Chapter 20 : Volume And Surface Area Of Solids
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Exercise 20A
Question 1:
Solution:
(i) Volume of the cuboid = (lbh) cubic units

$$= (22 \times 12 \times 7.5) = 1980\ cm^3$$

Lateral surface area of the cuboid = $\{2(l+b)\times h\}$ cm^2

$$=2(22 + 12) \times 7.5 = 2 \times 34 \times 7.5 = 510\ cm^2$$

Total surface area of the cuboid = 2(lb + bh + lh) sq.units

$$= 2(22 \times 12 + 12 \times 7.5 + 7.5 \times 22)$$

$$= 2(264 + 90 + 165)$$

$$= 2 \times 519 = 1{,}038\ cm^2$$

(ii) Height = 9 dm = 0.9 m.
Volume of the cuboid = (lbh) cubic units

$$= (15\times6\times0.9) = 81\ m^3$$

Lateral surface area of the cuboid = $\{2(l+b)\times h\}$ m^2

$$= 2(15+6)\times0.9 = 42\times0.9 = 37.8\ m^2$$

Total surface area of the cuboid = 2(lb+bh+lh) sq.units

$$= 2\ (15\times6 + 6\times0.9 + 15\times0.9) = 2(90+5.4+13.5) = 217.8\ m^2$$

(iii) Breadth = 25 cm = 0.25 m
Volume of the cuboid = (lbh) cubic units

$$= (24 \times 0.25 \times 6)\ m^3 = 36\ m^3$$

Lateral surface area of the cuboid = $\{2(l+b)\times h\}$ m^2

$$= [2(24 + 0.25) \times 6]\ m^2 = (2 \times 24.25 \times 6)\ m^2 = 291\ m^2$$

Total surface area of the cuboid = 2(lb+bh+lh) sq.units

$$= 2((24 \times 0.25) + (0.25 \times 6) + (24 \times 6))\ m^2 = 2(6 + 1.5 + 144)\ m^2$$

$$= (2 \times 151.5)\ m^2 = 303\ m^2$$

(iv)) length = 48 cm = 0.48 m, breadth = 6 dm = 0.6m and height = 1 m
Volume of the cuboid = (lbh) cubic units

$$= (0.48\times0.6\times1) = 0.288\ m^3$$

Lateral surface area of the cuboid = $\{2(l+b)\times h\}$ m^2

$$= 2(0.48+0.6) \times 1 = 2.16\ m^2$$

Total surface area of the cuboid = 2(lb+bh+lh) sq.units

$$= 2\left(0.48\times0.6 + 0.6\times1 + 1\times0.48\right)$$

$$= 2\,(0.288 + 0.6 + 0.48) = 2.736\ \text{m}^2$$

Question 2:

Solution: Length of the rectangular water tank = 2 m 75 cm = 275 cm

Breadth of the rectangular water tank = 1 m 80 cm = 180 cm

Height of the rectangular water tank = 1 m 40 cm = 140 cm

Volume of the water tank = $L\times B\times H = 275\times180\times140 = 6930000\ cu\ cm$

Since 1 liter = 1000 cu cm,

So, capacity of the water tank = $\dfrac{6930000}{1000} = 6930\ liters$

So, the water tank can hold 6930 liters of water when it is filled to the brim.

Question 3:

Solution: Given that the dimensions of the cuboid is Length = l = 1.05 m = 105 cm, Breadth = b = 70 cm and Height = h = 1.5 cm

Volume of the solid = lbh = $105\ cm \times 70cm \times 1.5\ cm = 11025\ cm^3$

According to the problem given, 1 cm^3 iron weighs 8 grams. So,

11025 cm^3 iron weighs = $8 \times 11025\ gm = 88200 grams = 88200/1000 kg = 88.2 kgs$

Therefore, the solid weighs 88.2 kgs

Question 4:

Solution: Given that the area of the courtyard = 3750 sq m.

Height of the gravel = 1 cm or 1/100 m = 0.01 m

Since Volume = $Base\ area\times Height = 3750\times 0.01 = 37.5\ m^3$

Now, cost of 1 cu m of gravel = Rs. 6.40

Total cost of gravel = $37.5\times 6.40 = Rs.\ 240$

Total cost of covering the courtyard with gravel of 1 cm height = Rs. 240

Question 5:

Solution: The volume of hall= $length \times breadth \times height = 16\times (12.5) \times (4.5) = 900\ m^3$

Therefore, the number of people who can be accommodated in the hall = $\dfrac{900}{3.6} = 250$.

Question 6:

Solution: Dimensions of the cardboard box (volume of box) =

$120cm \times 72cm \times 54cm = 466560\ cm^3$

dimension of soap bars (volume of soap)= $6cm \times 4.5cm \times 4cm = 108\ cm^3$

Therefore $\dfrac{466560}{108} = 4320$ soaps can be put.

