20. Volume and Surface Area of Solids

Exercise 20A

1. Question

Find the volume, lateral surface area and the total surface area of the cuboid whose dimensions are:

(i) length = 22 cm, breadth = 12 cm and height = 7.5 cm

(ii) length = 15 m, breadth = 6 m and height = 9 dm

(iii) length = 24 m, breadth = 25 cm and height = 6 m

(iv) length = 48 cm, breadth = 6 dm and height = 1 m

Answer

(i) We know that,

Volume of cuboid = Length × Breadth × Height

= (22 × 12 × 7.5)

= 1980 cm^3

We also know that,

Total Surface Area of cuboid = 2 (lb + bh + hl)

= 2 (22 × 12) + (22 × 7.5) + (12 × 7.5)

= 2 (264 + 165 + 90)

= 1038 cm^2

Now,

Lateral surface area of cuboid = [2 (l + b) × h]

= 2 (22 + 12) × 7.5

= 510 cm^2

(ii) We know that,

Volume of cuboid = Length × Breadth × Height

= (15 × 6 × 0.9)

= 81 m^3

We also know that,

Total Surface Area of cuboid = 2 (lb + bh + hl)

= 2 (15 × 6) + (15 × 0.9) + (6 × 0.9)

= 2 (90 + 13.5 + 5.4)

= 217.8 m^2

Now,

Lateral surface area of cuboid = [2 (l + b) × h]

= 2 (15 + 6) × 0.9

= 37.8 m^2

(iii) We know that,

Volume of cuboid = Length × Breadth × Height

= (24 × 0.25 × 6)

= 36 m^3

We also know that,

Total Surface Area of cuboid = 2 (lb + bh + hl)

= 2 (24 × 0.25) + (24 × 6) + (0.25 × 6)

= 2 (6 + 144 + 1.5)

= 303 m^2

Now,

Lateral surface area of cuboid = [2 (l + b) × h]

= 2 (24 + 0.25) × 6

= 291 m^2

(iv) We know that,

Volume of cuboid = Length × Breadth × Height

= (0.48 × 0.6 × 1)

= 0.288 m^3

We also know that,

Total Surface Area of cuboid = 2 (lb + bh + hl)

= 2 (0.48 × 0.6) + (0.48 × 1) + (0.6 × 1)

= 2 (0.288 + 0.48 + 0.6)

= 2.736 m^2

Now,

Lateral surface area of cuboid = [2 (l + b) × h]

= 2 (0.48 + 0.6) × 1

= 2.16 m^2

2. Question

The dimensions of a rectangular water tank are 2 m 75 cm by 1 m 80 cm by 1 m 40 cm. How many litres of water does it hold when filled to the brim?

Answer

We know that,

1m = 100 cm

Therefore,

Dimensions of the tank will be: 2m 75cm × 1m 80 cm × 1m 40cm

= 275 cm × 180 cm × 140 cm

We know that,

Volume of cuboid = Length × Breadth × Height

= 275 × 180 × 140

= 6930000 cm^3

We also know that,

1000 cm^3 = 1L

Therefore,

Volume = $\frac{6930000}{1000}$

= 6930 Litres

3. Question

A solid rectangular piece of iron measures 1.05 m x 70 cm x 1.5 cm. Find the weight of this piece in kilograms if 1 cm^3 of iron weighs 8 grams.

Answer

We know that,

1m = 100cm

Therefore,

Dimensions of the iron piece will be: 105 cm × 70 cm × 1.5 cm

We know that,

Volume of cuboid = Length × Breadth × Height

Total volume of the piece of iron = 105 × 70 × 1.5

= 11025 cm^3

We also know that,

1 cm^3 = 8 gms

Therefore,

Weight of the piece = 11025 × 8

= 88200 g

= $\frac{88200}{1000}$

= 88.2 kg

4. Question

The area of a courtyard is 3750 m^2. Find the cost of covering it with gravel to a height of 1 cm if the gravel costs Rs. 6.40 per cubic metre.

Answer

We know that,

1cm = 0.01m

Therefore,

Volume of the gravel used = Area × Height

= 3750 × 0.01

= 37.5 m^3

It is given in the question that cost of the gravel is Rs. 6.40 per cubic meter

Therefore,

Total cost of covering = (37.5 × 6.4)

= Rs. 240

5. Question

How many persons can be accommodated in a hall of length 16 m, breadth 12.5 m and height 4.5 m, assuming that 3.6 m^3 of air is required for each person?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Total volume of hall = 16 × 12.5 × 4.5

= 900 m^3

It is given in the question that 3.6 m^3 of air is required for each person

Therefore,

Total number of persons that can be accommodated in the hall = $\frac{\text{Total volume}}{\text{Volume required by each person}}$

= $\frac{900}{3.6}$

= 250 people

6. Question

A cardboard box is 1.2 m long, 72 cm wide and 54 cm high. How many bars of soap can be put into it if each bar measures 6 cm x 4.5 cm x 4 cm?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Firstly, we have to find out volume of cardboard box

Volume of cardboard box = 120 × 72 × 54

= 466560 cm^3

Now,

Volume of each bar of soap = 6 × 4.5 × 4

= 108 cm^3

Therefore,

Total number of bars of soap that can be accommodated in that box = $\frac{\text{Volume of the box}}{\text{Volume of each soap}}$

= $\frac{466560}{108}$

= 4320 bars

7. Question

The size of a matchbox is 4 cm x 2.5 cm x 1.5 cm. What is the volume of a packet containing 144 matchboxes? How many such packets can be placed in a carton of size 1.5 m x 84 cm x 60 cm?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Firstly, we have to find out volume occupied by a single matchbox

Volume occupied by a single matchbox = (4 × 2.5 × 1.5)

= 15 cm^3

Now,

Volume of a packet containing 144 matchboxes = (15 × 144)

= 2160 cm^3

Also,

Volume of carton = (150 × 84 × 60)

= 756000 cm^3

Therefore,

Total number of packets that can be placed in a carton $= \frac{\text{Volume of the carton}}{\text{Volume of a packet}}$

$= \frac{75600}{2160}$

= 350 packets

8. Question

How many planks of size 2 m x 25 cm x 8 cm can be prepared from a wooden block 5 m long, 70 cm broad and 32 cm thick, assuming that there is no wastage?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Total volume of the block = (500 × 70 × 32)

= 1120000 cm^3

Total volume of each plank = 200 × 25 × 8

= 40000 cm^3

Hence,

Total number of planks that can be made $= \frac{\text{Total volume of the block}}{\text{Volume of each plank}}$

$= \frac{1120000}{40000}$

= 28 planks

9. Question

How many bricks, each of size 25 cm x 13.5 cm x 6 cm, will be required to build a wall 8 m long, 5.4 m high and 33 cm thick?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Firstly,

Volume of the brick = 25 × 13.5 × 6

= 2025 cm^3

Now,

Volume of the wall = 800 × 540 × 33

= 14256000 cm^3

Hence,

Total number of bricks required = $\frac{\text{Volume of the wall}}{\text{Volume of each brick}}$

= $\frac{14256000}{2025}$

= 7040 bricks

10. Question

A wall 15 m long, 30 cm wide and 4 m high is made of bricks, each measuring 22 cm x 12.5 cm x 7.5 cm. If $\frac{1}{12}$ of the total volume of the wall consists of mortar, how many 12bricks are there in the wall?

Hint. Volume of bricks in the wall = {(1500 x 30 x 400) $\frac{1}{12}$ x (1500 x 30 x 400)1 cm^3.

