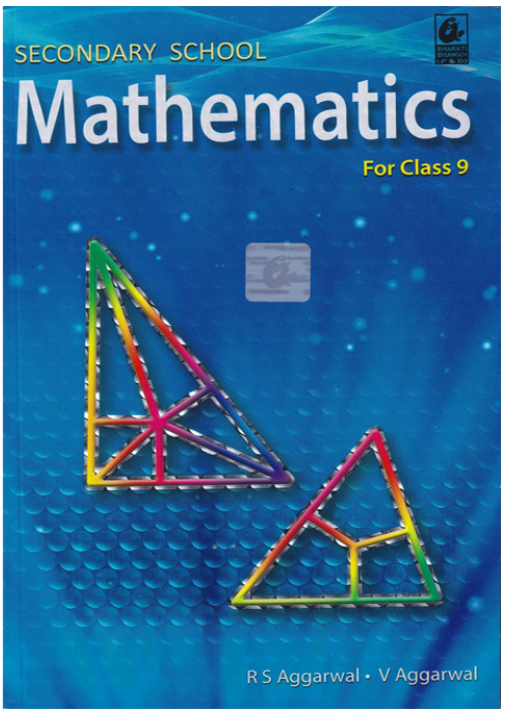
RS Aggarwal Solutions for Class 9 Maths Chapter 13–Volume and Surface Area

Class 9 - Chapter 13 Volume and Surface Area



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RS Aggarwal Solutions for Class 9 Maths Chapter 13–Volume and Surface Area

Class 9: Maths Chapter 13 solutions. Complete Class 9 Maths Chapter 13 Notes.

RS Aggarwal Solutions for Class 9 Maths Chapter 13–Volume and Surface Area

RS Aggarwal 9th Maths Chapter 13, Class 9 Maths Chapter 13 solutions

Ex 13A

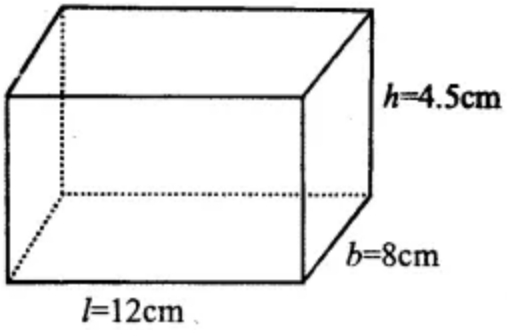
Question 1.

Solution:

(i) Length of cuboid (l) = 12cm

Breadth (b) = 8cm

and height (h) = 4.5cm



(a) $\therefore$ Volume $= l.b.h = 12 \times 8 \times 4.5\ cm^3$
$= 432\ cm^3$

(b) Lateral surface area $= 2(l + b)\ h$
$= 2(12 + 8) \times 4.5\ cm^2$
$= 2 \times 20 \times 4.5 = 180\ cm^2$

(c) Total surface area $= 2(lb + bh \times hl)$
$= 2[12 \times 8 + 8 \times 4.5 + 4.5 \times 12]$
$= 2[96 + 36 + 54]\ cm^2$
$= 2 \times 186 = 372\ cm^2$

(ii) Length of cuboid $(l) = 26m$
Breadth $(b) = 14$ m
and height $(h) = 6.5$ m

(a) volume = $l.b.h.$ = $26 \times 14 \times 6.5$ m^3
= 2366 m^3

(b) Lateral surface area = $2(l + b)\, h$
= $2(26 + 14) \times 6.5$ cm^2
= $2 \times 40 \times 6.5$ m^2
= 520 m^2

(c) Total surface area = $2(lb + bh + hl)$
= $2\{26 \times 14 + 14 \times 6.5 + 6.5 \times 26\}$
= $2\{364 + 91 + 169\} = 2 \times 624$ m^2
= 1248 m^2 Ans.

(iii) Length of cuboid (l) = 15m
Breadth (b) = 6m

and height (h) = 5dm = $\frac{5}{10}$ m

(a) Volume = $l.b.h = 15 \times 6 \times \frac{5}{10} = 45m^3$

(b) Lateral surface area = $2\{l + b\}\, h$

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$= 2\ (15 + 6) \times \frac{5}{10}\ m^2$

$= 2 \times 21 \times \frac{1}{2} = 21\ m^2$

Total surface area $= 2(lb + bh + hl)$

$= 2(15 \times 6 + 6 \times \frac{5}{10} + \frac{5}{10} \times 15]$

$= 2[90 + 3 + \frac{15}{2}]\ m^2$

$= 2\left(\frac{180+6+15}{2}\right)\ m^2$

$= 201\ m^2$ Ans.

(iv) Length of cuboid $(l) = 24m$

Breadth $(b) = 25cm = \frac{25}{100} = \frac{1}{4}\ m$

and Height $(h) = 6m$.

(a) volume $= l.b.h. = 24 \times \frac{1}{4} \times 6 = 36\ m^3$

(b) Lateral surface area $= 2(l + b) \times h$

$= 2(24 + \frac{1}{4}) \times 6\ m^2$

$= 2 \times \frac{97}{4} \times 6 = 291\ m^2$

(c) Total surface area $= 2(lb + bh + hl)$

$= 2(24 \times \frac{1}{4} + \frac{1}{4} \times 6 + 6 \times 24)$

$= 2(6 + \frac{3}{2} + 144)\ m^2$

$= 2\left(\frac{12+3+288}{2}\right) = 303\ m^2$ Ans.

Question 2.

Solution:

Length of closed rectangular cistern (l) = 8m

breadth (b) = 6m

and depth (b) = 2.5m.

(i) .'. Volume of cistern = l.b.h.

= 8 x 6 x 2.5 m^3 = 120m^3

(ii) Total surface area = 2(lb + bh + hl)

= 2(8 x 6 + 6 x 2.5 + 2.5 x 8) cm^2

= 2(48 + 15 + 20)

= 2 x 83 m²

= 166 m² Ans.

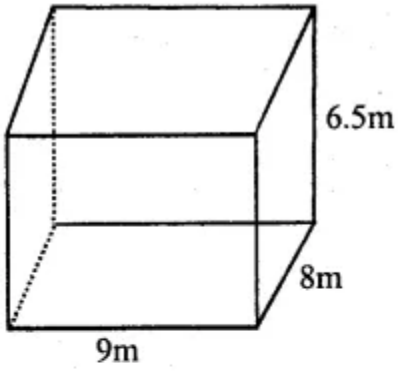
Question 3.

Solution:

Length of room (l) = 9m

Breadth (b) = 8m

and height (h) = 6.5m



Area of 4 walls = $2(l + b) \times h$

$= 2(9 + 8) \times 6.5\ m^2$

$= 2 \times 17 \times 6.5 = 221 m^2$

Area of 1 door = $(2 \times 1.5 \times 1) m^2 = 3m^2$

Area of 2 windows = $2 \times 1.5 \times 1 = 3m^2$

∴ Area of remaining walls = $(221 - 3 - 3) m^2$

$= 221 - 6 = 215\ m^2$

Rate of white washing = 6.40 per sq. m.

Total cost = Rs. 215 × 6.40

= Rs. 1376 Ans.

Question 4.

Solution:

Length of pit (l) = 20m

Breadth (b) = 6m

$$\text{and depth } (h) = 80\text{cm} = \frac{80}{100} = \frac{4}{5}\text{m}$$

$$\therefore \quad \text{Volume (capacity) of pit} = l.b.h.$$

$$= 20 \times 6 \times \frac{4}{5}\ \text{m}^3$$

$$= 96\text{m}^3$$

Volume of one plank of dimension (5m × 25cm × 10cm)

$$= 5 \times \frac{25}{100} \times \frac{10}{100}\ \text{m}^3$$

$$= \frac{1}{8}\ \text{m}^3$$

$$\text{No. of planks} = \frac{\text{Total volume}}{\text{Volume of one plank}}$$

$$= \frac{96}{\frac{1}{8}} = \frac{96 \times 8}{1} = 768 \quad \text{Ans.}$$

Question 5.

Solution:

Length of wall (l) = 8m.

Width (b) = 22.5 cm = 22510X100=940m

and height (h) = 6m.

Volume of wall = l.b.h.

$$= 8 \times \frac{9}{40} \times 6 = \frac{54}{5}\ m^3$$

volume of one brick = 25cm × 11.25 cm × 6cm

$$= \left(\frac{25}{100} \times \frac{11.25}{100} \times \frac{6}{100}\right)\ m^3$$

$$= \left(\frac{1}{4} \times \frac{1125}{100 \times 100} \times \frac{6}{100}\right)\ m^3$$

$$= \frac{27}{16000}\ m^3$$

$\therefore$ Number of bricks

$$= \frac{\text{Total volume of wall}}{\text{Volume of one brick}}$$

$$= \frac{54}{5} \div \frac{27}{16000} = \frac{54}{5} \times \frac{16000}{27}$$

$= 6400$ Ans.

Question 6.

Solution:

Length of wall (l) = 15m.

Width (b) = 30cm = 30100=310m

Height (h) = 4m

$\therefore$ Volume of wall = $l.b.h.$ = $15 \times \frac{3}{10} \times 4m^3 = 18m^3$

Volume of mortar used in wall = $\frac{1}{12}$ of $18m^3 = \frac{3}{2}m^3$

$\therefore$ Volume of only bricks = $18 - \frac{3}{2} = \frac{36-3}{2} = \frac{33}{2}m^3$

Volume of one brick measuring (22cm × 12.5cm × 7.5cm)

$= \frac{22}{100} \times \frac{125}{10 \times 100} \times \frac{75}{10 \times 100} m^3 = \frac{33}{16000} m^3$

$\therefore$ Number of bricks

$= \frac{\text{Volume of wall except mortar}}{\text{Volume of one brick}}$

$= \frac{33}{2} \div \frac{33}{16000}$

$= \frac{33}{2} \times \frac{16000}{33} = 8000$ Ans.