Question 7:

Solution: Volume of match box = $4 \times 2.5 \times 1.5 = 15 cm^3$

Hence the volume of 144 match boxes = $144 \times 15 = 2160\ cm^3$

Also the volume of carton = $150 \times 84 \times 60 = 0.756\ m^3 = 756000\ cm^3$

1 packet takes 15 cm^3

Each packet contains 144 matchboxes = 2160 cm^3,

So that number of packets that can be placed in the carton = $\dfrac{756000}{2160} = 350\ packets$.

Question 8:

Solution: Volume of the block = $(500 \times 70 \times 32)\ cm^3 = 1120000\ cm^3$.

Volume of the plank = $(200 \times 25 \times 8) = 40000\ cm^3$.

Number of plans that can be prepared = $\dfrac{1120000}{40000} = 28$.

Question 9:

Solution: Length of wall = 8 m = 800 cm

Height of wall = 5.4 m = 540 cm

Thickness or width of wall = 33 cm

Volume of the wall = $lbh = 800 \times 540 \times 33 = 14256000\ cm^3$

Volume of one brick = $25 \times 13.5 \times 6 = 2025\ cm^3$

Total number of bricks required = Volume of the wall/Volume of one brick

$= \dfrac{14256000}{2025} = 7040$

So, 7040 bricks will be needed.

Question 10:

Solution: Volume of the wall = $(1500 \times 30 \times 400) = 18000000$ cm^3.

Since 1/12 of the wall is mortar, $\dfrac{11}{12} \times 18000000 = 16500000$ is of wall.

Since each brick measures $22\ cm \times 12.5\ cm \times 7.5\ cm = 2062.5\ cm^3$

So the number of bricks in the wall = wall volume / brick volume = $\dfrac{16500000}{2062.5} = 8000\ bricks$

Question 11:

Solution: Cisterns are cuboidal in shape.

So the dimension = $11.2m \times 6m \times 5.8m = 389.76\ m^3$

1 m^3 = 1000l

So capacity = $389.76 \times 1000 = 389760\ Litre$

The area of iron sheet required = total surface area of cistern = 2(lb+bh+lh)

$= 2(11.2 \times 6 + 6 \times 5.8 + 11.2 \times 5.8) = 2(166.96)\ m^2 = 333.92\ m^2$

So the area of sheet required = 333.92 m^2

Question 12:

Solution: Volume of golden block = 0.5m^3

The area of the sheet = 1 hectare = 10000

So, the thickness of the sheet = volume /area =

$\frac{0.5}{10000} = 0.00005m = \left(\frac{0.5 \times 100 \times 10}{10000}\right) mm = 0.05\ mm$

Question 13:

Solution: Volume of water = Ah

Volume of water = 20000×0.05

Volume of water = 1000 m^3

Question 14:

Solution: Area of cross section of river= $2 \times 45 = 90\ m^2$

So, water flowing into the sea= area of cross section x rate of flowing water

$= 90 \times 3000 = 270000\ m^3$

Therefore, water flowing per minute= $\frac{270000}{60} = 4500\ m^3$

Question 15:

Solution: Length of a pit (l) = 5 m ; Breadth of a pit (b) = 3.5 m

Volume of Earth taken out = 14 m^3

Let the depth of a pit = h m

Since, the volume of cuboidal pit = volume of earth taken out

$lbh = 14\ m^3 \Rightarrow 5 \times 3.5 \times h = 14\ m^3$

$h = \frac{14}{(5 \times 3.5)} \Rightarrow h = \frac{140}{(5 \times 35)} = \frac{20}{(5 \times 5)} = \frac{20}{25} = 0.8\ m$

Hence, the depth of the pit is 0.8 m or 80 cm.

Question 16:

Solution: Let l be the length of the tank; Given b = 90 cm and h = 40 cm

Given volume = 576 litres.

1 litre = 1000 cm^3

576 litres = 576000 cm^3

Since volume = lbh = 576000 cm^3

$$l \times 90 \times 40 = 576000 => l \times 3600 = 576000 => l = \frac{576000}{3600} = 160\ cm = 1.6\ m$$

Question 17:

Solution: Since Volume = l × w × h

So, $1.35 = 5 \times w \times 0.36$

w = $\frac{1.35}{1.8} = 0.75\ m = 75\ cm$

Question 18:

Solution: The volume of the room = 378 m^3

So, lbh = 378

Area of its floor = lb = 84

Therefore, $84 \times h = 378 => h = \frac{378}{84} = 4.5\ meters.$

Question 19:

Solution: Given length l = 260 m, width w = 140 m

Let the height be 'h'.

