Exercise 11.1 (Revised) - Chapter 13 - Surface Areas & Volumes - Ncert Solutions class 9 - Maths

Updated On 11-02-2025 By Lithanya

Chapter 11: Surface Areas & Volumes - NCERT Solutions for Class 9 Maths

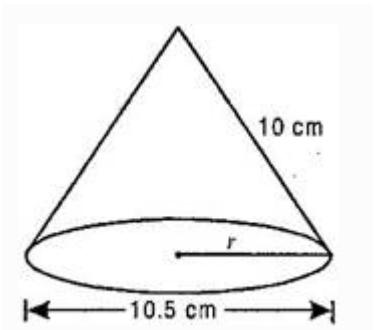
Assume $\pi = \frac{22}{7}$ unless ^stated otherwise.

Ex 11.1 Question 1.

Diameter of the base of a cone is $10.5\ \text{cm}$ and its slant height is $\mathbf{10\ cm}$. Find its curved surface area and its total surface area.

Answer.

Diameter $= 10.5\ \text{cm}$



$\Rightarrow$ Radius $(r) = \frac{10.5}{2} = \frac{21}{4}\text{cm}$

Slant height of cone $^{(l)} = 10\ \text{cm}$

Curved surface area of cone $= \pi rl$
$= \frac{22}{7} \times \frac{21}{4} \times 10 = 165\ \text{cm}^2$

Total surface area of cone $= \pi r(l + r)$
$= \frac{22}{7} \times \frac{21}{4}\left(10 + \frac{21}{4}\right)$
$= \frac{22}{7} \times \frac{21}{4} \times \frac{61}{4} = 251.625\ \text{cm}^2$

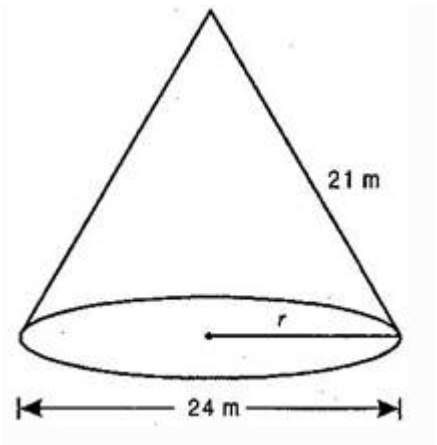
Ex 11.1 Question 2.

Find the total surface area of a cone, if its slant height is $\mathbf{21cm}$ and diameter of the base is $24\ \text{cm}$.

Answer.

Slant height of cone $^{(l)} = 21\ \text{m}$

Diameter of cone $= 24\ \text{m}$



$\Rightarrow$ Radius of cone $(r) = \frac{24}{2} = 12\ \mathrm{m}$

Total surface area of cone $= \pi r(l + r)$

$= \frac{22}{7} \times 12(21 + 12)$

$= \frac{264}{7} \times 33 = 1244.57\ \mathrm{m}^2$

Ex 11.1 Question 3.

Curved surface area of a cone is $308\ \mathrm{cm}^2$ and its slant height is $14\ \mathrm{cm}$. Find (i) radius of the base and (ii) total surface area of the cone.

Answer.

(i) Slant height of cone $^{(l)} = 14\ \mathrm{cm}$

Curved surface area of cone $= 308\ \mathrm{cm}^2$

$\Rightarrow \pi r l = 308$

$\Rightarrow \frac{22}{7} \times r \times 14 = 308$

$\Rightarrow r = \frac{308 \times 7}{14 \times 22}$

$\Rightarrow r = 7\ \mathrm{cm}$

(ii) Total surface area of the cone

$=$ Curved surface area + Area of circular base

$= 308 + \pi r^2$

$= 308 + \frac{22}{7} \times (7)^2$

$= 462\ \mathrm{cm}^2$

Ex 11.1 Question 4.

A conical tent is $10\ \mathrm{m}$ high and the radius of its base is $\mathbf{24 m}$. Find:

(i) slant height of the tent.

(ii) cost of the canvas required to make the tent, if the cost of a $\mathbf{m^2}$ canvas is Rs. 70 .