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Volume of the wall = 1500 × 30 × 400

= 18000000 cm^3

Total quantity of mortar = $\frac{1}{12} \times 18000000$

= 1500000 cm^3

Therefore,

Volume of bricks = 18000000 – 1500000

= 16500000 cm^3

Now,

Volume of a single brick = 22 × 12.56 × 7.5

= 2062.5 cm^3

Therefore,

Total number of bricks = $\frac{\text{Total volume of the bricks}}{\text{Volume of a single brick}}$

= $\frac{16500000}{2062.5}$

= 8000 bricks

11. Question

Find the capacity of a rectangular cistern in litres whose dimensions are 11.2 m x 6 m x 5.8 m. Find the area

of the iron sheet required to make the cistern.

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Volume of the cistern = 11.2 × 6 × 5.8

= 389.76 m^3

= 389.76 × 1000

= 389760 litres

Now,

Area of iron sheet that is required to make the cistern = Total surface area of the cistern

We also know that,

Total Surface Area of cuboid = 2 (lb + bh + hl)

= 2 (11.2 × 6 + 11.2 × 5.8 + 6 × 5.8)

= 2 (67.2 + 64.96 + 34.8)

= 333.92 cm^2

12. Question

The volume of a block of gold is 0.5 m^3. If it is hammered into a sheet to cover an area of 1 hectare, find the thickness of the sheet.

Answer

It is given that,

Volume of the block = 0.5 m^3

We know that,

1 hectare = 10000 m^2

Therefore,

Thickness of the sheet = volume/area

= 0.5/10000

= 0.00005 m

= 0.005 cm

= 0.05 mm

13. Question

The rainfall recorded on a certain day was 5 cm. Find the volume of water that fell on a 2-hectare field.

Answer

It is given that,

Rain recorded in a certain day = 5 cm = 0.05 m

Area of the field = 2 hectare

= 2 × 10000 m^2

= 20000m^2

Therefore,

Total rain over the field = Area of the field × Height of the field

= 0.05 × 20000

= 1000 m^3

14. Question

A river 2 m deep and 45 m wide is flowing at the rate of 3 km/h. Find the quantity of water that runs into the sea per minute.

Answer

It is given in the question that,

Area of cross section of river = 45m × 2m = 90 m^2

Rate of flow = 3 km/hr

$$= \frac{3 \times (1000\ m)}{(60\ m)}$$

= 50 m/min

Therefore,

Volume of water flowing through the cross-section in one minute = 90 m^2 × 50 m/min

= 4500 m^3 per minute

15. Question

A pit 5 m long and 3.5 m wide is dug to a certain depth. If the volume of earth taken out of it is 14 m^3, what is the depth of the pit?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Let the depth of the pit be x m

Therefore,

Volume = 5 × 3.5 × x

It is given in the question that,

Volume = 14 m^3

Therefore,

Depth, $x = \frac{\text{Volume}}{\text{Length} \times \text{Width}}$

$x = \frac{14}{5 \times 3.5}$

= 0.8 m

= 80 cm

16. Question

A rectangular water tank is 90 cm wide and 40 cm deep. If it can contain 576 litres of water, what is its length?

Answer

It is given that,

Capacity of the water tank = 576 Litres = 0.576 m^3

Width = 90 cm = 0.9 m

Depth = 40 cm = 0.4 m

Therefore,

$$\text{Length} = \frac{\text{Capacity}}{\text{Width} \times \text{Depth}}$$

$$= \frac{0.570}{0.9 \times 0.4}$$

= 1.600 m

17. Question

A beam of wood is 5 m long and 36 cm thick. It is made of 1.35 m^3 of wood. What is the width of the beam?

Answer

It is given in the question that,

Volume of the beam = 1.35 m^3

Length = 5 m

Thickness = 36 cm = 0.36 m

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

$$\text{Width} = \frac{\text{Volume}}{\text{Thickness} \times \text{Length}}$$

$$= \frac{1.35}{5 \times 0.36}$$

= 0.75 m

= 75 cm

18. Question

The volume of a room is 378 m^3 and the area of its floor is 84 m^2. Find the height of the room.

Answer

We know that,

Volume = Height × Area

Given that,

Volume = 378 m^3

Area = 84 m^2

Therefore,

$$\text{Height} = \frac{\text{Volume}}{\text{Area}}$$

$$= \frac{378}{84}$$

= 4.5 m

19. Question

A swimming pool is 260 m long and 140 m wide. If 54600 cubic metres of water is pumped into it, find the height of the water level in it.

Answer

It is given in the question that,

Length of the pool = 260 m

Width of the pool = 140 m

Also,

Volume of water in the pool = 54600 cubic metres

Therefore,

Height of water = $\frac{\text{Volume}}{\text{Length} \times \text{Width}}$

$= \frac{54600}{200 \times 140}$

= 1.5 metres

20. Question

Find the volume of wood used to make a closed box of outer dimensions 60 cm x 45 cm x 32 cm, the thickness of wood being 2.5 cm all around.

Answer

Given that,

External length = 60 cm

External width = 45 cm

External height = 32 cm

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

External volume of the box = 60 × 45 × 32

= 86400 cm^3

It is also given that,

Thickness of the wood = 2.5 cm

Therefore,

Internal length = 60 – (2.5 × 2) = 55 cm

Internal width = 45 – (2.5 × 2) = 40 cm

Internal height = 32 – (2.5 × 2) = 27 cm

As we know that,

Volume of cuboid = Length × Breadth × Height

Thereore,

Internal volume of the box = 55 × 40 × 27

= 59400 cm^3

Hence,

Volume of wood = External volume – Internal volume

= 86400 – 59400

= 27000 cm^3

21. Question

Find the volume of iron required to make an open box whose external dimensions are 36 cm x 25 cm x 16.5 cm, the box being 1.5 cm thick throughout. If 1 cm^3 of iron weighs 8.5 grams, find the weight of the empty box in kilograms.

Answer

Given that,

External length = 36 cm

External width = 25 cm

External height = 16.5 cm

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

External volume of the box = 36 × 25 × 16.5

= 14850 cm^3

It is also given that,

Thickness of iron = 1.5 cm

Therefore,

Internal length = 36 – (1.5 × 2) = 33 cm

Internal width = 25 – (1.5 × 2) = 22 cm

Internal height = 16.5 – 1.5 = 15 cm (As the box is open)

As we know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Internal volume of the box = 33 × 22 × 15

= 10890 cm^3

Hence,

Volume of iron = External volume – Internal volume

= 14850 – 10890

= 3960 cm^3

Also given that,

1 cm^3 of iron = 8.5 grams

Therefore,

Total weight of the box = 3960 × 8.5

= 33660 grams

= 33.66 kilograms

22. Question

A box with a lid is made of wood which is 3 cm thick. Its external length, breadth and height are 56 cm, 39 cm and 30 cm respectively. Find the capacity of the box. Also find the volume of wood used to make the box.

Answer

Given that,

External length = 56 cm

External width = 39 cm

External height = 30 cm

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

External volume of the box = 56 × 39 × 30

= 65520 cm^3

It is also given that,

Thickness of the wood = 3 cm

Therefore,

Internal length = 56 – (3 × 2) = 50 cm

Internal width = 39 – (3 × 2) = 33 cm

Internal height = 30 – (3 × 2) = 24 cm

As we know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Capacity of box = Internal volume of the box = 55 × 40 × 27

= 39600 cm^3

Hence,

Volume of wood = External volume – Internal volume

= 65520 – 39600

= 25920 cm^3

23. Question

The external dimensions of a closed wooden box are 62 cm, 30 cm and 18 cm. If the box is made of 2-cm-thick wood, find the capacity of the box.