Since volume = 54600 cubic m

We have lwh = 54600

So, h = $\frac{54600}{(l \times w)} = \frac{54600}{(260 \times 140)} = 1.5\ m$

So the height of water level in it = 1.5 m

Question 20:

Solution: Volume of wood = $(60 \times 45 \times 32) - \{(60 - 5) \times (45-5) \times (32-5)\}$

=86400 - 59400

=27000 cm^3

So, the volume of wood used = 27000 cm^3

Question 21:

Solution: The external dimensions of the rectangular box = $36cm \times 25cm \times 16.5cm$

= 14850 cubic cm

Since the thickness of the box is 1.5 cm and box is open, its internal length = $\left(36 - \left(1.5 \times 2\right)\right)$ cm = 36 - 3 = 33 cm

Internal breadth = $25 - \left(1.5 \times 2\right) = 25 - 3 = 22\ cm$

Internal height = 16.5 - 1.5 = 15 cm [since box is open]

Therefore the internal dimensions of the rectangular box = $33cm \times 22cm \times 15cm$

= 10890 cubic cm

Therefore the volume of the iron = external volume of the box - internal volume of the box

= 14850 – 10890 = 3960 cubic cm

Since 1 cubic cm of iron weighs 8.5 grams, weight of 3960 cubic cm =

$3960 \times 8.5 = 33660\ gm$

Therefore, the weight of the empty box is 33.66 kg.

Question 22:

Solution: For external box,

l = 56 cm; b = 39 cm; h = 30 cm

Volume = $lbh = 56 \times 39 \times 30 = 65520\ cm^3$

For the internal measure,

l = 56 – 6 = 50 cm

b = 39 – 6 = 33 cm

h = 30 – 6 = 24 cm

Volume = $lbh = 59 \times 33 \times 24 = 39600\ cm^3$

Wood used = 65520 – 39600 = 25920 cm^3

Question 23:

Solution:

The inside dimension of the wooden box = 62-4, 30-4, 18-4 = 58, 26, 14

The capacity of the box = the volume of the box = $lbh = 58 \times 26 \times 14 = 21112\ cm^3$

Question 24:

Solution:

Given the outer length of box = 80 cm; outer width of box = 65 cm and outer height of the box = 45 cm

Since the thickness of wood is 2.5cm,

The inner length of box = $80 - \left(2 \times 2.5\right) = 75\ cm$

The inner width of box = 65 - 5 = 60 cm

The inner height of box = 45 - 5 = 40 cm

Capacity of the box = $75 \times 60 \times 40 = 180,000\ cm^3$

Volume of wooden part = $80 \times 65 \times 45 - 75 \times 60 \times 40 = 54,000\ cm^3$

Weight of 100 cm^3 of wood = 8g
So the weight of 54,000 cm^3 of wood will be $8/100 \times 54,000 = 4320g = 4.32\ kg$.

Question 25:
Solution:
(i) Volume of cube = $a \times a \times a = 7 \times 7 \times 7 = 343\ m^3$
Lateral surface area = $4 \times a \times a = 4 \times 7 \times 7 = 196\ m^2$
Total surface area = $6 \times a \times a = 6 \times 7 \times 7 = 294\ m^2$
(ii) Volume of cube = $5.6 \times 5.6 \times 5.6 = 175.616\ cm^3$
Lateral surface area = $4 \times 5.6 \times 5.6 = 125.44\ cm^2$
Total surface area = $6 \times 5.6 \times 5.6 = 188.16\ cm^2$
(iii) Volume of cube = $85 \times 85 \times 85 = 614125\ cm^3$
Lateral surface area = $4 \times 85 \times 85 = 28900\ cm^2$
Total surface area = $6 \times 85 \times 85 = 43350\ cm^2$

Question 26:
Solution: Let the side of a cube = ‘a’ cm
Given that the surface area of the cube = 1176 cm^2
So, $6a^2 = 1176 \Rightarrow a^2 = 1176/6 = 196$
So a = 14 cm.
Therefore, the volume of the cube = a^3
$V = (14\ cm)^3 \Rightarrow V = 2744\ cm^3$

Question 27:
Solution: Let ‘a’ be the edge of the cube
Volume (v) = a^3 = 729
So, a = 9 cm
The lateral surface area = $4a^2 = 4 \times 9^2 = 4 \times 81 = 324\ cm^2$
The total surface area = $6a^2 = 6 \times 81 = 486\ cm^2$

Question 28:
Solution: No. of cubes = volume of metal block / volume of cube
$= lbh\ /\ (a \times a \times a) = (225 \times 150 \times 27)\ /\ (45 \times 45 \times 45) = 10\ cubes$ So, the number of cubes formed is 10.