Answer.

Height of the conical tent $^{(h)} = 10\ \mathrm{m}$

Radius of the conical tent $(r) = 24\ \mathrm{m}$

(i) Slant height of the tent $(l) = \sqrt{r^2 + h^2}$

$= \sqrt{(24)^2 + (10)^2}$

$= \sqrt{576 + 100} = \sqrt{676} = 26\ \mathrm{m}$

(ii) Canvas required to make the tent

$=$ Curved surface area of the tent $= \pi r l$

$= \frac{22}{7} \times 24 \times 26 = \frac{13728}{7} \mathrm{m}^2$

$\because$ Cost of $1\ \mathrm{m}^2$ canvas $=$ Rs. 70

$\therefore$ Cost of $\frac{13728}{7} \mathrm{m}^2$ canvas

$= 70 \times \frac{13728}{7} =$ Rs. 137280

Ex 11.1 Question 5.

What length of tarpaulin $3\ \mathrm{m}$ wide will be required to make conical tent of height $8\ \mathrm{m}$ and base radius $6\ \mathrm{m}$? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately $\mathbf{20 cm}$. (Use $\pi = 3.14$)

Answer.

Height of the conical tent $^{(h)} = 8\ \mathrm{m}$ and Radius of the conical tent $^{(r)} = 6\ \mathrm{m}$

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

$= \sqrt{(6)^2 + (8)^2} = \sqrt{36 + 64} = \sqrt{100} = 10\ \mathrm{m}$

Area of tarpaulin $=$ Curved surface area of tent $= \pi r l = 3.14 \times 6 \times 10 = 188.4\ \mathrm{m}^2$

Width of tarpaulin $= 3\ \mathrm{m}$

Let Length of tarpaulin $= \mathrm{L}$
$\therefore$ Area of tarpaulin $=$ Length $\times$ Breadth
$= L \times 3 = 3\,\mathrm{L}$

Now According to question,
$3L = 188.4$
$\Rightarrow L = \dfrac{1884.4}{3} = 62.8\ \mathrm{m}$

The extra length of the material required for stitching margins and cutting is $20\ \mathrm{cm} = 0.2\ \mathrm{m}$.

So the total length of tarpaulin bought is $(62.8 + 0.2)\mathrm{m} = 63\ \mathrm{m}$

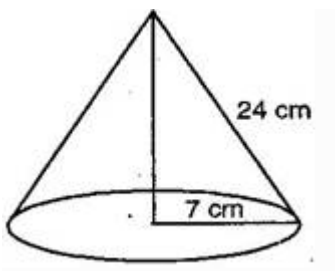
Ex 11.1 Question 6.

The slant height and base diameter of a conical tomb are $\mathbf{25}\mathrm{m}$ and $14\ \mathrm{m}$ respectively. Find the cost of whitewashing its curved surface at the rate of Rs. 210 per $100\ \mathrm{m}^2$.

Answer.

Slant height of conical tomb (l)
$= 25\ \mathrm{m}$, Diameter of tomb $= 14\ \mathrm{m}$
$\therefore$ Radius of the tomb $(r) = \frac{14}{2} = 7\ \mathrm{m}$

Curved surface are of tomb $= \pi r l$
$= \frac{22}{7} \times 7 \times 25 = 550\ \mathrm{m}^2$
$\because$ Cost of white washing $100\ \mathrm{m}^2$
$=$ Rs. 210
$\therefore$ Cost of white washing $1\ \mathrm{m}^2 = \frac{210}{100}$
$\therefore$ Cost of white washing $550\ \mathrm{m}^2$
$= \frac{210}{100} \times 550 =$ Rs. 1155



Slant height of the cone $(l) = \sqrt{r^2 + h^2}$
$= \sqrt{(7)^2 + (24)^2}$
$= \sqrt{49 + 576} = \sqrt{625} = 25\ \mathrm{cm}$

