EXERCISE 15D

Answer 1:

(i)

radius (r) = 3.5 cm

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

$$= \frac{4}{3} \times \left(\frac{22}{7}\right) \times (3.5)^3 cm^3$$

$$= 179.67\ cm^3$$

Surface area of Sphere $= 4\pi r^2$ sq. Unit

$$= 4 \times \left(\frac{22}{7}\right) \times (3.5)^2 cm^2$$

$$= 154\ cm^2$$

(ii)

radius (r) = 4.2 cm

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

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

$$= 310.464\ cm^3$$

Surface area of Sphere $= 4\pi r^2$ sq. Unit

$$= 4 \times \left(\frac{22}{7}\right) \times (4.2)^2 cm^2$$

$$= 221.76\ cm^2$$

(iii)

radius (r) = 5 cm

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

$$= \frac{4}{3} \times \left(\frac{22}{7}\right) \times (5)^3 cm^3$$

$$= 523.81 \text{ cm}^3$$

Surface area of Sphere $= 4\pi r^2$ sq. Unit

$$= 4 \times \left(\frac{22}{7}\right) \times (5)^2 cm^2$$

$$= 314.28 \text{ cm}^2$$

Answer 2:

Volume of sphere $= \frac{4}{3}\pi r^3 = 38808 \text{ cm}^3$ (Given $V = 38808 \text{ cm}^3$)

$\Rightarrow \frac{4}{3} \times \left(\frac{22}{7}\right) \times (r)^3 = 38808$

$r^3 = 9261$

$\Rightarrow \quad r = \sqrt[3]{9261}$

$r = 21$ cm

Surface area of Sphere $= 4\pi r^2$ sq. Unit

$$= 4 \times \left(\frac{22}{7}\right) \times (21)^2 cm^2$$

$$= 5544 \text{ cm}^2$$

Answer 3:

Volume of sphere $= \frac{4}{3}\pi r^3 = 606.375 \text{ m}^3$ (Given $V = 606.375 \text{ m}^3$)

$\Rightarrow \frac{4}{3} \times \left(\frac{22}{7}\right) \times (r)^3 = 606.375$

$r^3 = 144.703125$

$\Rightarrow \quad r = \sqrt[3]{144.703125}$

$r = 5.25$ m

Surface area of Sphere $= 4\pi r^2$ sq. Unit

$= 4 \times \left(\frac{22}{7}\right) \times (5.25)^2 m^2$

$= 346.5\ m^2$

Answer 4:

let radius of sphere = r cm

Surface area of Sphere $= 4\pi r^2 = 154\ cm^2$ (Given $S = 154cm^2$)

$4 \times \left(\frac{22}{7}\right) \times (r)^2 = 154$

$r^2 = \frac{49}{4}$

$r = \frac{7}{2} cm = 3.5$ cm

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

$\Rightarrow = \frac{4}{3} \times \left(\frac{22}{7}\right) \times (3.5)^3 cm^3$

$\Rightarrow \quad = 179.67\ cm^3$

Answer 5:

let radius of sphere = r cm

Surface area of Sphere $= 4\pi r^2 = 576\pi\ cm^2$ (Given $S = 576\pi cm^2$)

$4 \times \pi \times (r)^2 = 576\pi$

$r^2 = 144$

$r = 12$ cm

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

$\Rightarrow \frac{4}{3} \times \pi \times (12)^3 \text{cm}^3 = 2304\pi \text{cm}^3$

Answer 6:

Given :

diameter of leadshot = 3 mm

$\Rightarrow$ radius (r) = 1.5 mm = 0.15 cm

dimension of cubiod = 12 cm x 11 cm x 9 cm

Volume of Cuboid = no of lead shots x volume of 1 lead shot

$\Rightarrow$ no of lead shots $= \frac{Volume of Cuboid}{volume of 1 leadshot}$

$= \frac{(12 \times 11 \times 9)}{\left(\frac{4}{3}\right) \times \left(\frac{22}{7}\right) \times (0.15)^3}$

$= \frac{(12 \times 11 \times 9 \times 3 \times 7)}{4 \times 22 \times (0.15) \times (0.15) \times (0.15)}$

$= 84000$

Answer 7:

Given :

radius (r) of one lead ball = 1 cm

radius (R) of sphere = 8 cm

Volume of Sphere = no of lead balls x volume of 1 lead ball

$\Rightarrow$ no of lead balls $= \frac{Volume of Sphere}{volume of 1 lead ball}$

$$= \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\left(\frac{4}{3}\right)\times\pi\times r^3}$$

$\Rightarrow \frac{R^3}{r^3} = \frac{8^3}{1^3} = 512$

Answer 8:

Given :

radius (R) of sphere $= 3$ cm

diameter of balls $= 0.6$ cm

$\therefore$ radius (r) of balls $= 0.3$ cm

Volume of Solid Sphere = no of small balls casted x volume of 1 small ball

$\Rightarrow$ no of small balls $= \frac{Volume of Sphere}{volume of 1 lead ball}$

$$= \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\left(\frac{4}{3}\right)\times\pi\times r^3}$$

$\Rightarrow \frac{R^3}{r^3} = \frac{3^3}{(0.3)^3} = 1000$

Answer 9:

Given :

radius (R) of sphere $= 10.5$ cm

radius (r) of cones $= 3.5$ cm

height of cone (h) = 3 cm

Volume of Sphere = no of cones casted x volume of 1 small cone

$\Rightarrow$ no of cones $= \frac{Volume of Sphere}{volume of 1 small cone}$

$$= \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\left(\frac{1}{3}\right)\times\pi\times r^2\times h}$$

$$= \frac{4\times R^3}{r^2\times h} = \frac{4\times(10.5)^3}{(3.5)^2\times 3} = 126$$

Answer 10:

Given :

Diameter of sphere = 12 cm

$\Rightarrow$ radius (r) of sphere = 6 cm

Diameter of cylinder = 8 cm

$\Rightarrow$ radius of cylinder (R) = 4 cm

height of cylinder (H) = 90cm

Volume of Cylinder = no of sphere x volume of onesphere

$\Rightarrow$no of sphere $= \frac{Volume of Cylinder}{volume of 1 sphere}$

$$= \frac{\pi\times R^2\times H}{\left(\frac{4}{3}\right)\times\pi\times r^3}$$

$$= \frac{3\times R^2\times H}{4\times r^3} = \frac{3\times(4)^2\times 90}{4\times(6)^3} = 5$$

Answer 11:

Given :

Diameter of sphere $= 6$ cm

$\Rightarrow$radius of sphere (R) $= 3$ cm

Diameter of wire $= 2$mm

$\Rightarrow$ radius of wire (r) $= 1\text{mm} = 0.1$ cm

let the length of wire is h cm

Volume of Wire $=$ volume of Sphere

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

$\Rightarrow h = \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\pi\times r^2}$

$= \frac{4\times R^3}{3\times r^2}$

$= \frac{4\times 3^3}{3\times(0.1)^2} = \frac{36}{0.01}$

$=$ 3600 cm $= 36$ m

Answer 12:

Given :

Diameter of sphere $= 18$ cm

$\Rightarrow$radius of sphere (R) $= 9$ cm

length of wire (h) $= 108$ m $= 10800$ cm

let the radius of wire is r cm

Volume of Wire = volume of Sphere

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

$\Rightarrow r^2 = \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\pi\times h}$

$= \frac{4\times R^3}{3\times h}$

$= \frac{4\times 9^3}{3\times 10800}$

$r^2 = \frac{9}{100}$

$\Rightarrow \quad r = \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3$ cm

diameter of wire = 2 x radius of wire

= 2 x r = 2 x 0.3

= 0.6 cm

Answer 13:

Given :

Diameter of sphere = 15.6cm

$\Rightarrow$ radius of sphere (R) = 7.8 cm

length of cone (h) = 31.2cm

let the radius of base of cone is r cm

Volume of Cone = volume of Sphere

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

$\Rightarrow r^2 = \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\left(\frac{1}{3}\right)\times\pi\times h}$

$= \frac{4\times R^3}{h}$

$= \frac{4\times(7.8)^3}{31.2}$

$r^2 = 60.84$

$\Rightarrow r = \sqrt{60.84} = 7.8$ cm

diameter of base of Cone = 2 x radius of base of Cone

= 2 x r = 2 x 7.8

= 15.6 cm

Answer 14:

Given :

Diameter of sphere = 28 cm

$\Rightarrow$ radius of sphere (R) = 14 cm

Diameter of cone = 35cm

$\Rightarrow$ radius of cone (r) = 17.5cm

let the height of cone is h cm

Volume of Cone = Volume of Sphere

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

$\Rightarrow h = \frac{\left(\frac{4}{3}\right)\times\pi\times R^3}{\left(\frac{1}{3}\right)\times\pi\times r^2}$

$= \frac{4\times R^3}{r^2}$

$= \frac{4\times 14^3}{(17.5)^2} = \frac{10976}{306.25}$cm

$= 35.84$ cm

Answer 15:

Given :

radius of big ball(R) = 3 cm

radius of first ball (r_1) = 1.5cm

radius of second ball (r_2) = 2cm

let radius of third ball is $r_3$cm

Volume of Big Ball = Volume of first ball + Volume of Second ball + Volume ofthird ball

$\frac{4}{3}\pi R^3 = \frac{4}{3}\pi r_1^3 + \frac{4}{3}\pi r_2^3 + \frac{4}{3}\pi r_3^3$

$\frac{4}{3}\pi R^3 = \frac{4}{3}\pi(r_1^3 + r_2^3 + r_3^3)$

$R^3 = (r_1^3 + r_2^3 + r_3^3)$

$3^3 = \{(1.5)^3 + (2)^3 + r_3^3\}$

$27 = 3.375 + 8 + r_3^3$

$r_3^3 = 27 - 11.375$

$r_3^3 = 15.625$

$r_3 = \sqrt[3]{15.625} = 2.5$ cm

radius of third ball = 2.5 cm

Answer 16:

let the radii of first sphere is x cm and second sphere is y cm and Surface area is S_1 and S_2.

$\frac{x}{y} = \frac{1}{2}$ (Given)

$\Rightarrow$ $y = 2x$ ..... eq.(i)

so , $\frac{S1}{S2} = \frac{x}{y}$

$= \frac{x^2}{y^2} = \frac{x^2}{(2x)^2}$ [From eq(i)]

$= \frac{1}{4}$

$\Rightarrow S_1 : S_2 = 1:4$

Answer 17:

let the radii of twosphere is r and R , Volume is V_1 and V_2respectively

then,

$$\frac{4\pi r^2}{4\pi R^2} = \frac{1}{4} \qquad \text{(Given)}$$

$$\Rightarrow \frac{r^2}{R^2} = \frac{1}{4}$$

$$\Rightarrow \frac{r}{R} = \frac{1}{2} \qquad \ldots\ldots\ldots\ldots \text{ eq(i)}$$

so , $\frac{V1}{V2} = \frac{\left(\frac{4}{3}\right)\times\pi\times r^3}{\left(\frac{4}{3}\right)\times\pi\times R^3}$

$$= \left(\frac{r}{R}\right)^3$$

$$= \left(\frac{1}{2}\right)^3 \qquad \text{[From eq(i)]}$$

$$= \frac{1}{8}$$

$\Rightarrow V_1 : V_2 = 1:8$

Answer 18:

Given:

radius of cylindrical tub(R) = 12 cm

depth of tub = 20 cm

level of water raise (h) = 6.75 cm

let the radius of ball is r

Volume of iron ball = volume of water raised

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

$\Rightarrow \quad r^3 = \frac{3\times R^2\times h}{4}$

$= \frac{4}{3} = \frac{2916}{4}$

$r^3 = 729$

$\Rightarrow \quad r = 9$ cm

Answer 19:

Given:

radius of cylindrical bucket (R) = 15 cm

height of bucket = 20 cm

radius of ball (r) = 9 cm

let the increase in water level is x

Volume of water raised = volume of spherical ball

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

$\Rightarrow \quad x = \frac{4\times r^3}{3\times R^2}$

$\Rightarrow \quad = \frac{4\times 9^3}{3\times 15^2}$

$= \frac{2916}{675}$

$x = 4.32$ cm

Answer 20:

Given:

Outer Diameter of shell $= 12$ cm

$\Rightarrow$Outer radius of shell(R) $= 6$ cm

Inner Diameter of shell $= 8$cm

$\Rightarrow$Inner radius of shell (r) $= 4$cm

Volume of outer Shell $= \frac{4}{3}\pi R^3$

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

$= 905.15\ cm^3$

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

$= \frac{4}{3} \times \left(\frac{22}{7}\right) \times 4^3$

$= 268.20\ cm^3$

so, Volume of metal contained in shell = (Volume of outer Shell) - (Volume of inner Shell)

$= (905.15) - (268.20)\ cm^3$

$= 636.95\ cm^3$

Outer Surface area $= 4\pi R^2$ sq. unit

$= 4 \times \left(\frac{22}{7}\right) \times 6^2\ cm^2$

$= 452.57\ cm^2$

Answer 21:

Given:

Externalradii of shell(R) = 9 cm

Internalradii of shell(r) = 8 cm

density of metal (d) = 4.5 gm per cm^3

Volume of hollow shell $= \frac{4}{3} \times \pi \times (R^3 - r^3)$

$$= \frac{4}{3} \times \left(\frac{22}{7}\right) \times (9^3 - 8^3) cm^3$$

$$= \frac{4}{3} \times \left(\frac{22}{7}\right) \times 6^3 \ cm^3$$

$$= \frac{4}{3} \times \left(\frac{22}{7}\right) \times 217 \ cm^3$$

$$= 909.33 \ cm^3$$

Density $= \frac{Weight}{Volume}$

∴ Weight = Volume x Density

$$= 909.33 \times 4.5 \ g$$

= 4092 g

= 4.092 kg (1 kg = 1000 g)

Answer 22:

Given:

radius of hemisphere (R) = 9 cm

Height of cone (h) = 72 cm

let the base radius of cone is r.