Answer

Given that,

External length = 62 cm

External width = 30 cm

External height = 18 cm

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

External volume of the box = 62 × 30 × 18

= 33480 cm^3

It is also given that,

Thickness of the wood = 2 cm

Therefore,

Internal length = 62 – (2 × 2) = 58 cm

Internal width = 30 – (2 × 2) = 26 cm

Internal height = 18 – (2 × 2) = 14 cm

As we know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Capacity of box = Internal volume of the box = 58 × 26 × 14

= 21112 cm^3

24. Question

A closed wooden box 80 cm long, 65 cm wide and 45 cm high, is made of 2.5-cm-thick wood. Find the capacity of the box and its weight if 100 cm^3 of wood weighs 8 g.

Answer

Given that,

External length = 80 cm

External width = 65 cm

External height = 45 cm

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

External volume of the box = 80 × 65 × 45

= 234000 cm^3

It is also given that,

Thickness of the wood = 2.5 cm

Therefore,

Internal length = 80 – (2.5 × 2) = 75 cm

Internal width = 65 – (2.5 × 2) = 60 cm

Internal height = 45 – (2.5 × 2) = 40 cm

As we know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Capacity of box = Internal volume of the box = 75 × 60 × 40

= 180000 cm^3

Hence,

Volume of wood = External volume – Internal volume

= 234000 – 180000

= 54000 cm^3

It is also given that,

100 cm^3 of wood weighs 8 g

Therefore,

Weight of wood = $\frac{54000}{100} \times 8$

= 4320 g

= 4.32 kg

25. Question

Find the volume, lateral surface area and the total surface area of a cube each of whose edges measures:

(i) 7 m (ii) 5.6 cm (iii) 8 dm 5 cm

Answer

(i) We have,

Length of the edge of the cube = a = 7 cm

We know that,

Volume of cube = $a^3 = 7^3 = 343\ m^3$

Also,

Lateral surface area of the cube = $4a^2$

= 4 × 7 × 7

= 196 m^2

Total surface area of the cube = $6a^2$

= 6 × 7 × 7

= 294 m^2

(ii) We have,

Length of the edge of the cube = a = 5.6 cm

We know that,

Volume of cube = $a^3 = (5.6)^3 = 175.616\ cm^3$

Also,

Lateral surface area of the cube = $4a^2$

= 4 × 5.6 × 5.6

= 125.44 cm^2

Total surface area of the cube = $6a^2$

= 6 × 5.6 × 5.6

= 188.16 cm^2

(iii) We have,

Length of the edge of the cube = a = 8 dm 5 cm = 85 cm

We know that,

Volume of cube = $a^3 = 85^3 = 614125\ cm^3$

Also,

Lateral surface area of the cube = $4a^2$

= 4 × 85 × 85

= 28900 cm^2

Total surface area of the cube = $6a^2$

= 6 × 85 × 85

= 43350 cm^2

26. Question

The surface area of a cube is 1176 cm^2. Find its volume.

Answer

Let us assume the edge of the cube be a

We know that,

Total surface area of the cube = $6a^2$

$6a^2 = 1176\ cm^2$

$a = \sqrt{\frac{1176}{6}}$

$a = \sqrt{196}$

a = 14 cm

We also know that,

Volume of the cube = $a^3 = (14)^3$

= 2744 cm^3

27. Question

The volume of a cube is 729 cm^3. Find its surface area.

Answer

Let us assume the edge of the cube be a

We know that,

Volume of the cube = a^3

$a^3 = 729\ cm^3$

$a = \sqrt[3]{729}$

a = 9 cm

We also know that,

Total surface area of cube = $6a^2$

= 6 × 9 × 9

= 486 cm^2

28. Question

The dimensions of a metal block are 2.25 m by 1.5 m by 27 cm. It is melted and recast into cubes, each of side 45 cm. How many cubes are formed?

Answer

We know that,

1 m = 100 cm

Also,

Volume of a cuboid = Length × Breadth × Height

Therefore,

Volume of the original block = 225 × 150 × 27

= 911250 cm^3

Given that,

Length of the edge of the cube = 45 cm

Therefore,

Volume of one cube = $a^3 = (45)^3$

= 91125 cm^3

Hence,

Total number of blocks that can be cast = $\frac{\text{Volume of the block}}{\text{Volume of the cube}}$

= $\frac{911250}{91125}$

= 10

29. Question

If the length of each edge of a cube is doubled, how many times does its volume become? How many times does its surface area become?

Answer

Let us assume a be the length of the edge of the cube

We know that,

Volume of cube = a^3

Also,

Total surface area of the cube = $6a^2$

Now, if the length is doubled, then the new length becomes 2a

Now,

New volume = $(2a)^3 = 8a^3$

Also,

New surface area = 6 $(2a)^2$ = 24 a^2

Therefore,

The total volume of the cube is increased by the actor of 8 whereas the surface area is increased by the factor of 4.

30. Question

A solid cubical block of fine wood costs 256 at 500 per m^3. Find its volume and the length of each side.

Answer

It is given that,

Cost of wood = Rs. 500/m^3

Also,

Cost of the given block = Rs 256

We know that,

Volume of cube = a^3

Therefore,

Volume of the given block = $a^3 = \frac{256}{500}$

= 0.512 m^3

= 512000 cm^3

Also,

Length of its edge = a = $\sqrt[3]{0.512}$

= 0.8 m

= 80 cm

Exercise 20B

1. Question

Find the volume, curved surface area and total surface area of each of the cylinders whose dimensions are:

(i) radius of the base = 7 cm and height = 50 cm

(ii) radius of the base = 5.6 m and height = 1.25 m

(iii) radius of the base = 14 dm and height = 15 m

Answer

(i) At first,

In order to find volume, we will use the following formula:

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

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

Volume of the cylinder = $\pi(7)^2(50)$

$= \frac{22}{7} \times 7 \times 7 \times 50$

= 22 × 7 × 50

= 7700 cm^3

Now,

In order to find curved surface area, we will use the following formula:

Curved surface area of cylinder = $2\pi rh$

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

Curved surface area of cylinde

r = $2\pi rh$

$= 2 \times \frac{22}{7} \times 7 \times 50$

= 22× 2× 50

= 2200 cm^2

Now,

In order to find the total surface area we will use the following formula:

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

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

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

$= 2 \times \frac{22}{7} \times 7(7 + 50)$

= 22× 2× 57

= 2508cm^2

(ii) At first,

In order to find volume we will use the following formula:

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

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

Volume of the cylinder = $\pi(5.6)^2(1.25)$

$= \frac{22}{7} \times 5.6 \times 5.6 \times 1.25$

$= 22 \times 0.8 \times 7 \times 50$

$= 123.2\ cm^3$

Now,

In order to find curved surface area we will use the following formula:

Curved surface area of cylinder = $2\pi rh$

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

Curved surface area of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 5.6 \times 1.25$

$= 22 \times 2 \times 0.8 \times 1.25$

$= 44\ cm^2$

Now,

In order to find the total surface area we will use the following formula:

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

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

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

$= 2 \times \frac{22}{7} \times 5.6(5.6 + 1.25)$

$= 22 \times 2 \times 0.8 \times 6.85$

$= 241.12\ cm^2$

(iii) At first,

We will convert the radius into metre

Radius = 14dm = 1.4m

Now,

In order to find volume we will use the following formula:

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

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

Volume of the cylinder = $\pi(7)^2(50)$

$= \frac{22}{7} \times 1.4 \times 1.4 \times 15$

= 22× 0.2× 1.4× 1.5

= 92.4cm^3

Now,

In order to find curved surface area we will use the following formula:

Curved surface area of cylinder = $2\pi rh$

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

Curved surface area of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 1.4 \times 1.5$

= 22× 2× 0.2× 1.5

= 132cm^2

Now,

In order to find the total surface area we will use the following formula:

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

Where,

'r' = radius of the base

'h' = height of the cylinder

Hence,

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

$= 2 \times \frac{22}{7} \times 1.4(1.4 + 1.5)$

= 22× 2× 0.2× 2.9

= 144.32cm^2

2. Question

A milk tank is in the form of a cylinder whose radius is 1.5 m and height is 10.5 m. Find the quantity of milk in litres that can be stored in the tank.