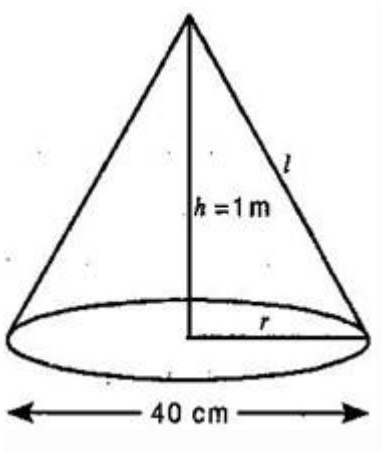
Area of sheet required to make a cap
$=$ CSA of cone $= \pi r l$
$= \dfrac{22}{7} \times 7 \times 25 = 550\ \mathrm{cm}^2$
$\therefore$ Area of sheet required to make 10 caps $= 10 \times 550 = 5500\ \mathrm{cm}^2$

Ex 11.1 Question 8.

A bus stop is barricaded from the remaining part of the road, by using $\mathbf{50}$ hollow cones made of recycled cardboard. Each cone has a base diameter of $40\ \mathrm{cm}$ and height $1\ \mathrm{m}$. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m^2, what will be the cost of painting all these cones? (Use $\pi = 3.14$ and take $\sqrt{1.04} = 1.02$)

Answer.

Diameter of cone $= 40\ \mathrm{cm}$
$\Rightarrow$ Radius of cone $(r) = \frac{40}{2} = 20\ \mathrm{cm}$
$= \frac{20}{100}\mathrm{m} = 0.2\ \mathrm{m}$



Height of cone $^{(h)} = 1\ \mathrm{m}$

Slant height of cone $(l) = \sqrt{r^2 + h^2}$
$= \sqrt{(0.2)^2 + (1)^2} = \sqrt{1.04}\ \mathrm{m}$

Curved surface area of cone $= \pi rl$

$= 3.14 \times 0.2 \times \sqrt{1.04}$

$= 0.64056 \text{ m}^2$

$\because$ Cost of painting 1 m^2 of a cone

$= \text{ Rs. } 12$

$\therefore$ Cost of painting 0.64056 m^2 of a cone

$= 12 \times 0.64056 = \text{ Rs. } 7.68672$

$\therefore$ Cost of painting of 50 such cones

$= 50 \times 7.68672 = \text{ Rs. } 384.34 \text{ (approx.)}$

Exercise 11.2 (Revised) - Chapter 13 - Surface Areas & Volumes - Ncert Solutions class 9 - Maths

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Chapter 11: Surface Areas & Volumes - NCERT Solutions for Class 9 Maths

Assume $\pi = \frac{22}{7}$ unless stated otherwise.

Ex 11.2 Question 1.

Find the surface area of a sphere of radius:
(i) $10.5\ \text{cm}$
(ii) $5.6\ \text{cm}$
(iii) $14\ \text{cm}$

Answer.

(i) Radius of sphere $= 105\ \text{cm}$

Surface area of sphere $= 4\pi r^2$
$= 4 \times \frac{22}{7} \times 10.5 \times 10.5 = 1386\ \text{cm}^2$
(ii) Radius of sphere $= 5.6\ \text{m}$

Surface area of sphere $= 4\pi r^2$
$= 4 \times \frac{22}{7} \times 5.6 \times 5.6 = 3.94.84\ \text{m}^2$
(iii) Radius of sphere $= 14\ \text{cm}$

Surface area of sphere $= 4\pi r^2$

$= 4 \times \frac{22}{7} \times 14 \times 14 = 2464\ \text{cm}^2$

Ex 11.2 Question 2.

Find the surface area of a sphere of diameter:
(i) $14\ \text{cm}$
(ii) $21\ \text{cm}$
(iii) $3.5\ \text{cm}$

Answer.