Question 7.

Solution:

Outer length of opened cistern = 1.35m = 135 cm

Breadth = 1.08 m = 108 cm

Depth = 90cm

Thickness of iron = 2.5cm.

$\therefore$ Inner length $(l) = 135 - 2 \times 2.5 = 135 - 5 = 130$ cm

Breadth $(b) = 108 - 2 \times 2.5 = 108 - 5 = 103$ cm

and depth $(h) = 90 - 2.5 = 87.5$ cm

$\therefore$ Capacity of cistern $= 130 \times 103 \times 87.5$ cm^3

$= 1171625$ cm^3

Total volume of cistern $= 135 \times 108 \times 90$ cm^3

$= 1312200$ cm^3

$\therefore$ Volume of iron used $= 1312200 -$ i171625

$= 140575$ cm^3 Ans.

Question 8.

Solution:

Depth of river = 2m

width = 45m.

Length of current in 60 minutes = 3km

$$\frac{3\text{km}}{60} = \frac{1}{20}\text{km}$$

$$= \frac{1}{20} \times 1000 = 50 \text{ m}$$

$\therefore$ Volume of water per minute

$= l.b.h = 50 \times 2 \times 45 \text{ m}^3$

$= 4500 \text{ m}^3$ Ans.

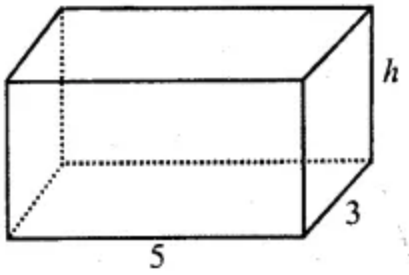
Question 9.

Solution:

Total cost of box = Rs. 1620

Rate per sq. m = Rs. 30

$\therefore$ Total surface area $= \frac{1620}{30} = 54\text{m}^2$



Length of box (l) = 5m
Width (b) = 3m
Let h be the height of the box

$\therefore$ Total surface area $= 2(lb + bh + hl)$

$\therefore$ $2(lb + bh + hl) = 54$

$\Rightarrow$ $2(5 \times 3 + 3h + h \times 5) = 54$

$\Rightarrow$ $2(15 + 3h + 5h) = 54$

$\Rightarrow$ $30 + 16h = 54$

$\Rightarrow$ $16h = 54 - 30 = 24$

$h = 24 \div 16 = \frac{24}{16} = \frac{3}{2} = 1.5$

Hence, height of box = 1.5m Ans.

Question 10.

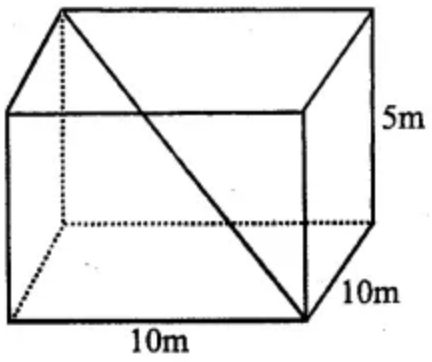
Solution:

Length of room (l) = 10m

Breadth (b) = 10m

Height (h) = 5m

$\therefore$ Longest possible pole $= \sqrt{l^2 + b^2 + h^2}$



$= \sqrt{(10)^2 + (10)^2 + (5)^2}$

$= \sqrt{100+100+25} = \sqrt{225}$

$= \sqrt{225} = 15$ m Ans.

Question 11.

Solution:

Length of hall (l) = 20m

Breadth (b) = 16m

and height (h) = 4.5m.

Volume of the air inside the hall

$= l.b.h. = 20 \times 16 \times 4.5\ m^3$

$= 1440\ m^3$

Air required for one person $= 5m^3$

Total number of persons

$$= \frac{\text{Total volume of air}}{\text{Volume for one person}}$$

$$= \frac{1440}{5} = 288 \text{ Ans.}$$

Question 12.

Solution:

Length of class room (l) = 10m

Width (b) = 6.4 m

Height (h) = 5m.

$\therefore$ Area of floor $= l \times b = 10 \times 6.4m^2 = 64\ m^2$

Area of place required each student $= 1.6\ m^2$

$$\therefore \text{Total number of students} = \frac{64}{1.6} = \frac{64 \times 10}{16}$$

$= 40$ students

Volume of air of the room $= l.b.h$

$= 10 \times 6.4 \times 5\ m^3$

$= 320\ m^3$

$$\therefore \text{Air required of each student} = \frac{320}{40} =$$

$8m^3$ Ans.

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Question 13.

Solution:

Volume of cuboid = 1536 m^3

Length (l) = 16m

Ratio in breadth and height = 3:2

Let breadth (b) = 3x

their height (h) = 2x

$\therefore$ Volume = $l.b.h. = 16 \times 3x \times 2x = 96x^2$

$\therefore\ 96x^2 = 1536 \quad \Rightarrow \quad x^2 = \frac{1536}{96}$

$\Rightarrow\ x^2 = 16 = (4)^2$

$\therefore\ x = 4$

$\therefore$ Breadth = $3x = 3 \times 4 = 12$ m

and height = $2x = 2 \times 4 = 8$m Ans.

Question 14.

Solution:

Length of cuboid (l) = 14 cm

Breadth (b) = 11 cm .

Let height (h) =x cm

Surface area = 2(lb + bh + hl)

But, surface area of the cuobid = 758 cm^2

$\therefore 2(lb + bh + hl) = 758$

$\Rightarrow 2(14 \times 11 + 11 \times x + x \times 14) = 758$

$\Rightarrow 2[154 + 11x + 14x) = 758$

$\Rightarrow 308 + 22x + 28x = 758$

$\Rightarrow 50x = 758 - 308 = 450$

$$\Rightarrow x = \frac{450}{50} = 9 \text{ cm}$$

$\therefore$ Height = 9cm Ans.

Question 15.

Solution:

(a) Edge of cube (a) = 9m .

(i) volume = $a^3 = (9)^3\ m^3 = 729\ m^3$

(ii) Lateral surface area = $4a^2$

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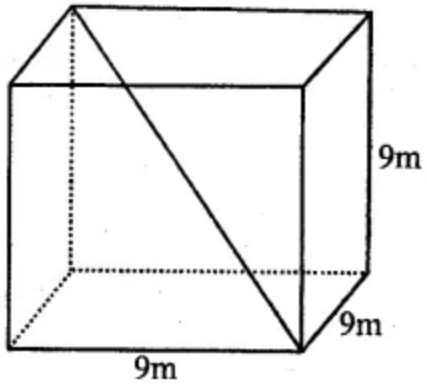
$= 4(a)^2 = 4 \times 81 = 324 \text{ m}^2$

(iii) Total surface area $= 6a^2 = 6(9)^2 = 6 \times 81 = 486 \text{ m}^2$

(iv) Longest diagonals $= \sqrt{3}\,.a = 1.73 \times 9$

$= 15.57$ m Ans.



(b) Edge of cube (a) = 6.5 cm

(i) Volume $= a^3 = (6.5)^3 = 274.625 \text{ cm}^3$

(ii) Lateral surface area $= 4a^2$

$= 4 \times (6.5)^2 \text{ cm}^2$

$= 4 \times 42.25 \text{ cm}^2 = 169 \text{ cm}^2$

(iii) Total surface area $= 6a^2 = 6 \times (6.5)^2$

$= 6 \times 42.25 = 253.50 \text{ cm}^2$

$= 253.5 \text{ cm}^2$

(iv) Longest diagonal $= \sqrt{3}\,.a = 1.73 \times 6.5$ cm

$= 11.245$ cm Ans.

Question 16.

Solution:

Total surface area of a cube = 1176 cm²

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Let each edge he ‘a’

then $6a^2 = 1176$

$$\Rightarrow a^2 = \frac{1176}{6} = 196 = (14)^2$$

$\therefore a = 14\text{cm}$

$\therefore$ Volume $= a \times a \times a$

$= 14 \times 14 \times 14\ \text{cm}^3$

$= 2744\ \text{cm}^3$ Ans.

Question 17.

Solution:

Lateral surface area of a cube = 900 cm²

Let ‘a’ be the edge of the cube

then lateral surface area $= 4a^2$

$\therefore 4a^2 = 900$

$$\Rightarrow a^2 = \frac{900}{4} = 225 = (15)^2$$

$\therefore a = 15\text{cm}$

$\therefore$ Volume $= a^3 = (15)^3 = 3375\ \text{cm}^3$ Ans.

Question 18.

Solution:

Volume of a cube = 512 cm³

Let ‘a’ be its edge, then

Volume = a^3

$\therefore \quad a^3 = 512 = (8)^3$

$\therefore \quad a = 8\text{cm}.$

Now surface area = $6a^2$

$= 6(8)^2 = 6 \times 64 \text{ cm}^3$

$= 384 \text{ cm}^3$ Ans.

Question 19.

Solution:

Edge of first-cube = 3 cm.

Volume = $(3)^3 = 27 \text{ cm}^3$

Edge of second cube = 4cm

$\therefore$ Volume = $(4)^3 = 64 \text{ cm}^3$

and edge of third cube = 5cm

$\therefore$ Volume = $(5)^3 = 125 \text{ cm}^3$

Total volume of the three cubes = $(27 + 64 + 125) \text{ cm}^3 = 216 \text{ cm}^3$

Let 'a' be the edge of new cubes formed

$\therefore \quad a^3 = 216 = (6)^3$

$\therefore \quad a = 6$

Now, lateral surface area of the new cube

$= 4a^2 = 4(6)^2 = 4 \times 36 = 144 \text{ cm}^2$ Ans.