Answer

It is given in the question that,

Radius of the cylindrical milk tank (r) = 1.5m

Height of the cylindrical milk tank (h) = 10.5m

Now,

In order to find the capacity of the tank we'll find the volume of the milk tank

Hence,

Volume of the cylindrical milk tank = $= \pi r^2 h$

$= \pi(1.5)^2(10.5)$

$= \frac{22}{7} \times 1.5 \times 1.5 \times 10.5$

$= 74.25\ m^3$

Now,

We know that,

$1\ m^3 = 1000\ L$

$\therefore 74.25\ m^3 = 74250\ L$

3. Question

A wooden cylindrical pole is 7 m high and its base radius is 10 cm. Find its weight if the wood weighs 225 kg per cubic metre.

Answer

It is given in the question that,

Radius of the cylindrical pole (r) = 10cm = 0.1m

Height of the cylindrical pole (h) = 7m

Now,

Volume of the cylindrical wooden pole $= \pi r^2 h$

$= \pi(0.1)^2(7)$

$= \frac{22}{7} \times 0.1 \times 0.1 \times 7$

$= 0.22\ cm^3$

Now,

We know that,

Weight of the wood = $225\ kg/m^3$

$\therefore$ Weight of the pole = 0.22×225

$= 49.5\ kg$

4. Question

Find the height of the cylinder whose volume is $1.54\ m^3$ and diameter of the base is 140 cm?

Answer

It is given in the question that,

Volume of cylinder = $1.54\ m^3$

Diameter of the base = 140 cm = 1.4m

Hence,

Radius of the base $= \frac{1.4}{2}$

$= 0.7$ m

Now,

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

1.54 = $\pi(0.7)^2(h)$

1.54 = $\frac{22}{7} \times 0.7 \times 0.7 \times h$

h = 1 m

Hence, height of the cuboid = 1m

5. Question

The volume of a circular iron rod of length 1 m is 3850 cm^3. Find its diameter.

Answer

It is given in the question that,

Volume of cylindrical rod = 3850 cm^3

Height of the rod = 1m = 100cm

Now,

In order to find the diameter of the rod we need to find the radius of the rod

Hence,

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

3850 = $\pi(r)^2(100)$

3850 = $\frac{22}{7} \times r^2 \times 100$

$r^2 = \frac{3850 \times 7}{100 \times 22}$

r = 1.75× 7

r = 3.5 cm

Hence,

Diameter = 2(radius)

= 2 × 3.5

= 7 cm

6. Question

A closed cylindrical tank of diameter 14 m and height 5 m is made from a sheet of metal. How much sheet of metal will be required?

Answer

It is given in the question that,

Diameter of the cylindrical tank = 14 m

Radius of the cylindrical tank = $\frac{14}{2}$

= 7 m

Height of the cylindrical tank = 5 m

Now,

In order to find the total area of the metal sheet required we need to find the total surface area of the tank.

Hence,

Total surface area of the cylindrical tank $= 2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times 7(5 + 7)$

$= 44 \times 12$

$= 528\ m^2$

7. Question

The circumference of the base of a cylinder is 88 cm and its height is 60 cm. Find the volume of the cylinder and its curved surface area.

Answer

It is given in the question that,

Circumference of the base of the cylinder = 88cm

Height of the cylinder = 60cm

Hence,

Curved surface area = Circumference× height

$= 88 \times 60$

$= 5280\ cm^2$

Now,

The circumference of the base = $2\pi r$ = 88 cm

Hence,

The radius of the base(r) $= \frac{88}{2\pi}$

$= \frac{88 \times 7}{2 \times 22}$

= 14cm

Hence,

We can find the volume as follows:

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

$= \frac{22}{7} \times (14)^2 \times 60$

$= 22 \times 2 \times 14 \times 60$

$= 36960 cm^3$

8. Question

The lateral surface area of a cylinder of length 14 m is 220 m^2. Find the volume of the cylinder.

Answer

In the question it is given that

Length of the cylinder = 14 m

Which means,

That the height of the cylinder = 14m

Lateral surface area of the cylinder = $2\pi rh$

$220 = 2 \times \frac{22}{7} \times r \times 14$

$r = \frac{10}{4}$

r = 2.5 m

Hence,

We can find the volume as,

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

$= \frac{22}{7} \times (2.5)^2 \times 14$

= 22× 2× 2.5× 2.5

= 275 m^3

9. Question

The volume of a cylinder of height 8 cm is 1232 cm^3. Find its curved surface area and the total surface area.

Answer

It is given in the question that,

Height of the cylinder = 8cm

And,

Volume of the cylinder = $\pi r^2 h = 1232\ cm^3$

Hence,

We can find the radius as,

$r = \sqrt{\frac{1232}{\pi h}}$

$r = \sqrt{\frac{1232 \times 7}{22 \times 8}}$

r = √49

r = 7 cm

Now,

Curved surface area of the cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 7 \times 8$

= 252 cm^2

Therefore,

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

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

= 2× 22× 15

= 660 cm^2

10. Question

The radius and height of a cylinder are in the ratio 7 : 2. If the volume of the cylinder is 8316 cm 3, find the total surface area of the cylinder.

Answer

It is given in the question that,

The ratio of radius and height is 7 : 2

This means that,

$\frac{\text{radius}}{\text{height}} = \frac{7}{2}$

$\frac{r}{h} = \frac{7}{2}$

$r = \frac{7}{2}h$

Now,

We can find the volume of the cylinder as:

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

$8316 = \pi\left(\frac{7}{2}h\right)^2 h$

$8316 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h^3$

$h^3 = \frac{8316 \times 2}{11 \times 7}$

$h^3 = 216$

$h = 6$

Hence,

Radius, $r = \frac{7}{2}h$

$= \frac{7}{2} \times 6$

= 21 cm

Therefore,

Total surface area of the cylinder = $2\pi r(r + h)$

$= 2 \times \frac{22}{7} \times 21 \times 27$

= 2× 22× 3× 27

= 3564 cm^2

11. Question

The curved surface area of a cylinder is 4400 cm^2 and the circumference of its base is 110 cm. Find the volume of the cylinder.

Answer

In the above question it is given that

Curved surface area of the cylinder = $2\pi rh$ = 4400 cm^2

And,

The circumference of the base of the cylinder = $2\pi r = 110\ cm$

Now,

The height of the cylinder = h = $\frac{\text{curved surface area}}{\text{circumference}}$

= $\frac{4400}{110}$

= 40 cm

Also,

Radius of the cylinder = r = $\frac{4400}{2\pi h}$

= $\frac{4400\times7}{2\times22\times40}$

= $\frac{35}{2}$

Hence,

We can find the volume of the cylinder as:

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

= $\frac{22}{7}\times\frac{35}{2}\times\frac{35}{2}\times 40$

= 38500 cm^3

12. Question

A particular brand of talcum powder is available in two packs, a plastic can with a square base of side 5 cm and of height 14 cm, or one with a circular base of radius 3.5 cm and of height 12 cm. Which of them has greater capacity and by how much?

Answer

In the above given question,

In order to find the greater capacity pack

At first, we'll calculate the volume of the cubic pack,

Length of the side of pack, a = 5cm

Height of the pack, h = 14cm

Hence,

Volume of the pack = a^2h

= $(5)^2(14)$

= 5× 5 × 14

= 350 cm^3

Now,

We'll calculate the volume of the cylindrical pack,

Radius of the base, r = 35cm

Height of the cylinder, h = 12 cm

Hence,

Volume of the pack = $\pi r^2 h$

$= \frac{22}{7} \times 35 \times 35 \times 12$

$= 22 \times 5 \times 35 \times 12$

$= 462\ cm^3$

Hence,

It's clear that the pack with the circular has a greater capacity than the than the pack with square base.