(i) Diameter of sphere $= 14\ \text{cm}$,

Therefore Radius of sphere $= \frac{14}{2} = 7\ \text{cm}$

Surface area of sphere $= 4\pi r^2$
(ii) Diameter of sphere $= 21\ \text{cm}$
$\therefore$ Radius of sphere $= \frac{21}{2}\text{cm}$

Surface area of sphere $= 4\pi r^2$
$= 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = 1386\ \text{cm}^2$
(iii) Diameter of sphere $= 3.5\ \text{cm}$
$\therefore$ Radius of sphere $= \frac{3.5}{2} = 1.75\ \text{cm}$

Surface area of sphere $= 4\pi r^2$
$= 4 \times \frac{22}{7} \times 1.75 \times 1.75 = 38.5\ \text{cm}^2$

Ex 11.2 Question 3.

Find the total surface area of a hemisphere of radius $10\ \mathrm{cm}$.
(Use $\pi = 3.14$)

Answer.

Radius of hemisphere $(r) = 10\ \mathrm{cm}$
Total surface area of hemisphere $= 3\pi r^2$
$= 3 \times 3.14 \times 10 \times 10 = 942\ \mathrm{cm}^2$

Hence total surface area of hemisphere is
$942\ \mathrm{cm}^2$.

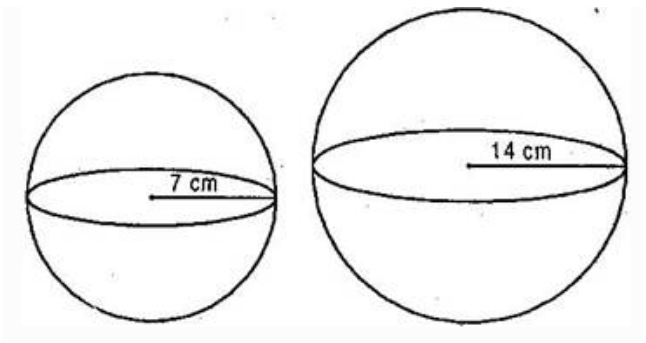
Ex 11.2 Question 4.

The radius of a spherical balloonincreases from $7\ \mathrm{cm}$ to $14\ \mathrm{cm}$ as air isbeing pumped into it. Find the ratio ofsurface areas of the balloon in the twocases.

Answer.

I case: Radius of balloon $^{(r)} = 7\ \mathrm{cm}$

Surface area of balloon $= 4\pi r^2$
$= 4\pi \times 7 \times 7\ \mathrm{cm}^2 \ldots\ldots\ldots\ (\mathrm{i})$



II case: Radius of balloon $(R) = 14\ \mathrm{cm}$

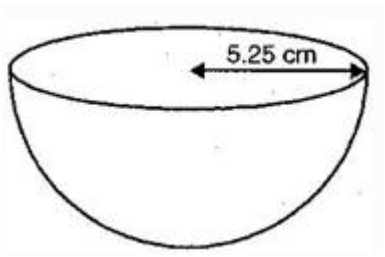
Surface area of balloon $= 4\pi \mathrm{R}^2$
$= 4\pi \times 14 \times 14\ \mathrm{cm2}$

Now, Ratio [from eq. (i) and (ii)],
$$\frac{\text{CSA in first case}}{\text{CSA in second case}} = \frac{4\pi \times 7 \times 7}{4\pi \times 14 \times 14}$$
$$= \frac{1}{4}$$

Hence, required ratio $= 1 : 4$

Ex 11.2 Question 5.

A hemispherical bowl made of brass has inner diameter $105\ \mathrm{cm}$. Find the cost of tin-plating it on the inside at the rate of Rs. 16 per $100\ \mathrm{cm}^2$.



Answer.

Inner diameter of bowl
$= 10.5\ \mathrm{cm}$
$\therefore$ Inner radius of bowl $(r) = \frac{10.5}{2}$
$= 5.25\ \mathrm{cm}$

Now, Inner surface area of bowl
$$= 2\pi r^2$$
$$= 2 \times \frac{22}{7} \times 5.25 \times 5.25$$
$$= 2 \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} = \frac{693}{4}\mathrm{cm}^2$$
$\because$ Cost of tin-plating per $100\ \mathrm{cm}^2$
$= \mathrm{Rs.}\ 16$
$\therefore$ Cost of tin-plating per $1\ \mathrm{cm}^2 = \frac{16}{100}$
$\therefore$ Cost of tin-plating per $\frac{693}{4}\mathrm{cm}^2$
$= \frac{16}{100} \times \frac{693}{4} = \mathrm{Rs.}\ 27.72$

Ex 11.2 Question 6.