Question 20.

Solution:

Area of ground = 2 hectares

= 2 x 10000 = 20000 m^2

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Height of rain falls 5cm = 5100m

∴ Volume of rain water = 20000 x 5100 m^3

= 1000 m^3 Ans.

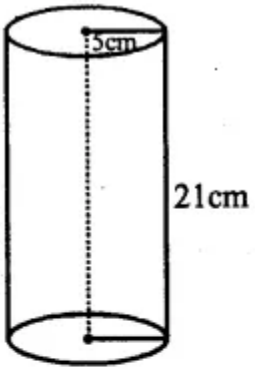
Ex 13B

Question 1.

Solution:

Radius of the base of a cylinder (r) = 5cm.

and height (h) = 21cm



(i) ∴ Volume $= \pi r^2 h$

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

$= 1650 \text{ cm}^3$

(ii) curved surface area $= 2\pi rh$

$2 = \frac{22}{7} \times 5 \times 21 \text{ cm}^2 = 660 \text{ cm}^2$ Ans.

Question 2.

Solution:

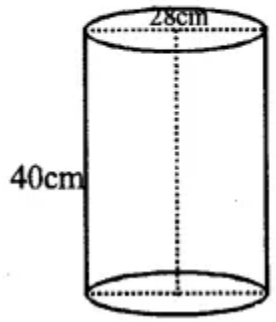
Diameter of the base of the cylinder = 28cm

Radius = 12 x 28 = 14 cm

Height (h) = 40cm.

$\therefore$ (i) Curved surface area $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times 14 \times 40 \text{ cm}^2 = 3520 \text{ cm}^2$$



(ii) Total surface area $= 2\pi r(h + r)$

$$= 2 \times \frac{22}{7} \times 14 \ (40 + 14) \text{ cm}^2$$

$$= 88(54) \text{ cm}^2 = 4752 \text{ cm}^2$$

(iii) Volume $= \pi r^2 h$

$$= \frac{22}{7} \times 14 \times 14 \times 40\text{cm}^3$$

$$= 44 \times 14 \times 40 = 24640 \text{ cm}^3 \text{ Ans.}$$

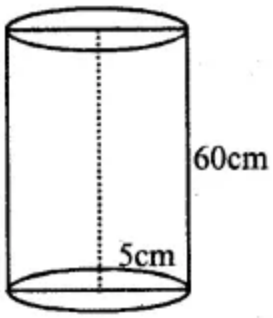
Question 3.

Solution:

Radius of cylinder (r) = 10.5cm

Height (h) = 60cm.

$\therefore$ Volume $= \pi r^2 h = \frac{22}{7} \times 10.5 \times 10.5 \times 60\ cm^3$



$= 20790\ cm^3$

Weight of $1\ cm^3 = 5g$

$\therefore$ Total weight of the solid cylinder

$= 207090 \times 5\ g$

$= \frac{20790 \times 5}{1000}\ kg = 103.95\ kg$ Ans.

Question 4.

Solution:

Diameter of cylinder = 20cm

Radius (r) = 202 = 10cm

Curved surface area = 1210 cm^2
Let height of the cylinder = h
then $2\pi rh$ = curved surface area

$$\Rightarrow 2 \times \frac{22}{7} \times 10 \times h = 1210$$

$$\Rightarrow h = \frac{1210 \times 7}{2 \times 22 \times 10} = 19.25 \text{ cm}$$

$\therefore$ Volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times 10 \times 10 \times 19.25 \text{ cm}^3$$

$$= \frac{22}{7} \times 100 \times \frac{1925}{100} \text{ cm}^3$$

$= 6050 \text{ cm}^3$ Ans.

Question 5.

Solution:

Curved surface area of cylinder = 4400 cm²

Circumference of its base = 110 cm

$$\therefore \quad \text{Height} = \frac{\text{Curved surface area}}{\text{Circumference of base}}$$

$$= \frac{4400}{110} = 40\text{cm}$$

$$\text{Now radius} = \frac{\text{circumference}}{2 \times \pi} = \frac{110 \times 7}{2 \times 22}$$

$$= \frac{35}{2} \text{ cm} = 17.5 \text{ cm}$$

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

$$= \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times 40 \text{ cm}^3$$

$$= 38500 \text{ cm}^3 \text{ Ans.}$$

Question 6.

Solution:

The ratio of the radius and height of a cylinder = 2:3

Volume =1617 cm^3

Let radius = 2x

and height = 3x.

$\therefore$ Volume $= \pi r^2 h$

$\Rightarrow \pi r^2 h = 1617$

$$\Rightarrow \frac{22}{7} \times 2x \times 2x \times 3x = 1617$$

$$\Rightarrow \frac{264}{7} x^3 = 1617 \Rightarrow x^3 = \frac{1617 \times 7}{264}$$

$$\Rightarrow x^3 = \frac{49 \times 7}{8} = \frac{343}{8} = \left(\frac{7}{2}\right)^3$$

$$\therefore x = \frac{7}{2}$$

$$\therefore \text{Radius} = 2x = \frac{7}{2} \times 2 = 7\text{cm}$$

$$\text{Height} = 3x = \frac{7}{2} \times 3 = \frac{21}{2} = 10.5\text{cm}$$

Now, total surface area of the cylinder
$= 2\pi r\ (h + r)$

$$= 2 \times \frac{22}{7} \times 7\ (10.5 + 7)\ \text{cm}^2$$

$$= 44(17.5) = 770\ \text{cm}^2 \text{ Ans.}$$

Question 7.

Solution:

Total surface area of the cylinder = 462 cm²

Curved surface area = 13 x 462 = 154

cm^2

and area of two circular surface = 462 – 154 = 308 cm^2

and area of one circular side = $\frac{308}{2}$ = 154 cm^2

$$r = \sqrt{\frac{\text{area of circle}}{\pi}} = \sqrt{\frac{154}{22} \times 7}$$

$$= \sqrt{49} = 7 \text{ cm}$$

Curved surface area = $2\pi rh$

$$= 2 \times \frac{22}{7} \times 7 \times h = 154$$

$$\Rightarrow 44h = 154$$

$$\Rightarrow h = \frac{154}{44} = \frac{7}{2} = 3.5 \text{ cm}$$

$\therefore$ Volume of the cylinder = $\pi r^2 h$

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

$$= 539 \text{ cm}^3 \text{ Ans.}$$

Question 8.

Solution:

Total surface area of solid

cylinder = 231 cm²

$\therefore$ its curved surface area $= \frac{2}{3} \times 231$ cm^2

$= 154\ cm^2$

and area of two circular sides $= (231 - 154)\ cm^2$

$= 77\ cm^2$

and area of one circular side $= \frac{77}{2}\ cm^2$

$\Rightarrow \pi r^2 = \frac{77}{2} \Rightarrow \frac{22}{7} r^2 = \frac{77}{2}$

$\Rightarrow r^2 = \frac{77}{2} \times \frac{7}{22} = \frac{49}{4} = \left(\frac{7}{2}\right)^2$

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

Curved surface area $= 2\pi rh$

$\Rightarrow 2 \times \frac{22}{7} \times \frac{7}{2} h = 154$

$\Rightarrow 22h = 154$

$\Rightarrow h = \frac{154}{22} = 7\ cm$

$\therefore$ Volume $= \pi r^2 h = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7$

$= \frac{539}{2} cm^3$

$= 269.5\ cm^3$ Ans.

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Question 9.

Solution:

Sum of radius and height = 37m.

and total surface area = 1628 m²

Let r be the radius

then height $(h) = 37 - r$

$\therefore$ Total surface area $= 2\pi r\,(r + h)$

$\Rightarrow 1628 = 2\pi r\,(37)\ m^2$

$\Rightarrow 1628 = 74\pi r$

$$\Rightarrow 1628 = 74 \times \frac{22}{7} r$$

$$\Rightarrow r = \frac{1628 \times 7}{74 \times 22} = 7\ m$$

$\Rightarrow h = 37 - r = 37 - 7 = 30m$

Now, its volume $= \pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 30\ m^3$$

$= 4620\ m^3$ Ans.

Question 10.

Solution:

Total surface area = 616 cm²

Curved surface area = 616X12 = 308

cm^2

$\therefore$ Area of two circular faces = 616 – 308
= 308 cm^2

and area of one circular face = $\frac{308}{2}$ = 154
cm^2

$\Rightarrow \pi r^2 = 154 \quad \Rightarrow \quad \frac{22}{7} r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22} = 49 = (7)^2$

$\therefore \quad r = 7cm$

Now, curved surface area = $2\pi rh$

$\therefore \quad 2 \times \frac{22}{7} \times 7h = 308$

$44h = 308$

$\Rightarrow h = \frac{308}{44} = 7cm$

Now volume = $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 7 =$
1078 cm^3 Ans.

Question 11.

Solution:

Volume of gold = 1 cm^3

diameter of wire = 0.1 mn

$\therefore$ Radius $(r) = \frac{0.1}{2} = 0.05$ mn $= \frac{0.05}{10}$ cm

Let length of wire $= h = 0.005$cm.