And,

The deference between their volume= 462 – 350

$= 112\ cm^3$

13. Question

Find the cost of painting 15 cylindrical pillars of a building at Rs. 2.50 per square metre if the diameter and height of each pillar are 48 cm and 7 metres respectively.

Answer

It is given in the question that,

Diameter of the cylindrical pillars = 48 cm

Hence,

The radius of the cylindrical pillars $= \frac{48}{2}$

= 24 cm

= 0.24 m

Height of the cylindrical pillars = 7 m

Now,

Lateral surface area of one pillar = πdh

$= \frac{22}{7} \times 0.48 \times 7$

$= 10.56\ m^2$

Now,

The surface area to be painted = total surface area of 15 pillars

$= 15 \times 10.56$

$= 158.4\ m^2$

Therefore,

The total cost of painting = Rs(158.4 × 2.5)

= Rs 396

14. Question

A rectangular vessel 22 cm by 16 cm by 14 cm is full of water. If the total water is poured into an empty cylindrical vessel of radius 8 cm, find the height of water in the cylindrical vessel.

Answer

It can be concluded from the question that,

Volume of the rectangular vessel = 22 × 16 × 14

= 4928 cm^3

Radius of the cylindrical vessel = 4cm

Volume of the cylindrical vessel = $\pi r^2 h$

Now,

Since, the water is poured from the rectangular vessel to a cylindrical vessel

Therefore, the volume of the water will remain same.

Hence,

Volume of the cylindrical vessel = volume of rectangular vessel

$\pi r^2 h = 4928$

$\frac{22}{7} \times 4 \times 4 \times \text{height} = 4928$

Height = 24.5

15. Question

A piece of ductile metal is in the form of a cylinder of diameter 1 cm and length 11 cm. It is drawn out into a wire of diameter 1 mm. What will be the length of the wire so obtained?

Answer

It is given in the question that,

Diameter of the wire = 1cm

Hence,

Radius of the wire = 0.5 cm

Length or the height of the wire = 11 cm

Hence,

The volume of the wire = $\pi r^2 h$

$= \frac{22}{7} \times 0.5 \times 0.5 \times 11$

= 8.643 cm^3

Now,

We know that,

The volumes of both the cylinders would be the same.

And,

Diameter of the new wire = 1mm = 0.1 cm

Radius = 0.05cm

Therefore the new length of the wire would be = $\frac{\text{volume}}{\pi r^2}$

$= \frac{8.643 \times 7}{22 \times 0.05 \times 0.05}$

= 1100.02 cm

= 11 m

16. Question

A solid cube of metal each of whose sides measures 2.2 cm is melted to form a cylindrical wire of radius 1

mm. Find the length of the wire so obtained.

Answer

It is given in the question that

Length of the edge, a = 2.2 cm

Hence,

Volume of the cube = a^3

= $(2.2)^3$

= 10.648 cm^3

Now,

Volume of the wire = $\pi r^2 h$

Radius of the wire = 1mm = 0.1cm

We know that,

Volume of the cube = volume of the wire

Hence,

Length of the wire = $\frac{\text{volume}}{\pi r^2}$

= $\frac{10.648 \times 7}{22 \times 0.1 \times 0.1}$

= 338.8 cm

17. Question

How many cubic metres of earth must be dug out to sink a well which is 20 m deep and has a diameter of 7 metres? If the earth so dug out is spread over a rectangular plot 28 m by 11 m, what is the height of the platform so formed?

Answer

It is given in the question that,

Diameter = 7m

Hence,

Radius = 3.5 m

Depth = 20 m

Volume of the earth to be dug out = $\pi r^2 h$

= $\frac{22}{7} \times 3.5 \times 3.5 \times 20$

= 770 m^3

Volume of the earth piled upon the given plot = 28× 11 × h

Therefore,

Height = $\frac{770}{28 \times 11}$

= $\frac{70}{28}$

= 2.5 m

18. Question

A well of inner diameter 14 m is dug to a depth of 12 m. Earth taken out of it has been evenly spread all around it to a width of 7 m to form an embankment. Find the height of the embankment so formed.

Hint. Required height =

$$\frac{\text{volume of earth taken out}}{\pi \times \left[(114)^2 - (7)^2\right]}$$

Answer

Given that,

Inner diameter = 14 cm

Therefore,

Radius = 7 cm

Also, Depth = 12 m

Therefore,

Volume of earth dug out = $\Pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 12$

$= 1848\ m^3$

It is also given that,

Width of embankment = 7 m

Therefore,

Total radius = 7 + 7 = 14 m

Volume of embankment = Total volume – Inner volume

$= \Pi r_o^2 h - \Pi r_1^2 h$

$= \Pi h (r_o^2 - r_1^2)$

$= \frac{22}{7} h (14^2 - 7^2)$

$= \frac{22}{7} h (196 - 49)$

$= \frac{22}{7} h \times 147$

$= 21 \times 22h$

$= 462 \times h\ m^3$

Since,

Volume of embankment = Volume of earth dug out

Therefore,

$1848 = 462\ h$

$h = \frac{1848}{462}$

$h = 4$ m

Therefore,

Height of the embankment = 4 m

19. Question

A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of the road roller is 84 cm and its length is 1 m.

Answer

It is given in the question that,

Diameter = 84 cm

Hence,

Radius = 42cm

Length = 1m = 100cm

Now,

Lateral surface area = $2\pi rh$

$= 2 \times \frac{22}{7} \times 42 \times 100$

= 26400 cm^2

Hence, the area of the road will be

= lateral surface area × no. of rotations

= 26400 × 750

= 19800000 cm^2

= 1980 m^2

20. Question

A cylinder is open at both ends and is made of 1.5-cm-thick metal. Its external diameter is 12 cm and height is 84 cm. What is the volume of metal used in making the cylinder? Also, find the weight of the cylinder if 1 cm^3 of the metal weighs 7.5 g.

Hint. External radius = 6 cm, internal radius = 4.5 cm.

Volume of metal =

$\left\{\pi \times (6)^2 \times 84 - \pi \times (4.5)^2 \times 84\right\} cm^3$.

Answer

It is given in the question that,

Thickness of the cylinder = 1.5 cm

External diameter of the cylinder = 12cm

Hence,

Radius = 6 cm

And,

Internal radius = 4.5cm

Height = 84cm

Hence,

We have the following measurements now,

Total volume = $\pi r^2 h$

$= \frac{22}{7} \times 6 \times 6 \times 84$

= 9504 cm^3

Inner volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 4.5 \times 4.5 \times 84$

= 5346 cm^3

Hence,

The volume of the metal = total volume – internal volume

= 9504 – 5346

= 4158 cm^3

Therefore,

Weight of the iron = 4158 × 7.5

= 31.185 kg

21. Question

The length of a metallic tube is 1 metre, its thickness is 1 cm and its inner diameter is 12 cm. Find the weight of the tube if the density of the metal is 7.7 grams per cubic centimetre.

Hint. Weight of 1 cm^3 of metal = 7.7 g.

