l = \sqrt{7^2 + 4^2}$$

$$l = \sqrt{65} = 8.06\text{m}$$

Slant height of cone = 8.06 m

Area of the canvas used = Curved surface area of cylinder + curved surface area of cone

$$= 2\pi rH + \pi r l$$

$$= \left(2 \times \frac{22}{7} \times 7 \times 8\right) + \left(\frac{22}{7} \times 7 \times 8.06\right)$$

$$= 352 + 177.32$$

$$= 529.32\text{m}^2$$

Area of the canvas used = 529.32 m²

Answer 14.

Height of the cylinder = $h = 5$ m

Slant height of the cone = $l = 53$ m

Diameter = 42 m \Rightarrow radius = $r = 21$ m

Area of the canvas used = Curved surface area of cylinder + curved surface area of cone

$$\begin{aligned} &= 2\pi rh + \pi rl \\ &= \left(2 \times \frac{22}{7} \times 21 \times 5\right) + \left(\frac{22}{7} \times 21 \times 53\right) \\ &= 660 + 3498 \\ &= 4158\text{m}^2 \end{aligned}$$

Area of the canvas required = 4158 m²

Answer 15.

Height of the cylinder = $h_1 = 32$ cm

Radius of bucket = $r_1 = 18$ cm

Height of conical heap = $h_2 = 24$ cm

Let radius of conical heap = r_2

Volume of sand in the bucket = volume of sand in conical heap

$$\Rightarrow \pi \times r_1^2 \times h_1 = \frac{1}{3} \times \pi \times r_2^2 \times h_2$$

$$\Rightarrow 18 \times 18 \times 32 = \frac{1}{3} \times r_2^2 \times 24$$

$$\Rightarrow r_2^2 = \frac{10368 \times 3}{24}$$

$$\Rightarrow r_2^2 = 1296$$

$$\Rightarrow r_2 = 36\text{cm}$$

Radius of the conical heap = 36 cm

Ex 20.2**Answer 4.**

Surface area = volume

$$\Rightarrow 4\pi r^2 = \frac{4}{3}\pi r^3$$

$$\Rightarrow 3r^2 = r^3$$

$$\Rightarrow r = 3$$

Radius of the sphere = 3 units

Answer 5.

Diameter of circle = 2.8 cm \Rightarrow radius = $r = 1.4$ cm

Area of a circle = πr^2

$$= \pi (1.4)^2$$

$$= 1.96\pi$$

Surface area of sphere = $4\pi r^2$

Given,

Surface area of sphere = Area of the circle

$$\Rightarrow 4\pi r^2 = 1.96\pi$$

$$\Rightarrow r^2 = \frac{1.96}{4}$$

$$\Rightarrow r^2 = 0.49$$

$$\Rightarrow r = 0.7\text{cm}$$

Radius of the sphere = 0.7 cm

Answer 6.

lid sphere = 9 m

$$\begin{aligned}\text{Volume of sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 9 \times 9 \times 9 \\ &= 3054.857 \text{m}^3 \dots\dots\dots(i)\end{aligned}$$

Diameter of cylindrical wire = 4 m

Therefore, radius = 2 m

Let length of wire be h

$$\begin{aligned}\therefore \text{Volume} &= \pi r^2 h \\ &= \frac{22}{7} \times 2 \times 2 \times h \\ &= \frac{88h}{7} \text{m}^3 \dots\dots\dots(ii)\end{aligned}$$

From (i) and (ii)

$$\begin{aligned}\Rightarrow \frac{88h}{7} &= 3054.857 \\ \Rightarrow h &= \frac{3054.857 \times 7}{88} \\ \Rightarrow h &= 243 \text{m}\end{aligned}$$

Length of the wire = 243 m

Answer 7.

radius of sphere = 9 cm

$$\begin{aligned}\text{Volume of sphere} &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 9 \times 9 \times 9 \\ &= 3054.857 \text{ cm}^3 = 30.55 \times 10^{-4} \text{ m}^3 \dots\dots\dots (i)\end{aligned}$$

Diameter of cylindrical wire = 2 mm

Therefore, radius = 1 mm = 0.001 m

Let length of wire be h

$$\begin{aligned}\therefore \text{Volume} &= \pi r^2 h \\ &= \frac{22}{7} \times 0.001 \times 0.001 \times h \\ &= 3.142h \times 10^{-6} \text{ m}^3 \dots\dots\dots (ii)\end{aligned}$$

From (i) and (ii)

$$\begin{aligned}\Rightarrow 3.142 \times 10^{-6} h &= 30.55 \times 10^{-4} \\ \Rightarrow h &= \frac{30.55 \times 10^{-4}}{3.142 \times 10^{-6}} \\ \Rightarrow h &= 972 \text{ m}\end{aligned}$$

Length of the wire = 972 m

Answer 8.