Question 29:
Solution:
Let the edge of the cube = a units

Volume = a^3
Surface area = $6a^2$ square units
If the length of each edge is doubled, the new cube will have an edge = 2a units
And hence the volume = $(2a)^3 = 8a^3 = 8 \times (1) = 8$ *times the first cube volume*
Its surface area $= A = 6 \times (2a)^2 = 6 \times 4 \times a^2 = 4 \times (6a^2) = 4 \times (2) = 4$ *times the first cube*

Question 30:
Solution:
Cost for one meter cube = Rs. 500
Original cost = Rs. 256
Product of Volume and cost for one meter cube = 256
So, the volume = $\frac{256}{500} = 0.512\, m^3 = 512000\, cm^3$
We know that the volume of cube = $a^3 = 0.512$
So a = 0.8 m = 80 cm

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Exercise 20B
Question 1:
Solution:
Volume of a cylinder = $(\pi r^2 h)$ cubic units
Curved surface area of a cylinder = $2\pi rh$ sq.units
Total surface area of a cylinder = $2\pi r\,(h+r)$ sq.units
(i) Volume of a cylinder = $(\pi \times 7^2 \times 50)$ *cubic cm* $= 7700\, cm^3$
Curved surface area of a cylinder = $2\pi \times 7 \times 50 sq.cm = 2200\, cm^2$
Total surface area of a cylinder = $2\pi \times 7 \times (50 + 7)\, sq.cm = 2508\, cm^2$

(ii) Volume of a cylinder = $(\pi \times 5.6^2 \times 1.25)$ *cubic m* $= 123.2\, m^3$
Curved surface area of a cylinder = $2\pi \times 5.6 \times 1.25 sq.m = 44\, m^2$
Total surface area of a cylinder = $2\pi \times 5.6(5.6 + 1.25)\, sq.m = 241.12\, m^2$

(iii) Volume of a cylinder = $(\pi \times 1.4^2 \times 15)$ *cubic m* $= 92.4\, m^3$
Curved surface area of a cylinder = $2\pi \times 1.4 \times 15 sq.m = 132\, m^2$
Total surface area of a cylinder = $2\pi \times 1.4\, (1.4 + 15)\, sq.m = 144.32\, m^2$

Question 2:
Solution:
In the given cylindrical tank, r = 1.5 m and h = 10.5 m.
Volume =

$$\pi r^2 h = 1.5 \times 1.5 \times 10.5 \times \pi = \frac{(15 \times 15 \times 105 \times 22)}{(7 \times 1000)} = \frac{4950 \times 15}{1000} = \frac{74250}{1000} m^3$$

The quantity of milk it can store = $\left(\frac{74250}{1000}\right) m^3 = \left(\frac{74250}{1000}\right) \times 1000\ litre = 74250\ litre$

Question 3:
Solution: Here, height h = 7 m and radius (r) = 10 cm = 0.1 m
So, the diameter (d) = 20 cm = 0.2m
We know that volume = $\pi r^2 h = \frac{22}{7} \times 0.1 \times 0.1 \times 7 = 0.22\ m^3$
Weight of 1 cubic meter wood = 225kg/ m^3
So, its weight = $225 \times 0.22 = 49.5\ kg$.

Question 4:
Solution: Given that the volume of the cylinder = 1.54m^3 and diameter of the base = 140cm
So, the radius of the base = 140/2 = 70cm = 0.7m
Therefore, the volume of cylinder

$$= \pi r^2 h \Rightarrow 1.54 = 22/7 \times 0.7^2 \times h \Rightarrow 1.54 \times \frac{7}{22} \times 0.7 \times 0.7 \Rightarrow h = 1$$

The height of the cylinder is 1m.

Question 5:
Solution:
Given volume = 3850 cm^3; Height = 1 m = 100 cm
Volume = $\pi r^2 h$

$$\frac{22}{7} \times r^2 \times 100 = 3850 \Rightarrow r^2 = \frac{3850}{100} \times \frac{7}{22} \Rightarrow r^2 = 12.25 \text{ So, r = 3.5}$$

So, the diameter of the rod is twice the radius = 2×3.5 *i.e.* 7 *cm.*

Question 6:
Solution:
The total surface area of the cylindrical tank will be equal to the area of metal sheet required.
So Total surface area = $2\pi r(h+r) = 44\ (12) = 528\ m^2$

Question 7:

Solution: Given circumference = $2\pi r = 88$

so, $2\times\ \pi\ \times\ r\ =\ 88\ \Rightarrow\ r = \dfrac{(44\times 7)}{22}\ \Rightarrow\ r\ =\ 14cm.$

Volume= $\pi r^2 h$ = (22/7) * 14 * 14 * 60

$=\ 44\ \times\ 14\ \times\ 60\ =\ 36960\ cm^3$

Cross sectional area $= 2\pi rh\ =\ 2\ \times\ [22/7]\ \times\ 14\ \times\ 60$

$=88\ \times 60\ =\ 5280\ cm^2$

Question 8:

Solution:

Given height h = 14m and the lateral surface area = 220

So, $2\pi\ rh\ =\ 220$

That is, $2\ \times\ \dfrac{22}{7}\ \times\ r\ \times\ 14\ =\ 220\ \Rightarrow\ r\ =\ 2.5\ m$