Answer

It is given in the question that,

Length = 1m

= 100cm

Inner diameter = 12 cm

Inner Radius = 6 cm

Hence,

Inner volume $= \Pi r_1^2 h$

Thickness = 1 cm

outer radius = 7 cm

Now,

We can calculate the following measurements:

Total volume $= \Pi r_2^2 h$

Now,

Volume of the tube = total volume – inner volume

$= \Pi r_2^2 h - \Pi r_1^2 h$

$= \Pi h(r_2^2 - r_1^2) = 3.14 \times 100 \times (7^2 - 6^2) = 3.14 \times 100 \times (49 - 36) = 314 \times 13 = 4082\ cm^3$

We have,

Density of the tube = 7.7 g/cm^3

Therefore,

Weight of the tube = volume × density

= 4082 × 7.7

= 31431g

= 31.43 kg

Exercise 20C

1. Question

The maximum length of a pencil that can be kept in a rectangular box of dimensions

12 cm x 9 cm x 8 cm, is

A. 13 cm

B. 17 cm

C. 18 cm

D. 19 cm

Answer

We know that,

Length of the diagonal of the cuboid = $\sqrt{l^2 + b^2 + h^2}$

= $\sqrt{12^2 + 9^2 + 8^2}$

= $\sqrt{144 + 81 + 64}$

= $\sqrt{289}$

= 17 cm

Therefore, option B is correct

2. Question

The total surface area of a cube is 150 cm^2. Its volume is

A. 216 cm^3

B. 125 cm^3

C. 64 cm^3

D. 1000 cm^3

Answer

We know that,

Total surface area of cube = $6a^2$

$6a^2$ = 150 cm^2

a = $\sqrt{\frac{150}{6}}$

a = $\sqrt{25}$

a = 5 cm

Therefore,

Volume of the cube = $a^3 = 5^3 = 125\ cm^3$

Hence, option B is correct

3. Question

The volume of a cube is 343 cm^3. Its total surface area is

A. 196 cm^2

B. 49 cm^2

C. 294 cm^2

D. 147 cm^2

Answer

Given that,

Volume of cube = 343 cm^3

$a^3 = 343\ cm^3$

$a = \sqrt[3]{343}$

a = 7 cm

We know that,

Total surface area of cube = $6a^2$

$= 6 \times 7 \times 7$

$= 294\ cm^2$

Hence, option C is correct

4. Question

The cost of painting the whole surface area of a cube at the rate of is 10 paise per cm^2 Rs. 264.60. Then, the volume of the cube is

A. 6859 cm^3

B. 9261 cm^3

C. 8000 cm^3

D. 10648 cm^3

Answer

Let the side of cube be ‘a’

Hence total surface area of cube = $6a^2$

Cost of painting the cube = $6a^2 \times 10$

$264.6 = 60\ a^2$

$a^2 = \frac{264.6}{60}$

$a^2 = 4.41$

a = 2.1

Hence,

Volume of the cube= a^3

= $(2.1)^3$

= 9.261 cm^3

Hence, option B is correct

5. Question

How many bricks, each measuring 25 cm x 11.25 cm x 6 cm, will be needed to build a wall 8 m long, 6 m high and 22.5 cm thick?

A. 5600

B. 6000

C. 6400

D. 7200

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Volume of each brick = 25 × 11.25 × 6

= 1687.5 cm^3

Volume of wall = 800 × 600 × 22.5

= 10800000 cm^3

Therefore,

Number of bricks = $\frac{10800000}{1687.5}$

= 6400

Hence, option C is correct

6. Question

How many cubes of 10 cm edge can be put in a cubical box of 1 m edge?

A. 10

B. 100

C. 1000

D. 10000

Answer

Volume of smaller cube = $a^3 = (10)^3$ = 1000 cm^3

Volume of box = $(100)^3$ = 1000000 cm^3

Therefore,

Total number of cubes = $\frac{1000000}{1000}$

= 1000

Hence, option C is correct

7. Question

The edges of a cuboid are in the ratio 1: 2: 3 and its surface area is 88 cm2. The volume of the cuboid is

A. 48 cm^3

B. 64 cm^3

C. 96 cm^3

D. 120 cm^3

Answer

Let a be the length of the smallest edge

Therefore,

The edges are in proportion a: 2a: 3a

We know that,

Surface area of cuboid = 2 (lb + bh + hl)

= 2 (a × 2a + a × 3a + 2a × 3a)

= 2 ($2a^2 + 3a^2 + 6a^2$)

= $22a^2$

= 88 cm^2

a = $\sqrt{\frac{88}{22}}$

= $\sqrt{4}$ = 2

Also,

2a = 2 × 2 = 4

And,

3a = 3 × 2 = 6

Therefore,

Volume = a × 2a × 3a

= 2 × 4 × 6

= 48 cm^3

Hence, option A is correct

8. Question

Two cubes have their volumes in the ratio 1 : 27. The ratio of their surface areas is

A. 1 : 3

B. 1 : 9

C. 1 : 27

D. None of these

Answer

Given that,

Volumes are in the ration 1: 27

Therefore,

$$\frac{\text{Volume 1}}{\text{Volume 2}} = \frac{1}{27} = \frac{a^3}{b^3}$$

$$a = \frac{b}{\sqrt[3]{27}}$$

$$a = \frac{b}{3}$$

Or b = 3a

$$\text{Or } \frac{b}{a} = 3$$

We have to find out ratio of their surface areas:

$$\frac{\text{Surface area 1}}{\text{Surface area 2}} = \frac{6a^2}{6b^2}$$

$$= \frac{a^2}{b^2}$$

$$= \frac{\left(\frac{b}{3}\right)^2}{b^2}$$

$$= \frac{1}{9}$$

Therefore, the surface areas are in the ratio 1: 9

Hence, option B is correct

9. Question

The surface area of a (10 cm x 4 cm x 3 cm) brick is

A. 84 cm^2

B. 124 cm^2

C. 164 cm^2

D. 180 cm^2

Answer

We know that,

Surface area of a cuboid = 2 (lb + bh + hl)

= 2 (10 × 4 + 10 × 3 + 4 × 3)

= 2 (40 + 30 + 12)

= 164 cm^2

Hence, option C is correct

10. Question

An iron beam is 9 m long, 40 cm wide and 20 cm high. If 1 cubic metre of iron weighs 50 kg, what is the weight of the beam?

A. 56 kg

B. 48 kg

C. 36 kg

D. 27 kg

Answer

We know that,

Volume of a cuboid = Length × Breadth × Height

= 9 × 0.4 × 0.2

= 0.72 m^3

Therefore,

Weight = 0.72 × 50

= 36 kg

11. Question

A rectangular water reservoir contains 42000 litres of water. If the length of reservoir is 6 m and its breadth is 3.5 m, the depth of the reservoir is

A. 2 m

B. 5 m

C. 6 m

D. 8m

Answer

We know that,

Volume of a cuboid = Length × Breadth × Height

42000 L = 42 m^3 (As 1 m^3 = 1000 L)

Therefore,

Height (h) = $\frac{\text{Volume}}{\text{lb}}$

= $\frac{42}{6\times3.5}$

= 2 m

Hence, option A is correct

12. Question

The dimensions of a room are (10 mx8mx 3.3 m). How many men can be accommodated in this room if each man requires 3 m^3 of space?

A. 99

B. 88

C. 77

D. 75

Answer

We know that,

Volume of a cuboid = Length × Breadth × Height

Therefore,

Volume of the room = 10 × 8 × 3.3

= 264 m^3

Space required by 1 person = 3 m^3

Therefore,

Total number of people that can be accommodated = $\frac{264}{3}$

= 88

Hence, option B is correct

13. Question

A rectangular water tank is 3 m long, 2 m wide and 5 m high. How many litres of water can it hold?