Find the radius of a sphere whose surface area is $154\ \text{cm}^2$.

Answer.

Surface area of sphere $= 154\ \text{cm}^2$

$\Rightarrow 4\pi r^2 = 154$

$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22 \times 4}$

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

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

Ex 11.2 Question 7.

The diameter of the moon is approximately one fourth the diameter of the earth. Find the ratio of their surface areas.

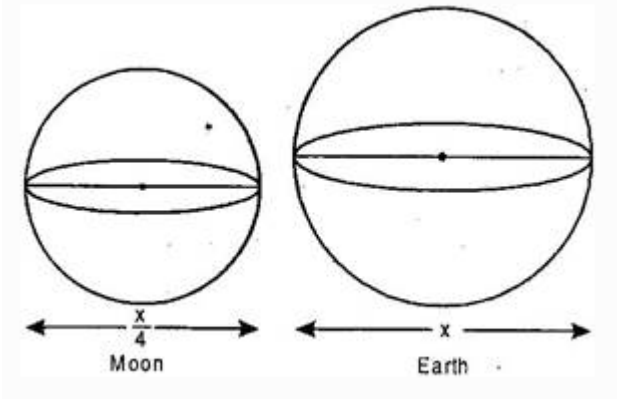
Answer.

Let diameter of Earth $= x$

$\therefore$ Radius of Earth $(r) = \frac{x}{2}$

$\therefore$ Surface area of Earth $= 4\pi r^2$

$= 4\pi \times \frac{x}{2} \times \frac{x}{2} = \pi x^2$



Now, Diameter of Moon $= \frac{1}{4}$th of diameter of Earth $= \frac{x}{4}$

$\therefore$ Radius of Moon $(r) = \frac{x}{8}$

Surface area of Moon $= 4\pi r^2$

$= 4\pi \times \frac{x}{8} \times \frac{x}{8} = \frac{\pi x^2}{16}$

Surface area of Moon

Now, Ratio $=$ Surface area of Earth

$= \frac{\frac{\pi x^2}{16}}{\pi x^2} = \frac{\pi x^2}{16} \times \frac{1}{\pi x^2} = \frac{1}{16}$

$\therefore$ Required ratio $= 1 : 16$

Ex 11.2 Question 8.

A hemispherical bowl is made of steel, $0.25\ \text{cm}$ thick. The inner radius of the bowl is $5\ \text{cm}$. Find the outer curved surface area of the bowl.

Answer.

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

Thickness of steel $(t) = 0.25\ \text{cm}$

$\therefore$ Outer radius of bowl $(\text{R}) = r + t$

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

$\therefore$ Outer curved surface area of bowl

$= 2\pi \text{R}^2 = 2 \times \frac{22}{7} \times 5.25 \times 5.25$

$= 2 \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4}$

$= \frac{693}{4} = 173.25\ \text{cm}^2$

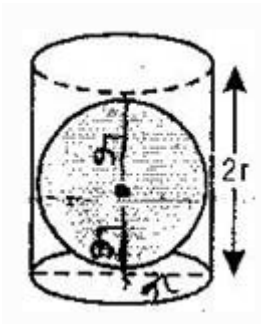
Ex 11.2 Question 9.

A right circular cylinder just encloses a sphere of radius r (See figure). Find:

(i) Surface area of the sphere.

(ii) Curved surface area of the cylinder.

(iii) Ratio of the areas obtained in (i) and (ii).



Answer.

(i) Radius of sphere $= r$

$\therefore$ Surface area of sphere

$= 2\pi(\text{ radius })^2 = 2\pi r^2$

$\because$ The cylinder just encloses the sphere in it.

$\therefore$ The height of cylinder will be equal to diameter of sphere.

And The radius of cylinder will be equal to radius of sphere.

