Exercise 20B

Q11.

Answer :

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

Circumference $= 2\pi r = 110\ \mathrm{cm}$

Now, height$= h = \frac{curved\ surface\ area}{circumference} = \frac{4400}{110} = 40\ cm$

Also, radius, $r = \frac{4400}{2\pi h} = \frac{4400 \times 7}{2 \times 22 \times 40} = \frac{35}{2}$

$\therefore$ Volume$= \pi r^2 h = \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times 40 = 22 \times 5 \times 35 \times 10 = 38500\ \mathrm{cm}^3$

Q12.

Answer :

For the cubic pack:

Length of the side, a = 5 cm

Height = 14 cm

Volume$= a^2 h = 5 \times 5 \times 14 = 350\ cm^3$

For the cylindrical pack:

Base radius $= r = 3.5\ cm$

Height = 12 cm

Volume$= \pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 12 = 462\ \mathrm{cm}^3$

We can see that the pack with a circular base has a greater capacity than the pack with a square base.

Also, difference in volume$= 462 - 350 = 112\ cm^3$

Q13.

Answer :

Diameter = 48 cm

Radius = 24 cm = 0.24 m

Height = 7 m

Now, we have:

Lateral surface area of one pillar$= \pi dh = \frac{22}{7} \times 0.48 \times 7 = 10.56\ \mathrm{m}^2$

Surface area to be painted = total surface area of 15 pillars $= 10.56 \times 15 = 158.4\ m^2$

$\therefore$ Total cost$= \mathrm{Rs}\ (158.4 \times 2.5) = \mathrm{Rs}\ 396$

Q14.

Answer :

Volume of the rectangular vessel $= 22 \times 16 \times 14 = 4928\ cm^3$
Radius of the cylindrical vessel = 8 cm
Volume$= \pi r^2 h$

As the water is poured from the rectangular vessel to the cylindrical vessel, we have:
Volume of the rectangular vessel = volume of the cylindrical vessel

$\therefore$ Height of the water in the cylindrical vessel$= \frac{volume}{\pi r^2} = \frac{4928 \times 7}{22 \times 8 \times 8} = \frac{28 \times 7}{8} = \frac{49}{2} = 24.5\ cm$

Q15.

Answer :

Diameter of the given wire = 1 cm
Radius = 0.5 cm
Length = 11 cm
Now, volume$= \pi r^2 h = \frac{22}{7} \times 0.5 \times 0.5 \times 11 = 8.643\ cm^3$
The volumes of the two cylinders would be the same.
Now, diameter of the new wire = 1 mm = 0.1 cm
Radius = 0.05 cm
$\therefore$ New length $= \frac{\text{volume}}{\pi r^2} = \frac{8.643 \times 7}{22 \times 0.05 \times 0.05} = 1100.02\ cm \cong$ 11 m

Q16.

Answer :

Length of the edge, a = 2.2 cm
Volume of the cube $= a^3 = (2.2)^3 = 10.648\ cm^3$
Volume of the wire$= \pi r^2 h$
Radius = 1 mm = 0.1 cm
As volume of cube = volume of wire, we have:

$h = \frac{volume}{\pi r^2} = \frac{10.648 \times 7}{22 \times 0.1 \times 0.1} = 338.8\ cm$

Q17.

Answer :

Diameter = 7 m
Radius = 3.5 m
Depth = 20 m

Volume of the earth dug out $= \mathbf{\pi r^2 h} = \frac{22}{7} \times 3.5 \times 3.5 \times 20 = 770\ \mathbf{m^3}$
Volume of the earth piled upon the given plot$= 28 \times 11 \times h = 770\ m^3$

$\therefore\ h = \frac{770}{28 \times 11} = \frac{70}{28} = 2.5\ m$

Q18.

Answer :

Inner diameter = 14 m
i.e., radius = 7 m
Depth = 12 m
Volume of the earth dug out$= \mathbf{\pi r^2 h} = \frac{22}{7} \times 7 \times 7 \times 12 = 1848\ \mathbf{m^3}$

Width of embankment = 7 m
Now, total radius $= 7 + 7 = 14\ m$

$\mathbf{Volume\ of\ the\ embankment} = \mathbf{total\ volume\ -\ inner\ volume}$
$= \pi r_o{}^2 h - \pi r_i{}^2 h = \pi h(r_o{}^2 - r_i{}^2)$
$= \frac{22}{7} h\left(14^2 - 7^2\right) = \frac{22}{7} h(196 - 49)$
$= \frac{22}{7} h \times 147 = 21 \times 22h$
$= 462 \times h\ m^3$

Since volume of embankment = volume of earth dug out, we have:
$1848 = 462\ h$
$\Rightarrow h = \frac{1848}{462} = 4\ m$
∴ Height of the embankment = 4 m

Q19.

Answer :

Diameter = 84 cm
i.e., radius = 42 cm
Length = 1 m = 100 cm
Now, lateral surface area $= \mathbf{2\pi rh} = 2 \times \frac{22}{7} \times 42 \times 100 = 26400\ \mathbf{cm^2}$
∴ Area of the road

$= \textbf{lateral surface area} \times \textbf{no. of rotations} = 26400 \times 750 = 19800000\ \mathbf{cm^2} = 1980\ \mathbf{m^2}$

Q20.

Answer :

Thickness of the cylinder = 1.5 cm
External diameter = 12 cm
i.e., radius = 6 cm
also, internal radius = 4.5 cm
Height = 84 cm

Now, we have the following:
Total volume$= \boldsymbol{\pi}\mathbf{r^2h} = \frac{22}{7} \times 6 \times 6 \times 84 = 9504\ \mathbf{cm^3}$
Inner volume $= \boldsymbol{\pi}\mathbf{r^2h} = \frac{22}{7} \times 4.5 \times 4.5 \times 84 = 5346\ \mathbf{cm^3}$
Now, volume of the metal = total volume – inner volume $= 9504 - 5346 = 4158\ \boldsymbol{cm^3}$
∴ Weight of iron $= \mathbf{4158 \times 7.5 =\ 31185\ g =\ 31.185\ kg}$ [Given: $\mathbf{1}\ \boldsymbol{cm^3} = \mathbf{7.5}\boldsymbol{g}$]

Q21.

Answer :

Length = 1 m = 100 cm
Inner diameter = 12 cm
Radius = 6 cm
Now, inner volume$= \boldsymbol{\pi}\mathbf{r^2h} = \frac{22}{7} \times 6 \times 6 \times 100 = 11314.286\ \mathbf{cm^3}$
Thickness = 1 cm
Total radius = 7 cm

Now, we have the following:
Total volume$= \boldsymbol{\pi}\mathbf{r^2h} = \frac{22}{7} \times 7 \times 7 \times 100 = 15400\ \mathbf{cm^3}$
Volume of the tube $= \textbf{total volume} - \textbf{inner volume} =\ 15400 - 11314.286 = 4085.714\ \boldsymbol{cm^3}$
Density of the tube = 7.7 g/cm^3
∴ Weight of the tube $= \textbf{volume} \times \textbf{density} = 4085.714 \times 7.7 = 31459.9978\ \mathbf{g} = 31.459\ \mathbf{kg}$

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