Let r be the radii of sphere and cone.

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h \quad (h = 2r \text{ for sphere})$$

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

But h = 2r for sphere

Therefore, h = 2r for cone also.

Hence, proved.

Answer 9.

Let r, h be the radius and height of Cylinder, Cone and Sphere.

$$\text{Volume of cylinder} = \pi r^2 h$$

$$\text{Volume of sphere} = \frac{4}{3} \pi r^3 \quad (h = 2r \text{ for sphere})$$

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$\pi r^2 h : \frac{1}{3} \pi r^2 h : \frac{4}{3} \pi r^3$$

The volume of a cylinder is three times the volume of a cone with equal height and radius. The volume of a sphere is two times the volume of a cone with equal height and radius.

So the ratio of volumes is 3:1:2.

Answer 10.

of spherical marble = 1.4 cm

Therefore, radius = 0.7 cm

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

$$= \frac{4}{3} \times \pi \times (0.7)^3 \text{ cm}^3 \dots\dots\dots(i)$$

Diameter of beaker = 7 cm

Therefore, radius = 3.5 cm

Height of water = 5.6 cm

$$\text{Volume of water} = \pi r^2 h$$

$$= \pi \times (3.5)^2 \times 5.6 \text{ cm}^3 \dots\dots\dots(ii)$$

$$\text{No. of balls dropped} = \frac{\text{Volume of water}}{\text{Volume of ball}}$$

$$\begin{aligned} &= \frac{\pi \times (3.5)^2 \times 5.6}{\frac{4}{3} \times \pi \times (0.7)^3} \\ &= \frac{3 \times (3.5)^2 \times 5.6}{4 \times (0.7)^3} \\ &= 150 \end{aligned}$$

No. of balls dropped = 150

Answer 11.

Radius of sphere = 10 cm

$$\begin{aligned}\text{Volume of sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 10 \times 10 \times 10 \text{cm}^3 \\ &= 4190.476 \text{cm}^3\end{aligned}$$

Therefore, volume of water = 4190.476 cm³

Radius of base of cylinder = 20 cm

Let h be the height of the water

$$\begin{aligned}\Rightarrow \pi r^2 h &= 4190.476 \\ \Rightarrow \frac{22}{7} \times 20 \times 20 \times h &= 4190.476 \\ \Rightarrow 1257.143h &= 4190.476 \\ \Rightarrow h &= 3.33 \text{cm}\end{aligned}$$

Increase in water level = 3.33 cm

Answer 12.

one = 8 cm

Radius = 5 cm

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

$$= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 8 \text{ cm}^3$$

$$= \frac{4400}{21} \text{ cm}^3$$

Therefore, volume of water that flowed out =

$$= \frac{1}{4} \times \frac{4400}{21} \text{ cm}^3$$

$$= \frac{1100}{21} \text{ cm}^3$$

Radius of each ball = 0.5 cm = $\frac{1}{2}$ cm

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

$$= \frac{4}{3} \times \frac{22}{7} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \text{ cm}^3$$

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

$$\text{Therefore, No. of balls} = \frac{1100}{21} \div \frac{11}{21} = 100$$

Hence, number of lead balls = 100

Answer 13.

Radius = 10 cm

$$\begin{aligned}\text{Total surface area} &= 3\pi r^2 \\ &= 3 \times \frac{22}{7} \times 10 \times 10 \text{cm}^2 \\ &= 942.86 \text{cm}^2\end{aligned}$$

$$\begin{aligned}\text{Volume of hemisphere} &= \frac{2}{3}\pi r^3 \\ &= \frac{2}{3} \times 3.14 \times 10 \times 10 \times 10 \text{cm}^3 \\ &= 2093.3 \text{cm}^3\end{aligned}$$

Total surface area = 942.86 cm² and volume = 2093.3 cm³

Answer 14.