(ii) $\therefore$ Curved surface area of cylinder

$= 2\pi rh = 2\pi r \times \pi r [\because h = 2r]$

$= 4\pi r^2$

Surface area of sphere

(iii) Curved surface area of cylinder

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

$\therefore$ Required ratio $= 1 : 1$

Exercise 11.3 (Revised) - Chapter 13 - Surface Areas & Volumes - Ncert Solutions class 9 - Maths

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Chapter 11: Surface Areas & Volumes - NCERT Solutions for Class 9 Maths

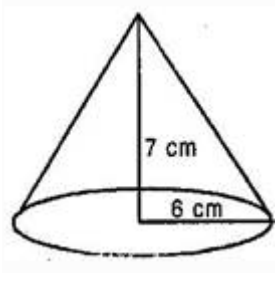
Assume $\pi = \frac{22}{7}$ unless stated otherwise.

Ex 11.3 Question 1.

Find the volume of the right circular cone with:

(i) Radius $\mathbf{6cm}$, Height $7\ \mathrm{cm}$

(ii) Radius $3.5\ \mathrm{cm}$, Height $12\ \mathrm{cm}$



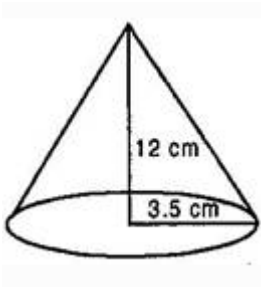
Answer.

(i) Given: $r = 6\ \mathrm{cm}, h = 7\ \mathrm{cm}$

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

$= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 7$ $(ii) Given$:r=3.5 \mathrm{~cm}, h=12 \mathrm{~cm}$

$= 264\ \mathrm{cm}^3$



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

$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 12$

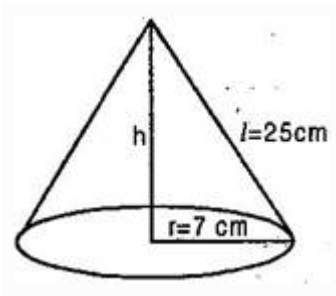
$= 154\ \mathrm{cm}^3$

Ex 11.3 Question 2.

Find the capacity of a conical vessel with:

(i) Radius $\mathbf{7cm}$, Slant height $\mathbf{25\ cm}$

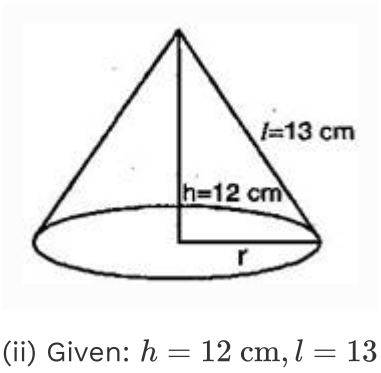
(ii) Height $12\ \mathrm{cm}$, Slant height $13\ \mathrm{cm}$



Answer.

(i) Given: $r = 7 \text{ cm}, l = 25 \text{ cm}$
$h = \sqrt{l^2 - r^2} = \sqrt{(25)^2 - (7)^2} = \sqrt{625 - 49} = \sqrt{576} = 24 \text{ cm}$

Capacity of conical vessel $= \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24 = 1232 \text{ cm}^3$
$= 1.232 \text{ liters } \left[\because 1000 \text{ cm}^3 = 1 \text{ liter }\right]$



(ii) Given: $h = 12 \text{ cm}, l = 13 \text{ cm}$
$r = \sqrt{l^2 - h^2} = \sqrt{(13)^2 - (12)^2}$
$= \sqrt{169 - 144}$
$= \sqrt{25} = 5 \text{ cm}$

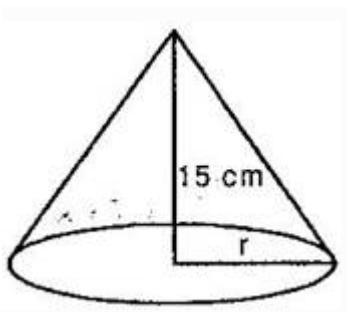
Capacity of conical vessel $= \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 = \frac{2200}{7} \text{cm}^3$
$= \frac{2200}{7} \times \frac{1}{1000} \text{liters}$
$\left[\because 1000 \text{ cm}^3 = 1 \text{ liter }\right]$
$= \frac{11}{35} \text{liter}$

Ex 11.3 Question 3.