A. 30000

B. 15000

C. 25000

D. 35000

Answer

For this we have to find out volume of the water tank

We know that,

Volume of a cuboid = Length × Breadth × Height

Therefore,

Volume of water tank = 3 × 2 × 5

= 30 m^3

= 30000 L (As, 1 m^3 = 1000 L)

Hence, option A is correct

14. Question

The area of the cardboard needed to make a box of size 25 cm x 15 cm x 8 cm will be

A. 390 cm^2

B. 1390 cm^2

C. 2780 cm^2

D. 1000 cm^2

Answer

We know that,

Surface area of cuboid = 2 (lb + bh + hl)

Therefore,

Area of the cardboard required to make a box = 2 (23 × 15 + 15 × 8 + 25 × 8)

= 2 (375 + 120 + 200)

= 1390 cm^2

Hence, option B is correct

15. Question

The diagonal of a cube measures $4\sqrt{3}$ cm. Its volume is

A. 8 cm^3

B. 16 cm^3

C. 27 cm^3

D. 64 cm^3

Answer

Given that,

Diagonal of the cube = $a\sqrt{3} = 4\sqrt{3}$ cm

i.e. a = cm

Therefore,

Volume of the cube = $a^3 = 4^3$

= 64 cm^3

Hence, option D is correct

16. Question

The diagonal of a cube is $9\sqrt{3}$ cm long. Its total surface area is

A. 243 cm^2

B. 486 cm^2

C. 324 cm^2

D. 648 cm^2

Answer

We know that,

Diagonal of the cube = $a\sqrt{3}$

= $9\sqrt{3}$

i.e. a = 9

Therefore,

Total surface area of the cube = $6a^2$

= 6 × 9 × 9

= 486 cm^2

Hence, option B is correct

17. Question

If each side of a cube is doubled then its volume

A. is doubled

B. becomes 4 times

C. becomes 6 times

D. becomes 8 times

Answer

Let the side of the cube be a units

Original volume = a^3

Now, when each side of the cube is doubled then its volume:

New side = 2a units

New Volume = $(2a)^3 = 8a^3$ cubic units

Therefore, the volume of the cube is 8 times than its original volume

Hence, option D is correct

18. Question

If each side of a cube is doubled, its surface area

A. is doubled

B. becomes 4 times

C. becomes 6 times

D. becomes 8 times

Answer

Let the side of the cube be “a” unit

Original Surface area = $6a^2$ sq units

Now, when each side of a cube is doubled than its surface area:

New surface area = 6 $(2a^2)$ sq units

= $24a^2$ sq units

Therefore, the surface area of the cube is 4 times than its original area

Hence, option B is correct

19. Question

Three cubes of iron whose edges are 6 cm, 8 cm and 10 cm respectively are melted and formed into a single cube. The edge of the new cube formed is

A. 12 cm

B. 14 cm

C. 16 cm

D. 18 cm

Answer

We know that,

Volume of cube = a^3

Total Volume of cube = $6^3 + 8^3 + 10^3$

= 216 + 512 + 1000

= 1728 cm^3

Therefore,

Edge of the new cube = $\sqrt[3]{1728}$

= 12 cm

Hence, option A is correct

20. Question

Five equal cubes, each of edge 5 cm, are placed adjacent to each other. The volume of the cuboid so formed, is

A. 125 cm^3

B. 375 cm^3

C. 525 cm^3

D. 625 cm^3

Answer

Length of the cuboid so formed = 25 cm

Breadth of the cuboid = 5 cm

Height of the cuboid = 5 cm

We know that,

Volume of cuboid = Length × Breadth × Height

= 25 × 5 × 5

= 625 cm^3

Hence, option D is correct

21. Question

A circular well with a diameter of 2 metres, is dug to a depth of 14 metres. What is the volume of the earth dug out?

A. 32 m^3

B. 36 m^3

C. 40 m^3

D. 44 m^3

Answer

Given that,

Diameter of the circular well = 2 m

Radius = 1 m

Height = 14 m

Therefore,

Volume of cylindrical well = $\pi r^2 h$

= $\frac{22}{7}$ × 1 × 1 × 14

= 44 m^3

Hence, option D is correct

2. Question

If the capacity of a cylindrical tank is 1848 m^3 and the diameter of its base is 14 m, the depth of the tank is

A. 8 m

B. 12 m

C. 16 m

D. 18 m

Answer

Given that,

Volume of cylindrical tank = 1848 m^3

Diameter = 14 m

So, Radius = 7 m

We know that,

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

$1848 = \frac{22}{7} \times 7 \times 7 \times h$

$h = \frac{1848}{22 \times 7}$

h = 12 m

Hence, option B is correct

23. Question

The ratio of the total surface area to the lateral surface area of 20 cm and height 60 cm, is

A. 2: 1

B. 3: 2

C. 4: 3

D. 5 : 3

Answer

We have,

$\frac{\text{Total surface area}}{\text{Lateral surface area}} = \frac{2\pi r(h+r)}{2\pi rh}$

$= \frac{h+r}{h}$

$= \frac{20+60}{60}$

$= \frac{4}{3}$

= 4: 3

Therefore, option C is correct

24. Question

The number of coins, each of radius 0.75 cm and thickness 0.2 rightcm, to be melted to make aright circular cylinder of height 8 cm and base radius 3 cm is

A. 460

B. 500

C. 600

D. 640

Answer

Total number of coins $= \frac{\text{Volume of cylinder}}{\text{Volume of each coin}}$

$= \frac{\pi \times 3 \times 3 \times 8}{\pi \times 0.75 \times 0.75 \times 0.2}$

= 640

Hence, option D is correct

25. Question

66 cm^3 of silver is drawn into a wire 1 mm in diameter. The length of the wire will be

A. 78 m

B. 84 m

C. 96 m

D. 108 m

Answer

We have to find out length of the wire:

Length $= \frac{\text{Volume}}{\pi r^2}$

Diameter = 1mm (Given)

Therefore,

Radius = 0.05 cm

Length $= \frac{66 \times 7}{22 \times 0.05 \times 0.05}$

= 8400 cm

= 84 m

Hence, option B is correct

26. Question

The height of a cylinder is 14 cm and its diameter is 10 cm. The volume of the cylinder is

A. 1100 cm^3

B. 3300 cm^3

C. 3500 cm^3

D. 7700 cm^3

Answer

We know that,

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

Given that,

Diameter = 10 cm

Radius = 5 cm

Height = 14 cm

Therefore,

Volume = $\pi r^2 h$

$= \frac{22}{7} \times 5 \times 5 \times 14$

$= 1100\ cm^3$

Hence, option A is correct

27. Question

The height of a cylinder is 80 cm and the diameter of its base is 7 cm. The whole surface area of the cylinder is

A. $1837\ cm^2$

B. $1760\ cm^2$

C. $1942\ cm^2$

D. $3080\ cm^2$

Answer

We know that,

Total surface area of the cylinder = $2\pi r\ (r + h)$

Given that,

Diameter = 7 cm

So, Radius = 3.5 cm

Height = 80 cm

Therefore,

Total surface area = $2 \times \frac{22}{7} \times 3.5\ (3.5 + 80)$

$= 22\ (83.5)$

$= 1837\ cm^2$

Hence, option A is correct

28. Question

The height of a cylinder is 14 cm and its curved surface area is 264 cm^2. The volume of the cylinder is

A. $308\ cm^3$

B. $396\ cm^3$

C. $1232\ cm^3$

D. $1848\ cm^3$

Answer

We know that,

Curved surface area of the cylinder = $2\pi rh$

$264 = 2\pi rh$

$r = \frac{264 \times 7}{2 \times 22 \times 14}$

$r = 3$ cm

We know that,

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

$= \frac{22}{7} \times 3 \times 3 \times 14$

$= 396\ cm^3$

Hence, option B is correct

29. Question

The diameter of a cylinder is 14 cm and its curved surface area is 220 cm^2. the volume of the cylinder is

A. 770 cm^3

B. 1000 cm^3

C. 1540 cm^3

D. 6622 cm^3

Answer

Given that,

Diameter = 14v cm

So, Radius = 7 cm

We know that,

Curved surface area of cylinder = $2\pi rh$

220 $cm^2 = 2\pi rh$

$h = \frac{220 \times 7}{2 \times 22 \times 7}$

h = 5 cm

Therefore,

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

$= \frac{22}{7} \times 7 \times 7 \times 5$

$= 770\ cm^3$

Hence, option A is correct

30. Question

The ratio of the radii of two cylinders is 2 : 3 and the ratio of their heights is 5 : 3. The ratio of their volumes will be

A. 4 : 9

B. 9 : 4

C. 20 : 27

D. 27 : 20

Answer

Given that,

$\frac{r1}{r2} = \frac{2}{3}$

Also,

$\frac{h1}{h2} = \frac{5}{3}$

We know that,

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

Therefore,

$\frac{V1}{V2} = \frac{\pi r1^2 h}{\pi r2^2 h}$

$= \frac{20}{27}$

Therefore, the volume of given two cylinders will be in the ration 20: 27

Hence, option C is correct

CCE Test Paper-20

1. Question

Find the volume of a cube whose total surface area is 384 cm^2.