Diameter of the hemispherical dome = 10 m

Therefore, radius of dome = 5 m

$$\begin{aligned}\text{Curved surface area} &= 2\pi r^2 \\ &= 2 \times \frac{22}{7} \times 5 \times 5 \\ &= 157.14 \text{m}^2\end{aligned}$$

Cost of painting one sq. metre = Rs. 1.40

$$\begin{aligned}\text{Cost of painting } 157.14 \text{ m}^2 &= \text{Rs.}(1.40 \times 157.14) \\ &= \text{Rs. } 219.99 = \text{Rs } 220\end{aligned}$$

Therefore, cost of painting the dome = Rs 220

Answer 15.

$$\text{Diameter of the sphere} = 3\frac{1}{3} \text{ cm} = \frac{10}{3} \text{ cm}$$

$$\text{Therefore, radius} = \frac{5}{3} \text{ cm}$$

$$\text{Total curved surface area of each hemisphere} = 3\pi r^2$$

$$\begin{aligned} &= 3 \times \frac{22}{7} \times \frac{5}{3} \times \frac{5}{3} \\ &= 26.19 \text{ cm}^2 \end{aligned}$$

$$\text{Total curved surface area of each hemisphere} = 26.19 \text{ cm}^2$$

Answer 16.

diameter of the room = height of the hall $\Rightarrow 2r = h$

Volume of the hall =

But $r = h/2$

$$\Rightarrow \pi \frac{h^2}{4} h + \frac{2}{3} \pi \frac{h^3}{8} = 5236$$

$$\Rightarrow \pi \frac{h^3}{4} + \frac{2}{24} \pi h^3 = 5236$$

$$\Rightarrow \pi h^3 \left(\frac{1}{4} + \frac{2}{24} \right) = 5236$$

$$\Rightarrow \pi h^3 = \frac{5236 \times 24}{8}$$

$$\Rightarrow h^3 = \frac{5236 \times 24 \times 7}{8 \times 22}$$

$$\Rightarrow h^3 = 4998$$

$$\Rightarrow h = 17.09 \text{ m}$$

Height of the hall = 17.09 m

Answer 17.

Inner diameter = 8 cm

Inner radius = r = 4 cm

Outer radius = R = 4cm + 1cm thick material = 5 cm

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

$$\begin{aligned} \text{Required Volume} &= \frac{4}{3}\pi(R^3 - r^3) \\ &= \frac{4}{3} \times \frac{22}{7} \times (5^3 - 4^3) \\ &= \frac{4}{3} \times \frac{22}{7} \times 61 \\ &= 255.6\text{cm}^3 \end{aligned}$$

Required volume = 255.6 cm³

Answer 18.

diameter = 8 cm

Therefore, Radius (R) = 4 cm

Internal diameter = 4 cm

Therefore, Radius (r) = 2 cm

$$\begin{aligned} \text{Volume of metal used} &= \frac{4}{3}\pi(R^3 - r^3) \\ &= \frac{4}{3} \times \frac{22}{7} \times (4^3 - 2^3) \\ &= \frac{4}{3} \times \frac{22}{7} \times 56 \\ &= 234.66\text{cm}^3 \dots\dots\dots(i) \end{aligned}$$

Diameter of the cone = 8 cm

Therefore, radius = 4 cm

Let height of the cone = h

$$\text{Volume} = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 4 \times 4 \times h = \frac{352h}{21} \dots\dots(ii)$$

From (i) and (ii)

$$\begin{aligned} \Rightarrow \frac{352h}{21} &= 234.66 \\ \Rightarrow 352h &= 4927.86 \\ \Rightarrow h &= 13.99\text{cm} = 14\text{cm} \end{aligned}$$

The height of the cone = 14 cm

Answer 19.