Volume of cylinder = $\pi\times\ r\ \times\ r\ \times\ h\ =\ \dfrac{22}{7}\ \times\ (2.5)\ \times\ (2.5)\ \times\ 14\ =\ 275\ m^3$

Question 9:

Solution:

V = 1232 $cm^3 = \pi r^2 h$

$r^2 = \dfrac{1232\ \times\ 7}{(8\ \times\ 22)}$

=> r = 7cm

The curved surface area is given by $2\pi rh = 2\ \times\ (22/7)\ \times\ 7\ \times\ 8\ =\ 352\ cm^2$

The total surface area is given by

$2\pi r\ (r+h)\ =\ 2\ \times\ (22/7)\ \times\ 7\ (7+8)\ =\ 44\ \times\ 15\ =\ 660\ cm^2$

Question 10:

Solution: Let the height be 2x and the radius be 7x.

Volume = $\pi\times 49\ x^2\times 2x\ =\ 3.14\times 98\ x^3 =\ 8316$

So $x^3 =\ 8316\ /\ (3.14\times 98)\ =\ 27\ cm$

So, x = 3 cm

Height = 6 cm; radius = 21 cm

Therefore the total surface area = $2\pi rh + 2\pi r^2$

$=\ 2\pi r(r\ +\ h)\ =\ 2\pi\times 21\times 27\ =\ 3564\ cm^2$

Question 11:

Solution:

Circumference of the base $= 2\pi r = 110\ cm \Rightarrow r = 110\ /\ (2\pi) = 17.5\ cm$.

Curved surface area of the cylinder $= 2\pi rh = 4400 \Rightarrow h = (4400\ /\ (2\pi \times 17.5)) = 40\ cm$.

So, the volume of the cylinder = $\pi r^2 h = \pi(17.5)^2 \times 40 = 38,500\ cm^3$

Question 12:

Solution: Square base side = 5cm, height = 14cm

The volume of square base pack = $lbh = 5 \times 5 \times 14 = 350\ cm^3$

For circle base, the volume of cylinder = $\pi r^2 h$

$= 22/7 \times 3.5 \times 3.5 \times 12 = 462\ cm^3$

So, the circular base is greater in capacity by 462 – 350 = 112 cm^3

Question 13:

Solution: Cost of painting the cylindrical pillars = Lateral surface of one pillar $\times 15 \times \frac{5}{2}$

$= 2 \times \frac{22}{7} \times 0.24 \times 7 \times 15 \times \frac{5}{2}$

$= 22 \times 0.24 \times 15 \times 5 = Rs.\ 396$

Question 14:

Solution:

Volume of the rectangular vessel = $lbh = 22 \times 16 \times 14 = 4928\ cm^3$

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

Here, $4928 = 22/7 \times 8^2 \times h$

So, h = $4928 \times 7/22 \times 1/64 = 24.5\ cm$

Question 15:

Solution: Diameter of wire = 1 cm

radius = 0.5; length = 11 cm;

Therefore, volume = 8.653 cm

Now, the diameter of new wire = 1mm = 0.1 cm

Radius = 0.05

Hence the new length = $\frac{volume}{\pi r^2} = 1100.02\ cm = 11\ m$

Question 16:

Solution:

We know that 2.2 cm = 22 mm

Since volume of cube = volume of wire in this case we have

$Side^3 = \pi r^2 L$ where L = length of wire

So, $22^3 = \frac{22}{7} \times 1^2 \times L \Rightarrow 10648 = \frac{22}{7} L$

So, $L = \frac{10648 \times 7}{22} = 338.8\ cm$.

Question 17:
Solution:
We first get the volume of the soil dug out by getting the volume of the hole dug.

Volume = $3.142 \times 3.5^2 \times 20 = 769.79 = 770\ m^3$

The area of the field is = $28 \times 11 = 308\ m^2$

The soil level = $\frac{770}{308} = 2.5m$

Question 18:
Solution:
The width of embankment = 7mts
Its inner radius (r) = 7 ms and outer radius (R) = 7 + 7 = 14mts
Volume of earth dug out = Volume of soil in embankment = $\pi r^2 h$

So, $22/7 \times 7^2 \times 12000 = \pi h (R^2 - r^2)$

$1848000 = \frac{22}{7} \times h \times (14^2 - 7^2) \Rightarrow \frac{1848000 \times 7}{22} = h \times 147 \Rightarrow h = \frac{84000 \times 7}{147}$

$h = \frac{588000}{147} = 4000\ m = 4\ kms.$

Question 19:
Solution: Length of roller = 1m = 100cm

Circumference of roller = $\pi \times D = \frac{22}{7} \times 84 = 264\ cm$

Length of road = 264 x 750 = 198000 cm
Width of road = length of roller = 100 cm
Therefore, the area of the road = $198000 \times 100 = 19,800,000\ cm^2\ or\ 1980\ m^2$