$\therefore$ $\pi r^2 h =$ volume

$\Rightarrow$ $\frac{22}{7}(0.005)^2 h = 1$

$$h = \frac{1\times 7}{22\times(0.005)^2} = \frac{1\times 7}{22\times 0.005\times 0.005}$$

$$= \frac{1}{22\times .0000025} = \frac{7\times 1000000}{22\times 25}$$

$$= \frac{7\times 20000}{11} = \frac{140000}{11} \text{ cm}$$

$= 12727.2$ cm

$\simeq 127.272$ m $= 127.27$ m Ans.

Question 12.

Solution:

Ratio in the radii of two cylinders = 2:3

and ratio in the heights = 5:3

If r1 and r2 and the radii and h1 and h2 are the heights, then

$$\frac{r_1}{r_2}=\frac{2}{3} \text{ and } \frac{h_1}{h_2}=\frac{5}{3}$$

$$\text{Now } \frac{\text{Volume of first cylinder}}{\text{Volume of second cylinder}}=\frac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$$

$$=\left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}=\left(\frac{2}{3}\right)^2 \times \frac{5}{3}=\frac{4}{9}\times\frac{5}{3}=\frac{20}{27}$$

$$\frac{\text{Curved surface area of first cylinder}}{\text{Curved surface area of second cylinder}}$$

$$\frac{2\pi r_1 h_1}{2\pi r_2 h_2}=\frac{r_1}{r_2}\times\frac{h_1}{h_2}=\frac{2}{3}\times\frac{5}{3}=\frac{10}{9}$$

$\therefore$ Ratio in their volumes = 20 : 27
and ratio in their curved surfaces area = 10 : 9 Ans.

Question 13.

Solution:

Side of square = 12cm

and height = 17.5cm

Diameter of the second cylindrical tin = 12cm

$\therefore$ Radius $(r) = \frac{12}{2} = 6\text{cm}$

Height $(h) = 17.5$ cm

$\therefore$ Volume $= \pi r^2 h = \frac{22}{7} \times 6 \times 6 \times 17.5$ cm

$= 1980$ cm^3

It is clear from above, that square tin has more powder.

Difference $= 2520 - 1980 = 540$ cm^3 Ans.

Question 14.

Solution:

Diameter of cylindrical bucket = 28cm

Radius (r) = 288 = 14cm

Height (h) = 72cm.

$\therefore$ Volume of water filled in it $= \pi r^2 h$

$= \frac{22}{7} \times 14 \times 14 \times 72 \text{ cm}^3 = 44352 \text{ cm}^3$

$\therefore$ Volume of water in rectangular tank = 44352 cm^2

Length of tank $(l) = 66\text{cm}$

width $(b) = 28\text{cm}$

Let h be the height of water in the tank.

$\therefore$ Volume $= l\ b\ h = 66 \times 28 \times h$

$\therefore \quad 66 \times 28 \times h = 44352$

$$h = \frac{44352}{66 \times 28} = 24 \text{ cm Ans.}$$

Question 15.

Solution:

Length of pipe (l) = 1m = 100cm

diameter of pipe = 3cm.

Inner radius = 32 cm

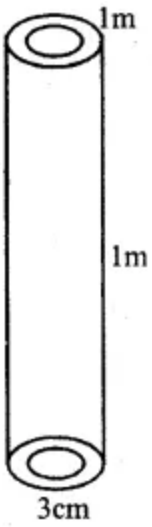
Thickness of metal used = 1cm.

$\therefore$ Outer radius $(r) = \frac{3}{2} + 1 = \frac{5}{2}$ cm

$\therefore$ Volume of iron used $= \pi R^2 h - \pi r^2 h$

$= \pi h\ (R^2 - r^2)$

$$= \frac{22}{7} \times 100 \left[\left(\frac{5}{2}\right)^2 - \left(\frac{3}{2}\right)^2\right] \text{ cm}^3$$



$$= \frac{2200}{7} \times \left[\frac{25}{4} - \frac{9}{4}\right] \text{ cm}^3$$

$$= \frac{2200}{7} \times \frac{16}{4} = \frac{8800}{7} \text{ cm}^3$$

Weight of 1 cm^3 iron = 21g

$\therefore$ Total weight $= \frac{8800}{7} \times 21\text{g}$

$$= \frac{8800 \times 3}{1000}\text{kg} = \frac{264}{10} \text{ kg}$$

= 26.4 kg Ans.

Question 16.

Solution:

Internal diameter of cylindrical tube = 10.4 cm

Radius (r) = 10.42 = 5.2cm.

Length of tube (h) = 25cm

Thickness of tube = 8mm

$\therefore$ External radius (R) = 5.2 + 0.8 = 6.0 cm

Now, volume of metal used

$$= \pi R^2 h - \pi r^2 h = \pi h\ (R^2 - r^2)$$

$$= \frac{22}{7} \times 25\ [(6)^2 - (5.2)^2]\ cm^3$$

$$= \frac{550}{7}\ (36 - 27.04)\ cm^3$$

$$= \frac{550}{7} \times 8.96 = 704\ cm^3 \text{ Ans.}$$

Question 17.

Solution:

Length of barrel (h) = 7cm

Diameter = 5mm.

$\therefore$ Radius $(r) = \frac{5}{2}\text{mm} = \frac{5}{2\times10} = \frac{1}{4}$ cm

$\therefore$ Volume of ink filled in it $= \pi r^2 h$

$= \frac{22}{7}\times\frac{1}{4}\times\frac{1}{4}\times7 \text{ cm}^3$

$= \frac{11}{8} \text{ cm}^3 = \frac{11}{8} \text{ g } (\because 1\text{g} = 1\text{cm}^3)$

$\therefore$ Words to be written with $\frac{1}{5}$ of liter ink

$= 1000 \times \frac{1}{5} \times \frac{330}{11} \times 8$

$= 48000$ words Ans.

Question 18.

Solution:

Diameter of pencil = 7mm

.'. Radius (R) = 72 mm = 720 cm.

and diameter of graphite in it = 1mm

Radius $(r) = \frac{1}{2}$ mm $= \frac{1}{20}$ cm.

Length of pencil $(h) = 10$cm.

Now, volume of pencil with graphite $= \pi R^2 h$

Volume of lead (graphite) $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 10 \text{ cm}^3 = \frac{11}{140} \text{ cm}^3$$

and volume of wood used $= \pi R^2 h - \pi r^2 h$

$$= \pi h (R^2 - r^2)$$

$$= \frac{22}{7} \times 10 \left[\left(\frac{7}{20}\right)^2 - \left(\frac{1}{20}\right)^2\right] \text{cm}^3$$

$$= \frac{220}{7} \left[\frac{49}{400} - \frac{1}{400}\right] \text{cm}^3$$

Now, weight of 1cm^3 wood $= 0.7$g

and weight of 1cm^3 lead $= 2.1$g

Total weight of the pencil

$$= \left[\frac{132}{35} \times 0.7 + \frac{11}{140} \times 2.1\right] \text{g}$$

$$= \left[\frac{132 \times 7}{35 \times 10} + \frac{11 \times 21}{140 \times 10}\right] \text{g}$$

$$= \frac{132}{50} + \frac{33}{200} = \frac{528 + 33}{200} = \frac{561}{200} \text{ g}$$

$= 2.805$ g Ans.

Ex 13C

Question 1.

Solution:

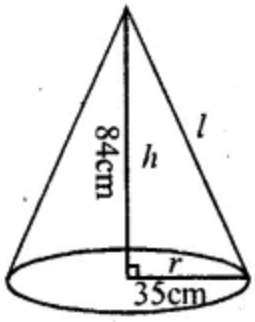
Radius of base (r) = 35cm

and height (h) = 84cm.

$\therefore$ Slant height $(l) = \sqrt{r^2 + h^2}$

$= \sqrt{(35)^2 + (84)^2} = \sqrt{1225 + 2056}$

$= \sqrt{8281} = 91$ cm



(i) Volume $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 35 \times 35 \times 84$ cm^3

$= 107800$ cm^3

(ii) Curved surface area $= \pi rl = \frac{22}{7} \times 35 \times 91$cm^2

$= 10010$ cm^2

(iii) Total surface area $= \pi rl + \pi r^2$

$= \pi r\,(l + r) = \frac{22}{7} \times 35\,(91 + 35)$ cm^2

$= 110\,(126) = 13860$ cm^2 Ans.

Question 2.

Solution:

Height of cone (h) = 6cm

Slant height (l) = 10cm.

We know that, $l^2 = r^2 + h^2$

$\Rightarrow (10)^2 = r^2 + (6)^2$

$100 = r^2 + 36$

$\Rightarrow r^2 = 100 - 36 = 64 = (8)^2$

$\therefore \quad r = 8\text{cm}$

Now volume $= \frac{1}{3}\pi r^2 h = \frac{1}{3}(3.14) \times 8 \times 8 \times 6\ \text{cm}^3$

$= 128 \times 3.14 = 401.92\ \text{cm}^3$

(ii) Curved surface area $= \pi rl$

$= (3.14) \times 8 \times 10\ \text{cm}^2$

$= 80 \times 3.14 = 251.20 = 251.2\ \text{cm}^2$

(ii) Total surface area $= \pi rl + \pi r^2$

$= \pi r\ (l + r)$

$= (3.14) \times 8\ (10 + 8)\ \text{cm}^2$

$= 3.14 \times 8 \times 18 = 452.16\ \text{cm}^2$ Ans.

Question 3.

Solution:

Volume of right circular cone = (100 π) cm^3

Height (h) = 12cm.