External diameter of hollow sphere = 12 cm

External radius = R = 6 cm

Internal diameter of hollow sphere = (12 - 4) cm = 8 cm

Internal radius = r = 4 cm

$$\text{Volume of metal used} = \frac{4}{3}\pi(R^3 - r^3)$$

$$= \frac{4}{3} \times \frac{22}{7} \times (6^3 - 4^3)$$

$$= \frac{4}{3} \times \frac{22}{7} \times 152$$

$$= 636.95 \text{ cm}^3$$

Volume of metal used = 636.95 cm³ = volume of solid sphere

$$\Rightarrow \frac{4}{3}\pi r^3 = 636.95$$

$$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3 = 636.95$$

$$\Rightarrow r^3 = \frac{636.95 \times 3 \times 7}{4 \times 22}$$

$$\Rightarrow r^3 = 151.99 = 152$$

$$\Rightarrow r = 5.34 \text{ cm}$$

Radius of the solid sphere = 5.34 cm

Answer 20.

Radius of hemispherical part (r) = 3.5 m = $\frac{7}{2}$ m

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

$$\begin{aligned} &= \frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} \\ &= \frac{539}{6} \text{ m}^3 \end{aligned}$$

Volume of conical part = $\frac{2}{3} \times \frac{539}{6} \text{ m}^3$ (2/3 of hemisphere)

Let height of the cone = h

Then,

$$\begin{aligned} \frac{1}{3}\pi r^2 h &= \frac{2 \times 539}{3 \times 6} \\ \Rightarrow \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h &= \frac{2 \times 539}{3 \times 6} \\ \Rightarrow h &= \frac{539 \times 2 \times 2 \times 7 \times 3}{3 \times 6 \times 22 \times 7 \times 7} \\ \Rightarrow h &= \frac{14}{3} \text{ m} = 4\frac{2}{3} \text{ m} = 4.67 \text{ m} \end{aligned}$$

Height of the cone = 4.67 m

Surface area of buoy = $2\pi r^2 + \pi r l$

But $l = \sqrt{r^2 + h^2}$

$$\begin{aligned} l &= \sqrt{\left(\frac{7}{2}\right)^2 + \left(\frac{14}{3}\right)^2} \\ &= \sqrt{\frac{49}{4} + \frac{196}{9}} = \sqrt{\frac{1225}{36}} = \frac{35}{6} \text{ m} \end{aligned}$$

Therefore, Surface area =

$$\begin{aligned} &= \left(2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right) + \left(\frac{22}{7} \times \frac{7}{2} \times \frac{35}{6}\right) \text{ m}^2 \\ &= \frac{77}{1} + \frac{385}{6} = \frac{847}{6} \\ &= 141.17 \text{ m}^2 \end{aligned}$$

Answer 21.

Radius of solid cylinder (r) = 2 cm

Height of cylinder (h) = 45 cm

$$\begin{aligned} \text{Volume of cylinder} &= \pi r^2 h \\ &= \frac{22}{7} \times 2 \times 2 \times 45 \\ &= \frac{3960}{7} \text{ cm}^3 \end{aligned}$$

Diameter of metallic sphere = 6 cm

Therefore, Radius (r1) = 3 cm

$$\begin{aligned} \text{Volume of sphere} &= \frac{4}{3} \pi (r1)^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 \\ &= \frac{792}{7} \text{ cm}^3 \end{aligned}$$

$$\text{Therefore, No. of spheres} = \frac{3960}{7} \div \frac{792}{7} = 5$$

Number of spheres that can be made = 5

Answer 22.

Radius of cone = 15 cm

Height of cone = 36 cm

Curved surface of the cone = $\pi r l$

$$l = \sqrt{r^2 + h^2} = \sqrt{15^2 + 36^2} = \sqrt{1521} = 39$$

$$\text{Curved surface of cone} = \frac{22}{7} \times 15 \times 39 = 1838.571 \text{ cm}^2$$

Curved surface of cone = curved surface of sphere

$$\begin{aligned} \Rightarrow 4\pi r^2 &= 1838.571 \\ \Rightarrow 4 \times \frac{22}{7} \times r^2 &= 1838.571 \\ \Rightarrow r^2 &= \frac{1838.571 \times 7}{4 \times 22} \\ \Rightarrow r^2 &= 146.25 \\ \Rightarrow r &= 12.09 \text{ cm} \end{aligned}$$

The radius of the sphere = 12.09 cm