Answer

We know that,

Total surface area of a cube = $6a^2$

$384 = 6a^2$

$a = \sqrt{\frac{384}{6}}$

= 8 cm

Therefore,

Volume of cone = $a^3 = (8)^3$

= 512 cm^3

2. Question

How many soap cakes each measuring 7 cm 7cmx 5 cm x 2.5 cm can be placed in a box of size 56cm x 40 cm x 25 cm?

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

Therefore,

Volume of a soap cake = 7 × 5 × 2.5

= 87.5 cm^3

Also,

Volume of the box = 56 × 40 × 25

= 56000 cm^3

Therefore,

Number of soap cakes = $\frac{56000}{87.5}$

= 640 units

Hence,

640 cakes of soap can be placed in a box of the given size

3. Question

The radius and height of the cylinder are in the ratio 5 : 7 and its volume is 550 cm^3. Find its radius and height.

Answer

Given that,

$\frac{\text{Radius}}{\text{Height}} = \frac{r}{h} = \frac{5}{7}$

We know that,

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

$= \frac{22}{7} \times \frac{5}{7}h \times \frac{5}{7}h \times h$

= 550 cm^3

Therefore,

$h = \sqrt[3]{\frac{550 \times 7 \times 7 \times 7}{22 \times 5 \times 5}}$

= 7 cm

Therefore,

$r = \frac{5}{7}h$

$= \frac{5}{7} \times 7$

= 5 cm

4. Question

Find the number of coins, 1.5 cm in diameter and 0.2 cm thick, to be melted to form a right circular cylinder with a height of 10 cm and a diameter of 4.5 cm.

Answer

Volume of coin = $\pi r^2 h = \frac{22}{7} \times 0.75 \times 0.75 \times 0.2$

Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times 2.25 \times 2.25 \times 10$

Therefore,

Total number of coins = $\frac{\text{Volume of cylinder}}{\text{Volume of coin}}$

$= \frac{\frac{22}{7} \times 2.25 \times 2.25 \times 10}{\frac{22}{7} \times 0.75 \times 0.75 \times 0.2}$

= 450 coins

Thus, 450 coins must be melted to form the required cylinder

5. Question

Find the surface area of a chalk box, whose length, breadth and height are 18 cm, 10 cm and 8 cm respectively.

Answer

Given that,

Length = 18 cm

Breadth = 10 cm

Height = 8 cm

We know that,

Total surface area of cuboid = 2 (lb + bh + hl)

= 2 (18 × 10 + 18 × 8 + 10 × 8)

= 2 (180 + 144 + 80)

= 808 cm^2

6. Question

The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3. Find the diameter and height of the pillar.

Answer

We know that,

Curved surface area of cylinder = $2\pi rh$

$264 = 2\pi rh$

$r = \frac{264}{2\pi h}$

$r = \frac{132}{\pi h}$ m

We also know that,

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

$= \pi \times \frac{132}{\pi h} \times \frac{132}{\pi h} \times h$

= 924 m^3

Now,

$r = \frac{132}{\pi h}$

$= \frac{132 \times 7}{22 \times 6} = 7$ m

Therefore,

Diameter of the pillar, d = 7 × 2 = 14 m

7. Question

The circumference of the circular base of a cylinder is 44 cm and its height is 15 cm. The volume of the cylinder is

A. 1155 cm^3

B. 2310 cm^3

C. 770 cm^3

D. 1540 cm^3

Answer

Given that,

Height = 15 cm

Circumference = $2\pi r$

r = $\frac{44\times7}{2\times22}$

= 7 cm

We know that,

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

= $\frac{22}{7}\times7\times7\times15$

= 2310 cm^3

Hence, option B is correct

8. Question

The area of the base of a circular cylinder is 35 cm^2 and its height is 8 cm. The volume of the cylinder is

A. 140 cm^3

B. 280 cm^3

C. 420 cm^3

D. 210 cm^3

Answer

Given that,

Area of the base of the cylinder = 35 cm^2

Height = 8 cm

Therefore,

Volume = Base area × Height

= 35 × 8

= 280 cm^3

Hence, option B is correct

9. Question

A cuboid having dimensions 16 m x 11 m x 8 m is melted to form a cylinder of radius 4 m. What is the height of the cylinder?

A. 28 m

B. 14 m

C. 21 m

D. 32 m

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

= 16 × 11 × 8

= 1408 m^3

Also,

Volume of cylinder = $\pi r^2 h$ = 1408 m^3

Therefore,

$h = \frac{1408 \times 7}{22 \times 4 \times 4}$

= 28 m

Hence, option A is correct

10. Question

The dimensions of a cuboid are 8m x 6 m x4 m. Its lateral surface area is

A. 210 m^2

B. 105 m^2

C. 112 m^2

D. 240 m^2

Answer

We know that,

Lateral surface area of cuboid = 2 [(l + b) × h]

= 2 [(8 + 6) × 4]

= 2 (56)

= 112 m^2

Hence, option C is correct

11. Question

The length, breadth and height of a cuboid are in the ratio 3 : 4 : 6 and its volume is 576 cm^3. The whole surface area of the cuboid is

A. 216 cm^2

B. 324 cm^2

C. 432 cm^2

D 460 cm^2

Answer

We know that,

Volume of cuboid = Length × Breadth × Height

576 = 3x × 4x × 6x

576 = $72x^3$

$x = \sqrt[3]{\frac{576}{72}}$

= 2

Therefore,

Total surface area of cuboid = 2 (lb + bh + hl)

= 2 (3x × 4x + 4x × 6x + 6x × 3x)

= 2 (48 + 96 + 72)

= 432 cm^2

12. Question

The surface area of a cube is 384 cm^2. Its volume is

A. 512 cm^3

B. 256 cm^3

C. 384 cm^3

D. 460 cm^3

Answer

We know that,

Surface area of cube = $6a^2$

$384 = 6a^2$

$a = \sqrt{\frac{384}{6}}$

$a = \sqrt{64}$

a = 8 cm

Therefore,

Volume of cube = $a^3 = 8^3$

= 512 cm^3

Hence, option A is correct

13. Question

Fill in the blanks:

(i) If l, b, h be the length, breadth and height of a cuboid, then its whole surface area = (.....) sq units.

(ii) If l, b, h be the length, breadth and height of a cuboid, then its lateral surface area = (.....) sq units.

(iii) If each side of a cube is a, then its lateral surface area is.....sq units.

(iv) If r is the radius of the base and h be the height of a cylinder, then its volume is (.....) cubic units.

(v) If r is the radius of the base and h be the height of a cylinder, then its lateral surface area is (.....) sq units.

Answer

(i) We know that,

Total surface area of the cuboid = 2 (lb + bh + hl

(ii) We know that,

Lateral surface area of cuboid = 2 [(l + b) × h]

(iii) We know that,

Lateral surface area of cube = $4a^2$

(iv) We know that,

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

(v) We know that,

Lateral surface area of cylinder = $2\pi rh$