Let r be the radius of the cone

$\therefore \quad \frac{1}{3}\pi r^2 h = \text{volume.}$

$\frac{1}{3} \times \pi \times r^2 \times 12 = 100\pi$

$4r^2 = 100 \quad \Rightarrow \quad r^2 = \frac{100}{4} = 25$

$\therefore \quad r^2 = (5)^2 \quad \Rightarrow \quad r = 5$

(i) Now slant height $(l) = \sqrt{r^2 + h^2}$

$= \sqrt{(5)^2 + (12)^2} = \sqrt{25+144} = \sqrt{169}$

$= 13\text{cm}$

(ii) $\therefore$ Curved surface area $= \pi rl$

$= \pi \times 5 \times 13 = 65\pi \text{ cm}^2$

Question 4.

Solution:

Circumference of the base = 44cm

$\therefore$ Radius $(r) = \dfrac{\text{Circumference}}{2\pi}$

$= \dfrac{44 \times 7}{2 \times 22} = 7\text{cm}$

Slant height $(l) = 25\text{cm}$.

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

$\Rightarrow (25)^2 = (7)^2 + h^2$

$\Rightarrow 625 = 49 + h^2$

$\Rightarrow h^2 = 625 - 49 = 576 = (24)^2$

$\therefore h = 24\text{cm}$

(i) Volume $= \dfrac{1}{3}\pi r^2 h$

$= \dfrac{1}{3} \times \dfrac{22}{7} \times 7 \times 7 \times 24 \text{ cm}^2$

$= 1232 \text{ cm}^3$

(ii) Curved surface area $= \pi rl$

$= \dfrac{22}{7} \times 7 \times 25 \text{ cm}^2$

$= 550 \text{ cm}^2$ Ans.

Question 5.

Solution:

Slant height of the cone (l) = 25cm

Curved surface area = 550 cm^2

Let r be the radius

πrl = curved surface area

$\Rightarrow \quad \frac{22}{7} \times r \times 25 = 50$

$\Rightarrow \quad r = \frac{550 \times 7}{22 \times 25} = 7\text{cm}$

(i) We know that

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

$\Rightarrow \quad (25)^2 = (7)^2 + h^2 \quad \Rightarrow \quad 625 = 49 + h^2$

$\Rightarrow \quad h^2 = 625 - 49 = 576 = (24)^2$

$\therefore \quad h = 24\text{cm}$

(ii) Volume $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24$ cm^3

$= 1232\ \text{cm}^3$ Ans.

Question 6.

Solution:

Radius.of base (r) = 35cm.

Slant height (l) = 37cm.

We know that

$\Rightarrow l^2 = r^2 + h^2 \Rightarrow (37)^2 = (35)^2 + h^2$

$\Rightarrow 1369 - 1225 = h^2$

$\Rightarrow h^2 = 1369 - 1225 = 144 = (12)^2$

$\therefore h = 12\text{cm}$

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

$= \frac{1}{3} \times \frac{22}{7} \times 35 \times 35 \times 12 \text{ cm}^3$

$= 15400 \text{ cm}^3$ Ans.

Question 7.

Solution:

Curved surface area = 4070 cm^2

Diameter of the base = 70cm

$\therefore$ Radius $(r) = \frac{70}{2} = 35$ cm

Let slant height be l

Then πrl = Curved surface area

$\Rightarrow \frac{22}{7} \times 35l = 4070$

$\Rightarrow l = \frac{4070 \times 7}{22 \times 35} = 37$

$\therefore$ slant height = 37cm Ans.

Question 8.

Solution:

IndCareer

Radius of the conical tent = 7m

and height = 24 m.

$\therefore$ Slant height $= \sqrt{r^2 + h^2}$

$= \sqrt{(7)^2 + (24)^2} = \sqrt{49 + 576} = \sqrt{625} = 25\text{m}$

$\therefore$ Curved surface area $= \pi rl$

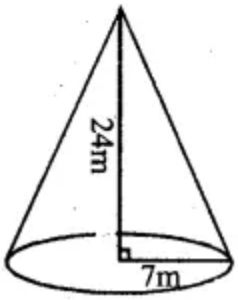
$= \frac{22}{7} \times 7 \times 25 \text{ m}^2 = 550 \text{ m}^2$

Width of cloth = 2.5m

$\therefore$ Length of cloth required $= 550 \div 2.5$

$= \frac{550 \times 10}{25} \text{ m}$

$= 220$ m Ans.



Question 9.

Solution:

Radius of the first cone (r) = 1.6 cm.

and height (h) = 3.6 cm.

$\therefore$ Volume $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi\,(1.6)^2 \times 3.6$ cm^3

$= \frac{1}{3}\pi \times 2.56 \times 3.6 = 3.072\pi\ cm^3$

Now, volume of the second cone $= 3.072\pi$ cm^3

Radius of its base = 1.2 cm.

$\therefore$ Height $(h) = \frac{\text{volume} \times 3}{\pi r^2} = \frac{3.072\pi \times 3}{\pi \times 1.2 \times 1.2}$

= 6.4cm Ans.

Question 10.

Solution:

Ratio in their heights =1:3

and ratio in their radii = 3:1

Let h1,h2 he their height and r1,r2 be their radii, then

$$\frac{h_1}{h_2}=\frac{1}{3} \text{ and } \frac{r_1}{r_2}=\frac{3}{1}$$

$$\therefore \frac{\text{Volume of 1st cone}}{\text{Volume of 2nd cone}} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$$

$$= \left(\frac{r_1}{r_2}\right)^2 \times \left(\frac{h_1}{h_2}\right) = \left(\frac{3}{1}\right)^2 \times \left(\frac{1}{3}\right)$$

$$= \frac{3}{1}\times\frac{3}{1}\times\frac{1}{3}=\frac{3}{1}$$

The ratio between their volumes is 3:1

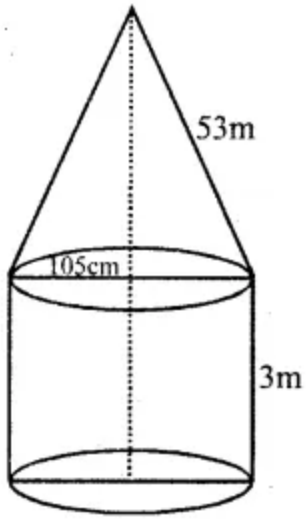
hence proved

Question 11.

Solution:

Diameter of the tent = 105m

$\therefore$ Radius $(r) = \frac{105}{2}$ m



Height of the cylindrical part = 3m
and slant height of the conical part = 53m
Curved surface area of conical part = πrl

$= \frac{22}{7} \times \frac{105}{2} \times 53 \text{ m}^2 = 8745 \text{ m}^2$

Curved surface area of cylindrical part = $2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{105}{2} \times 3 \text{ m}^2 = 990 \text{ m}^2$

$\therefore$ Total area of canvas used in tent = $8745 + 990 = 9735 \text{ m}^2$

Width of cloth = 5m

$\therefore$ Length of cloth = $9735 \div 5 = 1947$ m

Question 12.

Solution:

No. of persons to be s accommodated =11

Area to be required for each person = $4m^2$

$\therefore$ Total area required for 11 persons = $11 \times 4\ m^2 = 44m^2$

$\therefore$ Let r be the radius and h be the height of the conical tent

$$\therefore \pi r^2 = 44 \Rightarrow \frac{22}{7} r^2 = 44$$

$$\Rightarrow r^2 = \frac{44 \times 7}{22} = 14$$

Now volume of the air = $11 \times 20 = 220\ m^3$

$$\therefore \frac{1}{3} \pi r^2 h = 220$$

$$\frac{1}{3} \times \frac{22}{7} \times 14 \times h = 220 \ (\because r^2 = 14)$$

$$\Rightarrow h = \frac{220 \times 3 \times 7}{22 \times 14} = 15$$

$\therefore$ Height of the tent = 15m Ans.

Question 13.

Solution:

Height of the cylindrical bucket (h) = 32cm

Radius (r) = 18cm

Volume of sand filled in it = $\pi r^2 h$

= $\pi \times 18 \times 18 \times 32\ cm^3$

= $10368\pi\ cm^3$

Volume of conical sand = 10368 π cm^3

Height of cone = 24 cm

$$\text{and volume} = \frac{1}{3}\pi r^2 h.$$

$$\therefore \quad \frac{1}{3}\pi r^2 h = 10368\pi$$

$$\frac{1}{3}\pi r^2 \times 24 = 10368\pi$$

$$\Rightarrow \quad 8\pi r^2 = 10368\pi \quad \Rightarrow \quad r^2 = \frac{10368\pi}{8\pi}$$

$$\Rightarrow \quad r^2 = 1296 = (36)^2$$

$$\Rightarrow \text{Radius of the cone} = 36 \text{ cm Ans.}$$

$$\text{and slant height} = \sqrt{r^2 + h^2}$$

$$= \sqrt{(36)^2 + (24)^2} = \sqrt{1296 + 576}$$

$$= \sqrt{1872} = 43.266 \text{ cm}$$

$$= 43.27 \text{ cm Ans.}$$

Question 14.

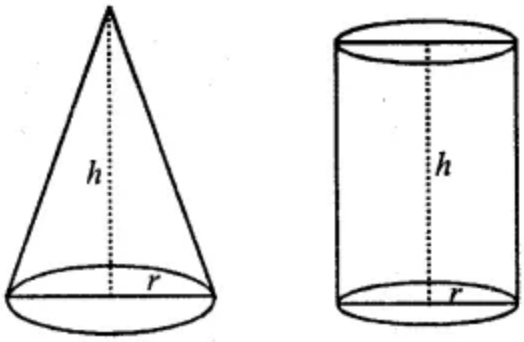
Solution:

Let h be the height and r be the radius of the cylinder and cone.