Question 20:
Solution:
V = $\pi \times r^2 \times height$. Since 4.5cm is hollowed out, 6 cm - 4.5 cm

So the formula becomes V= $\pi (6^2 - 4.5^2) \times height$

$\frac{22}{7} \times 15.75\ cm^2 \times 84\ cm\ =\ 4{,}158\ cm^3$. Weight = $4158 cm^3 \times\ 7.5\ =\ 31{,}185\ g\ or\ 31.185\ kg$

Question 21:
Solution:
Given that the Inner radius r = 12/2 = 6cm; thickness = 1cm
Therefore, the outer radius R = 6+1 = 7cm
Height, h = 1m = 100cm
Volume = $\pi\left(R^2 - r^2\right) \times h\ =\ \frac{22}{7} \times \left(49\ -\ 36\right) \times 100\ =\ \frac{22}{7} \times 13 \times 100\ =\ \frac{28600}{7}$
Since the density =7.7 gm/cm^3
Also, the weight = $volume \times density$ = $\left(\frac{28600}{7}\right) \times 7.7\ gm$
= 31460 gm or 31.46 kg

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Exercise 20C

Question 1:
Solution: (b)
Maximum length of a pencil = diagonal of the box =
$\sqrt{\left(l^2 + b^2 + h^2\right)}\ = \sqrt{\left(144 + 81 + 64\right)}\ =\ 17\ cm$

Question 2:
Solution: (b)
Total surface area of cube=$150\ cm^2\ =\ 6a^2$
So $a^2\ =\ \frac{150}{6}$ => $a^2\ =\ 25$ => $a\ =\ 5$
So the volume = a^3 = 125.

Question 3:
Solution: (c)
Edge of cube= $\sqrt[3]{343}\ = 7$
So the total surface area of the cube= $6 \times 49\ = 294 cm^2$

Question 4:
Solution: (b)
Given the cost of painting the whole surface area of a cube = Rs. 264.60 = 26460 paise and rate = 10 paise per cm^2
Let 'a' be the side of the cube.
Total cost = Surface area × rate
Surface area = Total cost / rate
Surface area = $\frac{26460}{10} = 2646\ cm^2 = 6a^2$
$a^2 = 2646/6 = 441 \Rightarrow a^2 = 441 \Rightarrow a = \sqrt{441} = 21\ cm$
Volume of cube = $side^3 = a^3$
Volume of cube = $21^3 = 21 \times 21 \times 21 = 9261$

Question 5:
Solution: (c)
L = 8m = 800cm; h = 6m = 600cm; b = 22.5cm
Volume of the wall = lbh = $800 \times 600 \times 22.5 = 10800000\ cm^3$
The brick has dimensions l = 25cm; b = 11.25cm; h = 6cm
Volume = lbh = $25 \times 11.25 \times 6 = 1687.5\ cm^3$
Hence the number of bricks = volume of wall / volume of 1 brick
$= \frac{10800000}{1687.5} = 6400\ bricks$

Question 6:
Solution: (c)
No of cubes = volume of box / volume of the cube =
$100 \times 100 \times 100 / 10 \times 10 \times 10 = \frac{1000000}{1000} = 1000\ cubes$

Question 7:
Solution: (a)
Let the dimensions be x, 2x , 3x
So total surface area = 2(lb + bh + lb) = $2(2x^2 + 6x^2 + 3x^2)$
$\Rightarrow\ 22x^2 = 88\ cm^2$
$\Rightarrow\ x = 2$ cm
The volume is hence $2 \times 4 \times 6 = 48\ cm^3$

Question 8:

Solution: (b)

Let the edges of the two cubes be a and b. Hence, $\frac{a^3}{b^3} = \frac{1}{27} \Rightarrow \left(\frac{a}{b}\right)^3 = \left(\frac{1}{3}\right)^3 \Rightarrow \frac{a}{b} = \frac{1}{3}$

Therefore, the ratio of the surface area = $\frac{6a^2}{6b^2} = \frac{a^2}{b^2} = \left(\frac{a}{b}\right)^2 = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$

So, the ratio of the surface area = 1 : 9

Question 9:

Solution: (c)

The surface area = $\left[2\left(10\times4 + 4\times3 + 10\times3\right)\right] sq.cm = 164\ sq.cm$

Question 10:

Solution: (c)

Volume of beam = $length \times width \times height = 900 \times 40 \times 20 = 72 \times 10^4 cm^3$

Mass = $density \times volume = 50\times72\times10^4 = 36\ kg$

Question 11:

Solution: (a)

Given length of the rectangular reservoir [cuboid] = l = 6m

Breadth = b = 3.5 m

Let the depth (height) of the cuboid is `h`

Given volume = 42000 litre = $42m^3$

We know that the volume of a cuboid = lbh

$\Rightarrow 6m\times 3.5m\times`h`m = 42m^3 \Rightarrow 21h\ m^3 = 42m^3 \Rightarrow h = \frac{42m^3}{21m^3}$

The depth of the reservoir is 2m

Question 12:

Solution: (b)

Volume of the room = $\left(10\ m\times8\ m\times3.3\ m\right) = 264\ m^3$

So the number of men = $\frac{264}{3} = 88$

Question 13:

Solution: (a)

The volume of the cuboid water tank = $\left(3\times2\times5\right) = 30$

So it can hold $30\times1000 = 30000$ litres of water.