Volume of Cone = volume of hemisphere

$\Rightarrow \quad \frac{1}{3}\pi r^2 h = \frac{2}{3}\pi R^3$

$\left(\frac{1}{3}\right) \times \pi \times r^2 \times 72 = \left(\frac{2}{3}\right) \times \pi \times 9^3$

$\Rightarrow r^2 = \frac{2\times9\times9\times9}{72}$

$= \frac{1458}{72}$

$r^2 = 20.25$

$\Rightarrow \quad r = 4.5$ cm

base radius of cone $= 4.5$ cm

Answer 23:

Given:

Radius of hemispherical bowl (R) $= 9$ cm

diameter of bottle $= 3$ cm

$\Rightarrow$ radius of bottle (r) $= 1.5$ cm

Height of bottle(h) $= 4$ cm

No. Of bottles $= \frac{Volume of bowl}{Volume of one bottle}$

$= \frac{\left(\frac{2}{3}\right)\times\pi\times(9)^3}{\pi\times(1.5)^2\times4}$

$= \left(\frac{2\times3\times81}{9}\right)$

$= 54$

Answer 24:

Given:

$$\text{internalRadius of bowl (r)} = 4 \text{ cm}$$

$$\text{thickness of bowl(t)} = 0.5 \text{ cm}$$

⇒ External radius of bowl (R) = Internal radius + thickness

$$= (r + t) \text{ cm}$$

$$= (4+0.5) \text{ cm} = 4.5 \text{ cm}$$

Volume of steel used = Volume of outer hemisphere – Volume of Inner hemisphere

$$\Rightarrow \quad = \frac{2}{3}\pi R^3 - \frac{2}{3}\pi r^3$$

$$= \frac{2}{3}\pi(R^3 - r^3)$$

$$= \left(\frac{2}{3}\right) \times \pi \times ((4.5)^3 - (4)^3)$$

$$= \left(\frac{2}{3}\right) \times \left(\frac{22}{7}\right) \times 27.125$$

$$= 56.83 \text{ cm}^3$$

Answer 25:

Given:

$$\text{innerRadius of bowl (r)} = 5 \text{ cm}$$

$$\text{thickness of bowl(t)} = 0.25 \text{ cm}$$

⇒ Outer radius of bowl (R) = Internal radius + thickness

$$= (r + t) \text{ cm}$$

$$= (5+0.25) \text{ cm} = 5.25 \text{ cm}$$

Outer Curved surface = $2\pi R^2$ sq. Unit

$= 2 \times \left(\frac{22}{7}\right) \times (5.25)^2$

$= 173.25 \text{ cm}^2$

Answer 26:

Given:

$\text{innerdiameter of bowl} = 10.5 \text{ cm}$

$\Rightarrow$ inner Radius of bowl (r) $= 5.25$ cm

Inner Curved surface area of bowl $= 2\pi r^2$

$=2 \times \left(\frac{22}{7}\right) \times (5.25)^2$

$= 173.25 \text{ cm}^2$

Cost of painting 100 cm^2 = Rs. 32

$\Rightarrow$ for 173.25 cm^2 = Rs. $(\frac{32 \times 173.25}{100})$

= Rs. 55.44

Answer 27: let the diameter of earth is d

$\Rightarrow$ $\text{radius} = \frac{d}{2}$

thus, diameter of moon will be $\frac{2}{3}$

$\Rightarrow$ $\text{radius of moon} = \frac{d}{8}$

$\frac{Volume of earth}{Volume of moon} = \frac{\left(\frac{4}{3}\right) \times \pi \times \left(\frac{d}{2}\right)^3}{\frac{4}{3} \times \pi \times \left(\frac{d}{8}\right)^3}$

$= \frac{\left(\frac{d^3}{8}\right)}{\left(\frac{d^3}{512}\right)} = \frac{d}{8}$

$= 64$

$\Rightarrow Volume of moon = \frac{1}{64} \times Voulme of Earth$

Answer 28:

Volume of Solid hemisphere = Surface area of solid hemisphere (Given)

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

$r = \frac{9}{2}$ unit

$\Rightarrow$ diameter $= 2 \times r = 2 \times \frac{9}{2} = 9$ unit