Curved surface area of cylinder = 2πrh

and curved surface area of cone = πrl

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



$$\therefore \quad \frac{\text{curved surface one of cylinder}}{\text{curved surface area of cone}} = \frac{8}{5}$$

$$\Rightarrow \quad \frac{2\pi rh}{\pi rl} = \frac{8}{5} \qquad \Rightarrow \quad \frac{2h}{l} = \frac{8}{5}$$

$$\frac{2h}{\sqrt{r^2 + h^2}} = \frac{8}{5}$$

$$= \frac{4h^2}{r^2+h^2} = \frac{64}{25} \text{ (squaring both sides)}$$

$$4h^2 \times 25 = 64 \times (r^2 + h^2)$$

$$\Rightarrow 100h^2 = 64r^2 + 64h^2$$

$$\Rightarrow 100h^2 - 64h^2 = 64r^2$$

$$\Rightarrow 36h^2 = 64r^2$$

$$\Rightarrow \frac{r^2}{h^2} = \frac{36}{64} \Rightarrow \left(\frac{r}{h}\right)^2 = \left(\frac{6}{8}\right)^2$$

$$\Rightarrow \frac{r}{h} = \frac{6}{8} = \frac{3}{4}$$

$\therefore$ Ratio in radius and height = 3 : 4

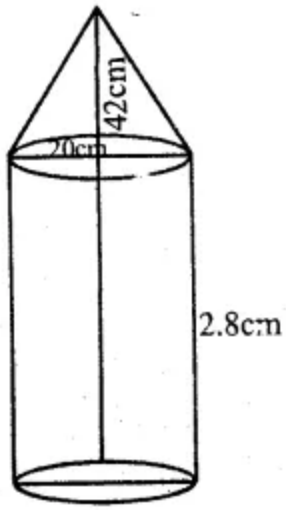
Hence proved.

Question 15.

Solution:

Diameter of the pillar = 20cm

Radius (r) = 202 = 10cm



Height of cylindrical part = 2.8m
= 280 cm
and height of conical part (h_1) = 42cm
∴ Volume of total pillar

$$= \pi r^2 h + \frac{1}{3}\pi r^2 h_1 = \pi r^2 \left[h + \frac{1}{3} h_1\right]$$

$$= \frac{22}{7} \times 10 \times 10 \left[280 + \frac{1}{3} \times 42\right] \text{cm}^3$$

$$= \frac{2200}{7} [280 + 14] = \frac{2200}{7} \times 294 \text{ cm}^3$$

$= 2200 \times 42 = 92400 \text{ cm}^3$
Weight of $1\text{cm}^3 = 7.5\text{g}$
∴ Total weight of the pillar = 92400 × 7.5 g

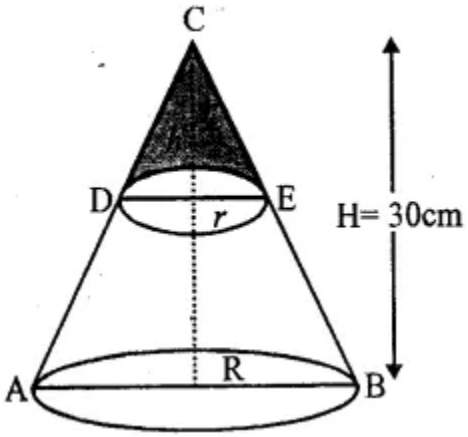
$$= \frac{92400 \times 75}{1000 \times 10} \text{ kg} = 693 \text{ kg Ans.}$$

Question 16.

Solution:

Height of the bigger cone (H) = 30cm

By cutting a small cone from it, then volume of smaller cone = 127 of volume of big cone



Let radius and height of the smaller cone be r and h

and radius and height of the bigger cone be R and H.

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

and volume of bigger cone $= \frac{1}{3}\pi R^2 H$

$= \frac{1}{3}\pi R^2 \times 30 \text{ cm}^3 = 10\pi R^2 \text{ cm}^3$

According to the condition,

$$\frac{1}{3}\pi r^2 h = \frac{1}{27} \times 10\pi R^2$$

$$r^2 h = \frac{10}{9} R^2$$

$$\Rightarrow h = \frac{10}{9} \times \frac{R^2}{r^2} \quad \ldots(i)$$

But $\frac{R}{r} = \frac{h}{H} \Rightarrow \frac{R}{r} = \frac{h}{30}$

$(\because \Delta ACB \sim \Delta CDE)$

$$\Rightarrow \frac{R}{r} = \frac{30}{h} \quad \ldots(ii)$$

Substituting in (i)

$$h = \frac{10}{9}\left(\frac{30}{h}\right)^2 \Rightarrow h = \frac{10 \times 900}{9h^2}$$

$\Rightarrow h^3 = 1000 = (10)^3$

$\therefore h = 10$

$\therefore H - h = 30 - 10 = 20$

Hence at the height of 20cm from the base it was cut off. Ans.

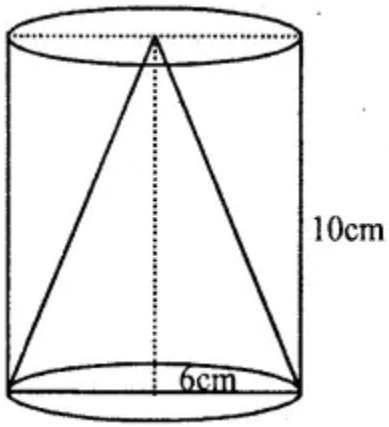
Question 17.

Solution:

Height of the cylinder (h) = 10cm.

Radius (r) = 6cm.

Height of the cone = 10cm



$\therefore$ Volume of cylinder $= \pi r^2 h$

and volume of cone cut off $= \frac{1}{3}\pi r^2 h$

$\therefore$ Volume of the remaining part

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

$= \frac{2}{3}\pi r^2 h = \frac{2}{3}(3.14) \times 6 \times 6 \times 10 \text{ cm}^3$

$= \frac{72 \times 31.4}{3} \text{cm}^3 = 24 \times 31.4 = 753.6 \text{ cm}^3$ Ans.

Question 18.

Solution:

Diameter of conical vessel = 40cm

Radius (r) = 402 = 20cm

and depth (h) = 24cm.

.'. Volume = 13 $\pi r^2 h$

$= \frac{1}{3} \times \pi(20)^2 \times 24 \text{ cm}^3$

$= \frac{1}{3} \times \pi \times 20 \times 20 \times 24 \text{ cm}^3 = \frac{9600}{3}\pi \text{ cm}^2$

$= 3200\pi \text{ cm}^2$

Volume of water in the pipe $= 3200\pi \text{ cm}^3$

Speed of water = 10m per minute

$\therefore$ Diameter of the pipe = 5mm $= \frac{5}{10}$ cm

$\therefore$ Radius of pipe $= \frac{5}{2\times10} = \frac{1}{4}$ cm.

Let h be the length of pipe

Then $\pi r^2 h = 3200\pi$

$\Rightarrow h = \frac{3200\pi \times 4 \times 4}{\pi} = 51200$ cm.

$= \frac{51200}{100} = 512$ m.

$\therefore$ Time take $= \frac{512}{10} \times 1$ minutes

$= 51.20$ minutes

$= 51$ minutes 12 seconds Ans.

Ex 13D

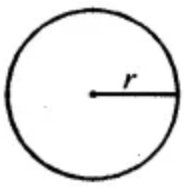
Question 1.

Solution:

(i) Radius of sphere = 3.5cm

(a) Volume = 43 πr^3

https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-13-volume-and-surface-area/



$$= \frac{4}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 3.5 \text{ cm}^3$$

$$= \frac{88}{3} \times 0.5 \times 12.25 \text{ cm}^3$$

$$= 179.67 \text{ cm}^3$$

(b) Surface area $= 4\pi r^2$

$$= 4 \times \frac{22}{7} \times 3.5 \times 3.5 \text{cm}^2$$

$= 88 \times 1.75 = 154 \text{ cm}^2$ Ans.

(ii) Radius of sphere = 4.2 cm.

(a) Volume $= \frac{4}{3}\pi r^3 \times \frac{4}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times 4.2\text{cm}^3$

$= 310.464\ \text{cm}^3$

(b) Surface area $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times 4.2 \times 4.2\text{cm}^2$

$= 221.76\ \text{cm}^2$

(iii) Radius of surface $= 5\text{m}$

(a) $\therefore$ Volume $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 5 \times 5 \times 5\,\text{m}^3$

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

(b) Surface area $= 4\pi r^2 = 4 \times \frac{22}{7} \times 5 \times 5\ \text{cm}^3$

$= \frac{2200}{7} = 314.28\ \text{m}^2$ Ans.

Question 2.

Solution:

Let r be the radius of the sphere and volume = 38808 cm^3

$\therefore 43\ \pi r^3 = 38803$

=> 43 x 227 r^3 = 38803

$$\Rightarrow \quad r^3 = \frac{38808 \times 3 \times 7}{4 \times 22} = 9261 = (21)^3$$

$$\therefore \quad r = 21$$

Hence radius = 21 cm

$$\therefore \quad \text{Surface area} = 4\pi r^2$$

$$= 4 \times \frac{22}{7} \times 21 \times 21 = 5544 \text{ cm}^2 \text{ Ans.}$$

Question 3.

Solution:

Let r be the radius of the sphere

$\therefore$ Volume = 43 πr^3

$$\therefore \quad \frac{4}{3}\pi r^3 = 606.375$$

$$\Rightarrow \quad \frac{4}{3} \times \frac{22}{7} r^3 = \frac{606325}{1000}$$

$$r^3 = \frac{606375 \times 3 \times 7}{4 \times 22 \times 1000} = \frac{9261}{64} = \left(\frac{21}{4}\right)^3$$

$$\therefore \quad r = \frac{21}{4}$$

$$\text{Now, surface area} = 4\pi r^2 = 4 \times \frac{22}{7} \times \frac{21}{4}$$

$$\times \frac{21}{4} = \frac{693}{2} = 346.5 \text{ m}^2 \text{ Ans.}$$

Question 4.