Question 14:
Solution: (b)
TSA of cardboard =2(25 x 15 + 15 x 8 + 8 x 25)
= 2(375 + 120 + 200) = $2 \times 695 = 1390\ cm^2$

Question 15:
Solution: (d)
The diagonal of a cube = $\sqrt{3} \times a = 4\sqrt{3} \Rightarrow a = 4$
Hence its volume = $a^3 = 64\ cm^3$

Question 16:
Solution: (b)
The diagonal of a cube is $9\sqrt{3}$ cm long = $\sqrt{3}a$ => a = 9 cm.
The total surface area of the cube = $6a^2 = 6 \times 9 \times 9 = 486\ cm^2$

Question 17:
Solution: (d)
Let a be the side of the cube. Then its volume = a^3
Then 2a will be the side of the new cube. Then its new volume will be $8a^3$. Hence the volume increases by 8 times.

Question 18:
Solution: (b)
Let a be the side of the cube. Surface area = $6a^2$
Then 2a will be the side of the cube. Surface area $= 6\left(2a\right)^2 = 4 \times \textit{surface area of the cube.}$

Question 19:
Solution: (a)
Volume of the cube having edge 6cm = $V_1 = 6^3 = 216 cm^3$
Volume of the cube having edge 8cm = $V_2 = 8^3 = 512 cm^3$
Volume of the cube having edge 10cm = $V_3 = 10^3 = 1000 cm^3$
Total volume = $V_1 + V_2 + V_3$ = 216 + 512 + 1000 = 1728 cm^3
Edge of the new cube = $\sqrt[3]{1728} = 12\ cm$

Question 20:
Solution: (d)
Side= 5cm

Volume of one cube = 5^3 = 125 cm^3

Volume of cuboid = $lbh = 125\times5 = 625cm^3$

Question 21:

Solution: (d)

Volume of the earth dug out = volume of the circle = $\pi r^2h = \pi\times1\times1\times14 = 44\ m^3$

Question 22:

Solution: (b)

Given that the capacity of a cylindrical tank = 1848 m^3 and the diameter of the base = 14 m

Therefore $\pi r^2h = 1848 \Rightarrow \frac{22}{7}\times7\times7\times h = 1848$

⇨ $154\times h = 1848$ => h = 12 m

Question 23:

Solution: (c)

Total surface area is 2πrh + 2πrr and lateral is 2πrh hence the ratio is $\frac{(h+r)}{h} = (80:60) = 4/3$ or 4 : 3.

Question 24:

Solution: (d)

We know that $\pi r^2h = \pi\times 3\times 3\times 8 = n\times\pi\times.75\times.75\times.2 \Rightarrow 72 = n\times0.1125$. So n = 640

Question 25:

Solution: (b)

Given V = 66 cm^3 and r = .05 cm

Volume v = πr^2h => $66 = 22/7\times0.05^2\times h$

⇨ $66\times7=22\times0.05\times0.05\times h$

So, h = 84 m

Question 26:

Solution: (a)

Volume of cylinder = $\pi r^2h = \frac{22}{7}\times25\times14 = 1100\ cm^3$

Question 27:

Solution: (a)

Given height h = 80 cm.

Diameter = 7 cm => Radius = 3.5 cm.

Whole surface area of the cylinder = $2\pi r\left(h+r\right) = 2\pi\times3.5\times\left(83.5\right) = 1837\ cm^2$

Question 28:

Solution: (b)

2πrh = 264 => $r = \dfrac{264}{(2\pi\times14)} = 3\ cm$.

Volume of the cylinder = $\pi r^2 h = \pi\times3\times3\times14 = 396\ cm^3$.

Question 29:

Solution: (a)

Given diameter d of cylinder = 14 cm, so radius r of cylinder = d ÷ 2 = 7 cm

Curved surface area of cylinder = 220 cm^2

Let the height be h.

Height h = 5 cm

So the volume = $\pi r^2 h = \pi\times7\times7\times5 = 770\ cm^3$

Question 30:

Solution: (c)

Let the radii be 2x and 3x.

Let the height be 5y and 3y.

So, the ratio of volume = $\dfrac{r^2h}{R^2H} = \dfrac{\left(2x\right)^2\times5y}{\left(3x\right)^2\times3y} = \dfrac{20x^2y}{27x^2y} = \dfrac{20}{27}$ or 20 : 27.