The height of a cone is 15 cm. If its volume is 1570 cm^3, find the radius of the base. (Use $\pi = 3.14$)

Answer.

Height of the cone $^{(h)} = 15 \text{ cm}$



Volume of cone $= 1570 \text{ cm}^3$
$\Rightarrow \frac{1}{3}\pi r^2 h = 1570$
$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r^2 \times 15 = 1570$
$\Rightarrow 15.70 r^2 = 1570$
$\Rightarrow r^2 = 1570 \times \frac{100}{1570} = 100$
$\Rightarrow r = 10 \text{ cm}$

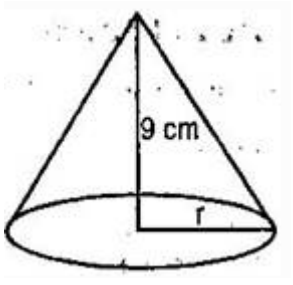
Hence required radius of the base is 10 cm.

Ex 11.3 Question 4.

If the volume of a right circular cone of height 9 cm is $48\pi \text{cm}^3$, find the diameter of the base.

Answer.

Height of the cone $^{(h)} = 9 \text{ cm}$



Volume of cone $= 48\pi \text{cm}^3$

$\Rightarrow \frac{1}{3}\pi r^2 h = 48\pi$

$\Rightarrow \frac{1}{3}\pi r^2 \times 9 = 48\pi$

$\Rightarrow 3r^2 = 48$

$\Rightarrow r^2 = \frac{48}{3} = 16$

$\Rightarrow r = 4 \text{ cm}$

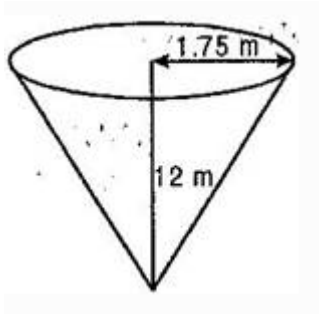
$\therefore$ Diameter of base $= 2r = 2 \times 4 = 8 \text{ cm}$

Ex 11.3 Question 5.

A conical pit of top diameter 3.5 m is 12 m deep. What is its capacity in kiloliters?

Answer.

Diameter of pit $= 3.5 \text{ m}$



$\therefore$ Radius of pit $= \frac{3.5}{2} = 1.75 \text{ m}$

Depth of pit $^{(h)} = 12 \text{ m}$

Capacity of pit $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 1.75 \times 1.75 \times 12$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{175}{100} \times \frac{175}{100} \times 12$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times 12$

$= 22 \times \frac{7}{4} = \frac{77}{2} \text{m}^3 = 35.8 \text{ m}^3$

$= 38.5 \text{kl} \left[\because 1 \text{ m}^3 = 1 \text{kl}\right]$

Ex 11.3 Question 6.

The volume of a right circular cone is 9856 cm^3. If the diameter of the base if $\mathbf{28 \text{ cm}}$, find:

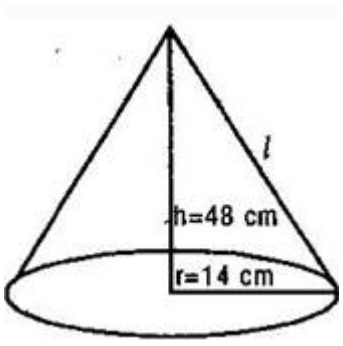
(i) Height of the cone

(ii) Slant height of the cone

(iii) Curved surface area of the cone.

Answer.