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Solution:

Surface area of a sphere = 394.24 m^2

Let r be the radius, then $4\pi r^2 = 394.24$

$$\Rightarrow 4 \times \frac{22}{7} r^2 = \frac{39424}{100}$$

$$\Rightarrow r^2 = \frac{39424 \times 7}{100 \times 4 \times 22}$$

$$\Rightarrow r^2 = \frac{39424 \times 7}{100 \times 88} = \frac{448 \times 7}{100} = \frac{3136}{100}$$

$$= 31.36$$

$$\therefore r = \sqrt{31.36} = 5.6 \text{ m}$$

$$\therefore \text{Volume} = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 5.6 \times 5.6 \times 5.6 \text{ m}^3$$

$$= 735.91 \text{ m}^3 \text{ Ans.}$$

Question 5.

Solution:

Surface area of sphere = 576π cm^2

Let r be the radius, then $4r^2 = 576\pi$

$$\Rightarrow r^2 = \frac{576 \times \pi}{4\pi} = 144 = (12)^2$$

$$\therefore \quad r = 12\text{cm}$$

$$\text{Now volume} = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 12 \times 12 \times 12$$

$$= 2304\pi \text{ cm}^3 \text{ Ans.}$$

Question 6.

Solution:

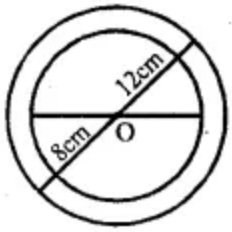
Outer diameter of shell = 12cm,

Outer radius (R) = 122 = 6cm

and inner diameter = 8cm

$\therefore$ Inner radius $= \frac{8}{2} = 4\text{cm}$

$\therefore$ Volume of the metal in the shell



$$= \frac{4}{3}\pi R^3 - \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\ (R^3 - r^3)$$

$$= \frac{4}{3} \times \frac{22}{7}\left[6^3 - 4^3\right]\ \text{cm}^3$$

$$= \frac{88}{21}\ (216 - 64) = \frac{88}{21} \times 152\ \text{cm}^3$$

$$= \frac{13376}{21} = 636.95\ \text{cm}^3$$

Outer surface area $= 4\pi R^2 = 4 \times \frac{22}{7} \times 6$

$\times 6\ \text{cm}^2$

$$= \frac{3168}{7} = 452.57\ \text{cm}^2\ \text{Ans.}$$

Question 7.

Solution:

Length of cuboid of (l) = 12cm

Breadth (b) = 11cm

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and height (h) = 9cm

$\therefore$ Volume $= l.b.h = 12 \times 11 \times 9\text{cm}^3$
$= 1188\ \text{cm}^3$
Diameter of lead shot = 3mm

$\therefore$ Radius $(r) = \frac{3}{2}\ \text{mm} = \frac{3}{20}\text{cm}$

$\therefore$ Volume of one shot $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{3}{20} \times \frac{3}{20} \times \frac{3}{20}\text{cm}^3$

$= \frac{99}{7000}$

$\therefore$ No. of shots $= \frac{\text{Total volume}}{\text{Volume of one shot}}$

$= 1188 \div \frac{99}{7000}\ \text{cm}^3$

$= \frac{1188 \times 7000}{99}$

$= 12 \times 7000 = 84000$ Ans.

Question 8.

Solution:

Radius of sphere (r) = 8cm

Volume = $43\pi r^3$

$$= \frac{4}{3} \times \pi \times 8 \times 8 \times 8 \text{ cm}^3 = \frac{2048}{3}\pi \text{ cm}^3$$

Radius of one lead ball = 1cm

$$\therefore \text{ Volume of one ball} = \frac{4}{3}\pi (1)^3$$

$$= \frac{4}{3}\pi \text{ cm}^3$$

$$\therefore \text{ No. of balls} = \frac{\text{Volume of sphere}}{\text{Volume of 1 ball}}$$

$$= \frac{2048\pi}{3} \div \frac{4}{3}\pi$$

$$= \frac{2048\pi}{3} \times \frac{3}{4\pi} = 512 \text{ balls Ans.}$$

$$\text{Now } \frac{\text{Volume of the first sphere}}{\text{Volume of the second sphere}} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$$

$$= \frac{(r_1)^3}{(r_2)^3} = \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{1}{2}\right)^3 \quad \left\{\because \frac{r_1}{r_2} = \frac{1}{2}\right\}$$

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

$\therefore$ Ratio of the volumes = 1 : 8 Ans.

Question 9.

Solution:

Radius of solid sphere (R) = 3cm.

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Volume = $43\pi(R)^3 = 43\pi(3)^3$ cm^3

$$\text{Radius of small ball } (r) = \frac{0.6}{2} = 0.3 \text{ cm}$$

$$\therefore \quad \text{Volume of small ball} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi (0.3)^3$$

$$= \frac{4}{3}\pi \times 0.027 \text{ cm}^3 = 0.036\pi \text{ cm}^3$$

$$\therefore \text{ No. of balls} = \frac{\text{Total volume of sphere}}{\text{Volume of one ball}}$$

$$= \frac{36\pi}{0.036\pi} = \frac{36\pi \times 1000}{36\pi} = 1000 \text{ Ans.}$$

Question 10.

Solution:

Radius of metallic sphere (R) = 10.5cm

$\therefore$ Volume $= \frac{4}{3}\pi R^3 = \frac{4}{3}\pi\ (10.5)^3\ cm^3$

$= \frac{4}{3}\pi\ (1157.625)\ cm^3$

Radius of cone $(r) = 3.5cm$
and height $(h) = 3cm$

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

$= \frac{1}{3}\pi \times (3.5)^2 \times 3\ cm^3$

$= 12.25\pi\ cm^3$

$\therefore$ No. of cones $= \frac{\text{Volume of sphere}}{\text{Volume of one cone}}$

$= \frac{4\pi(1157.625)}{3\times 12.25\pi}$

$= 4(31.5) = 126$ cones Ans.

Question 11.

Solution:

Diameter of a cylinder = 8cm

Radius (r) = 82 = 4cm

Height (h) = 90cm,

$\therefore$ Volume = $\pi r^2 h = \pi(4)^2 \times 90\text{cm}^3$

$= \pi \times 16 \times 90 = \pi 1440\ \text{cm}^3$

Diameter of sphere = 12cm.

$\therefore$ Radius $(r_1) = \frac{12}{2} = 6\text{cm}$

and volume $= \frac{12}{3}\pi r_1^3 = \frac{4}{3}\pi\ (6)^3\ \text{cm}^3$

$= \frac{4}{3}\pi \times 216 = 4\pi \times 72\ \text{cm}^3$

$= 288\pi\ \text{cm}^3$

$\therefore$ No. of spheres $= \frac{\text{Volume of cylinder}}{\text{Volume of one sphere}}$

$= \frac{1440\pi}{288\pi} = 5$ Ans.

Question 12.

Solution:

Diameter of sphere = 6cm

Radius (R) = 62 = 3cm

and volume $= \frac{4}{3}\pi R^3 = \frac{4}{3}\pi \times (3)^3 \text{ cm}^3$

$= \frac{4}{3}\pi \times 27 = 36\pi \text{ cm}^3$

Diameter of wire = 2mm

$\therefore$ Radius $(r) = \frac{2}{2}$ mm = 1mm = 0.1 cm

Let l be the length of wire, then

$\pi r^2 h$ = volume.

$\Rightarrow \pi r^2 l = 36\pi \Rightarrow \pi(0.1)^2 l = 36\pi$

$\Rightarrow l = \frac{36\pi}{(0.1)^2\pi} = \frac{36}{0.01} = \frac{36\times100}{1}$ cm

$= 3600$ cm $= 36$m Ans.

Question 13.

Solution:

Diameter of sphere = 18cm

Radius (R) = 182 = 9cm.

and volume $= \frac{4}{3}\pi R^3 = \frac{4}{3}\pi (9)^3 \text{ cm}^3$

$= \frac{4}{3}\pi \times 729 = 972\pi \text{ cm}^3$

Length of wire $(h) = 108\text{m}$.

Let radius of wire $= r$ cm.

$\therefore$ Volume $= \pi r^2 h$

$= \pi r^2 \times 108 \times 100\text{cm}$

$= 10800\pi r^2$

Now, volume of sphere = Volume of wire

$\therefore\ 10800\ \pi r^2 = 972\pi$

$\Rightarrow\ r^2 = \frac{972\pi}{10800\pi} = \frac{9}{100} = \left(\frac{3}{10}\right)^2$

$r = \frac{3}{10}$ cm

$\therefore$ Radius $= 0.3$ cm $= 3$mm

and diameter $= 2 \times 3\text{mm} = 6\text{mm}$

or 0.6 cm Ans.

Question 14.