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TEST PAPER-20

A.

Question 1:

Solution:

Surface area of cube is given by the formula $6a^2$

So $6a^2 = 384$

$a^2 = \dfrac{384}{6} = 64$

$a = \sqrt{64} = 8$

The volume of a cube is a^3, so $8^3 = 512\ cm^3$

Question 2:

Solution:

The volume of each soap cake= $lbh = 7\times5\times2.5 = 87.5 cm^3$

The volume of the box = $lbh = 56 \times 40 \times 25 = 56000\ cm^3$
So the number of soap cakes which can be kept in that box = volume of box / volume of soap cakes
= 56000 ÷ 87.5 = 640.
Therefore 640 soap cakes can be kept in that box.

Question 3:
Solution:
Let r = 5x and h = 7x hence the volume = $\pi r^2 h$
So, $550 = \dfrac{22 \times 5x \times 5x \times 7x}{7}$
$550 = 550x^3 \Rightarrow x^3 = 1 \Rightarrow x = 1$
Hence the radius = 5 × 1 = 5 cm , height = 7cm.

Question 4:
Solution: Each one of those coins will be a cylinder and hence its volume is
$V = \pi r^2 h = \pi \times (.75)^2 \times (.2) = \dfrac{9\pi}{80} cm^3$
The right circular cylinder has volume $V = \pi \times (2.25)^2 \times (10) = \dfrac{405\pi}{8} cm^3$.
By division, we obtain $\left(\dfrac{405\pi}{8}\right) / \left(\dfrac{9\pi}{80}\right) = 450\ coins$

Question 5:
Solution:
The total surface area of a cuboid is given by 2(lb + bh + lh) = 2(180 + 80 + 144) = 808 cm^2

Question 6:
Solution:
Since it is given that CSA of cylinder = 264 m^2 and volume of cylinder = 924 m^3
CSA of cylinder = $2\pi rh \Rightarrow 264 = 2 \times \dfrac{22}{7} \times r \times h \Rightarrow r \times h = \dfrac{(264 \times 7)}{44}$

- $\Rightarrow r \times h = \dfrac{1848}{44} \Rightarrow r \times h = 42 \Rightarrow h = \dfrac{42}{r}$

Also, volume of cylinder = $\pi r^2 h \Rightarrow 924 = \dfrac{22}{7} \times r^2 \times \dfrac{42}{r} \Rightarrow 924r = 924 \times 7 \Rightarrow r = 7\ m$
Since the radius is 7 m its diameter will be 7×2 = 14 m and the height of the cylinder = 42÷7 = 6 m

B.

Question 7:

Solution: (b)

The circumference of circle = $2\pi r = 44 = 2\times\frac{22}{7}\times r \Rightarrow r = 7$

The volume of a cylinder = $\pi r^2 h = \frac{22}{7}\times(7)^2\times 15 = 2310\ cm^3$

Question 8:

Solution: (b)

Volume = $\{\pi r^2\}\times h = 35\times 8 = 280\ cm^3$

Question 9:

Solution: (a)

In this case, the volume of the cylinder = volume of the cuboid

$\pi\times r^2\times h = l\ b\ h \Rightarrow \frac{22}{7}\times 16\times h = 16\times 11\times 8 = 1408$

$\frac{22}{7}\times h = \frac{1408}{16} = 88$

So, h = 28 m.

Question 10:

Solution: (c)

Lateral surface area = $2\ (8 + 6) \times 4 = 28 \times 4 = 112\ m^2$

Question 11:

Solution: (c)

Volume of cuboid = $l \times b \times h \Rightarrow 576 = 3x \times 4x \times 6x \Rightarrow 576 = 72 \times x^3$

So, $8 = x^3 \Rightarrow x = 2$

The sides are thus 6cm, 8 cm, and 12 cm.

The total surface area =

$2(lb + bh + hl) = 2(6\times 8 + 8\times 12 + 12\times 6) = 2(48 + 96 + 72) = 2 \times 216 = 432\ cm^2$

Question 12:

Solution: (a)

TSA of cube = $6 \times (side)^2 \Rightarrow 384 = 6 \times (side)^2 \Rightarrow side = 8\ cm$.

Therefore, volume = $(side)^3 = (8)^3 = 512\ m^3$

C.

Question 13:

(i)

Solution: 2 (lb + bh + lh) as that is the formula for whole surface area of a cuboid.

(ii)

Solution: 2(l + b) × h as that is the formula for lateral surface area of a cuboid.

(iii)

Solution: $4a^2$ as that is the formula for lateral surface area of a cube.

(iv)

Solution: $\pi r^2 h$ as that is the formula for volume of a cylinder.

(v)

Solution: $2\pi rh$ as that is the formula for surface area of a cylinder.