Solution:

Diameter of the sphere = 15.6 cm

Radius (R) = 15.62 = 7.8 cm

$\therefore$ Radius (R) $= \frac{15.6}{2} = 7.8$ cm

$\therefore$ Volume $= \frac{4}{3}\pi R^3 = \frac{4}{3}\pi (7.8)^3$ cm^3

$= 632.736\pi$ cm^3

Height of the cone (h) = 31.2 cm

Let r be the radius of the base of the cone

$\therefore$ Volume $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 \times 31.2$ cm^3

$= \frac{4}{3}\pi \times 7.8 \times 7.8 \times 7.8$ cm^3

$= 10.4\pi r^2$ cm^3

But, volume of cone = volume of sphere

$\therefore$ $10.4\pi r^2 = 632.736\pi$

$r^2 = \frac{632.736\pi}{10.4\pi} = \frac{632.736}{10.4} = 60.84$

$= (7.8)^2$

$\therefore$ $r = 7.8$ cm

Hence diameter of cone $= 2 \times r$

$= 2 \times 7.8$ cm $= 15.6$ cm Ans.

Question 15.

Solution:

Diameter of the canonball = 28cm

Radius (R) = 282 = 14 cm

$$\text{Volume} = \frac{4}{3}\pi R^3 = \frac{4}{3}\pi\ (14)^3\ \text{cm}^3$$

$$= \frac{4}{3}\pi \times 14 \times 14 \times 14 = \frac{10976}{3}\pi\ \text{cm}^3$$

Diameter of the cone = 35cm

$$\therefore\ \text{Radius } (r) = \frac{35}{2}\ \text{cm}$$

Let h be the height of the cone, then

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

$$= \frac{1}{3}\pi \left(\frac{35}{2}\right)^2 h\ \text{cm}^3$$

$$= \frac{1}{3}\pi\ \frac{1225}{4} h\ \text{cm}^3$$

$$= \frac{1225}{12}\pi h\ \text{cm}^3$$

But, volume of cone = Volume of sphere

$$\therefore\quad \frac{1225}{12}\pi h = \frac{10976}{3}\pi$$

$$h = \frac{10976\pi \times 12}{3 \times 1225\pi}\ \text{cm}$$

$$= \frac{131712}{3675} = 35.84\ \text{cm}$$

Hence, height of the cone = 35.84 cm Ans.

Question 16.

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Solution:

Given,

Radius of spherical big ball (R) = 3cm

$\therefore$ Volume $= \frac{4}{3}\pi R^3 = \frac{4}{3}\pi \times (3)^3$ cm^3

$= 36\pi$ cm^3

Radius of first small ball = 1.5cm

$\therefore$ Volume $= \frac{4}{3}\pi (1.5)^3 = \frac{4}{3}\pi \times 3.375$ cm^3

$= 4.5\pi$ cm^3

Radius of second small ball = 2cm

Then volume $= \frac{4}{3}\pi (2)^3 = \frac{32}{3}\pi$ cm^3

$= 10.67\pi$ cm^3

$\therefore$ Sum of volume of two small balls = $4.50\pi + 10.67\pi$

$= 15.17\pi$ cm^3

$\therefore$ Volume of third small ball

$= 36\pi - 15.17\pi = 20.83\pi$

Let r be the radius of the third ball

$\therefore$ Volume $= \frac{4}{3}\pi r^3$

$\therefore$ $\frac{4}{3}\pi r^3 = 20.83\pi$

$r^3 = 20.83\pi \times \frac{3}{4\pi} = \frac{62.49}{4}$

$= 15.6225$

$\therefore$ $r = \sqrt[3]{16.6225} = 2.499$ cm

$= 2.5$ cm (approximately)

$\therefore$ Radius of the third ball = 2.5cm. Ans.

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Question 17.

Solution:

Ratio in the radii of two spheres = 1:2

Let radius of smaller sphere = r then,

radius of bigger sphere = 2r

$\therefore$ Surface area of smaller one $= 4\pi r^2$
and surface area of bigger one $= 4\pi (2r)^2$
$= 4\pi(4r^2) = 16\pi r^2$
$\therefore$ Ratio between their surface area
$= 4\pi r^2 : 16\pi r^2$
$= 1 : 4$ Ans.

Question 18.

Solution:

Let r1 and r2 be the radii of two spheres

$$\frac{\text{Surface area of the first}}{\text{Surface area of the second}} = \frac{1}{4}$$

$$\Rightarrow \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{1}{4} \quad \Rightarrow \frac{r_1^2}{r_2^2} = \frac{1}{4}$$

$$\left(\frac{r_1}{r_2}\right)^2 = \left(\frac{1}{2}\right)^2 \Rightarrow \frac{r_1}{r_2} = \frac{1}{2}$$

Question 19.

Solution:

Radius of the cylindrical tub = 12cm.

First level of water = 20cm

Raised water level = 6.75cm.

$\therefore$ Volume of water raised $= \pi r^2 h =$

$\frac{22}{7} \times (12)^2 \times 6.75 \text{ cm}^3$

$= \pi \times 12 \times 12 \times \frac{675}{100} \text{ cm}^3$

$= 972\pi \text{ cm}^3$

$\therefore$ Volume of sphere $= 972\pi \text{ cm}^3$

Let r be the radius of the ball

then volume $= \frac{4}{3}\pi r^3 = 972\pi$

$\Rightarrow \quad r^3 = \frac{972\pi \times 3}{4 \times \pi}$

$\Rightarrow \quad r^3 = 243 \times 3 = 729 = (9)^3$

$\Rightarrow \quad r = 9$

Hence, radius of ball = 9cm Ans.

Question 20.

Solution:

Radius of the ball (r) = 9cm.

Volume of ball = $43\pi r^3$

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

$= \frac{4}{3} \times \pi \times (9)^3 \text{ cm}^3$

$= \frac{4}{3}\pi \times 729 = 972\ \pi \text{ cm}^3$

Radius of the tub $(r_1) = 15\text{cm}$.

Let rise in water $= h$ cm

$\therefore$ Volume of water $= \pi(r_1)^2 h$

$\pi \times (15)^2\ h = 225\pi h$

$\therefore$ $225\pi h = 972\pi$

$h = \frac{972\pi}{225\pi} = \frac{972}{225} = 4.32$ cm

Hence increase in water level = 4.32 cm

Ans.

Question 21.

Solution:

Given,

Radius of hemisphere of lead (r) = 9cm.

$\therefore$ Volume $= \frac{2}{3}\pi r^3 = \frac{2}{3}\pi (9)^3$ cm^3

$= \frac{2}{3}\pi \times 729 = 486\pi$ cm^3

Height of the cone $(h) = 72$ cm

Let r_1 be the radius, then

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

Question 22.

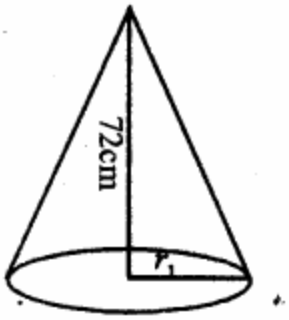
Solution:

Given,

Radius of hemispherical bowl (r) = 9cm

$\therefore$ Volume of bowl $= \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi (9)^3 \text{ cm}^3 = 486\pi \text{ cm}^3$



Diameter of cylindrical bottle = 3cm.

$\therefore$ Radius $(r_1) = \frac{3}{2}$ cm

and height $(h) = 4$cm

$\therefore$ Volume of one bottle $= \pi r_1^2 h$

$= \pi\left(\frac{3}{2}\right)^2 \times 4 = \pi \times \frac{9}{4} \times 4\text{cm}^3$

$= 9\pi \text{ cm}^3$

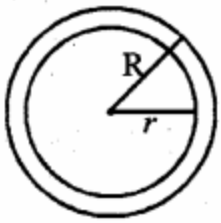
$\therefore$ No. of bottles to be required $= \frac{486\pi}{9\pi}$

$= 54$ bottles Ans.

Question 23.

Solution:

External radius of spherical shell (R) = 9cm



and internal radius $(r) = 8\text{cm}$

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

$$= \frac{4}{3}\pi [R^3 - r^3] = \frac{4}{3} \times \frac{22}{7} (9^3 - 8^3)\ \text{cm}^3$$

$$= \frac{4}{3} \times \frac{22}{7} (729 - 512) = \frac{4}{3} \times \frac{22}{7} \times 217\ \text{cm}^3$$

$$= \frac{2728}{3}\ \text{cm}^3$$

Now, weight of 1cm^3 metal $= 4.5\text{g}$

$$\text{Total weight} = \frac{2728}{3} \times 4.5\text{g}$$

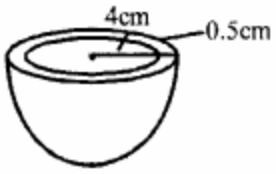
$$= 4092\text{g} = 4.092\ \text{kg Ans.}$$

Question 24.

Solution:

Inner radius (r) = 4 cm

Thickness of steel used = 0.5



$\therefore$ Outer radius (R) = 4 + 0.5 = 4.5cm

$\therefore$ Volume of steel used $= \frac{2}{3}\pi R^3 - \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi\ [R^3 - r^3]$

$= \frac{2}{3} \times \frac{22}{7}\ [(4.5)^3 - (4)^3]$

$= \frac{44}{21}\ [91.125 - 64]$

$= \frac{44}{21} \times 27.125 = 56.83\ cm^3$ Ans.

RS Aggarwal Class 9 Solutions

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He was born on January 2, 1946 in a village of Delhi. He graduated from Kirori Mal College, University of Delhi. After completing his M.Sc. in Mathematics in 1969, he joined N.A.S. College, Meerut, as a lecturer. In 1976, he was awarded a fellowship for 3 years and joined the University of Delhi for his Ph.D. Thereafter, he was promoted as a reader in N.A.S. College, Meerut. In 1999, he joined M.M.H. College, Ghaziabad, as a reader and took voluntary retirement in 2003. He has authored more than 75 titles ranging from Nursery to M. Sc. He has also written books for competitive examinations right from the clerical grade to the I.A.S. level.

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