(i) Diameter of cone $= 28 \text{ cm}$



$\therefore$ Radius of cone $= 14 \text{ cm}$

Volume of cone $= 9856 \text{ cm}^3$

$\Rightarrow \frac{1}{3}\pi r^2 h = 9856$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times h = 9856$

$\Rightarrow h = \frac{9856 \times 3 \times 7}{22 \times 14 \times 14} = 48 \text{ cm}$

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

$= \sqrt{(14)^2 + (48)^2}$

$= \sqrt{196 + 2304}$

$= \sqrt{2500} = 50 \text{ cm}$

(iii) Curved surface area of cone $= \pi rl = {}^{\frac{22}{7} \times 14 \times 50} = 2200 \text{ cm}^2$

Ex 11.3 Question 7.

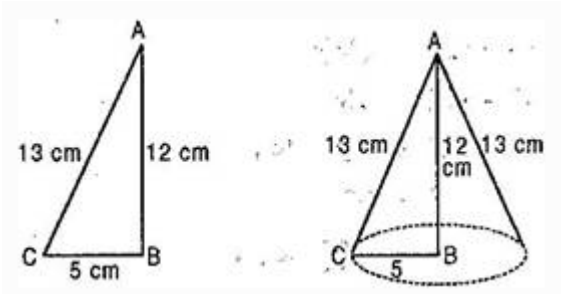
A right triangle ABC with sides $5 \text{ cm}, 12 \text{ cm}$ and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained. (Use $\pi = 3.14$)

Answer.

When right angled triangle ABC is revolved about side 12 cm, then the solid formed is a cone.

In that cone, Height $^{(h)} = 12 \text{ cm}$

And radius $(r) = 5 \text{ cm}$



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

$= \frac{1}{3}\pi \times 5 \times 5 \times 12$

$= 100\pi \text{cm}^3$

Ex 11.3 Question 8.

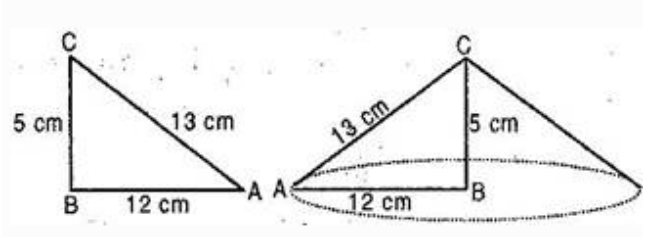
If the triangle ABC in question 7 above is revolved about the side 5 cm, then find the volume of the solid so obtained. Find, also, the ratio of the volume of the two solids obtained.

Answer.

When right angled triangle ABC is revolved about side 5 cm, then the solid formed is a cone.

In that cone, Height $^{(h)} = 5 \text{ cm}$

And radius $(r) = 12 \text{ cm}$



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

$= \frac{1}{3}\pi \times 12 \times 12 \times 5$

$= 240\pi \text{cm}^3$

Volume of cone in Q. No. 7

Now, Volume of vone in Q. No. 8

$= \frac{100\pi}{240\pi} = \frac{5}{12}$

$\therefore$ Required ratio $= 5 : 12$

Ex 11.3 Question 9.

A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is $\mathbf{3m}$. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.

Answer.

Radius (r) of heap

$= \left(\frac{10.5}{2}\right) \text{m} = 5.25 \text{ m}$

Height (h) of heap $= 3 \text{ m}$

Volume of heap

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

$= \left(\frac{1}{3} \times \frac{22}{7} \times (5.25)^2 \times 3\right) \text{m}^3$

$= 86.625 \text{ m}^3$

Therefore, the volume of the heap of wheat is $86.625\ \mathrm{m}^3$.

Area of canvas required $=$ CSA of cone

$$
\begin{aligned}
&= \pi r l = \pi r \sqrt{r^2 + h^2} \\
&= \left[\frac{22}{7} \times 5.25 \times \sqrt{(5.25)^2 + (3)^2} \right] \mathrm{m}^2 \\
&= \left(\frac{22}{7} \times 5.25 \times 6.05 \right) \mathrm{m}^2 \\
&= 99.825\ \mathrm{m}^2
\end{aligned}
$$

Therefore, $99.825\ \mathrm{m}^2$ canvas will be required to protect the heap from rain.

Exercise 11.4 (Revised) - Chapter 13 - Surface Areas & Volumes - Ncert Solutions class 9 - Maths

Updated On 11-02-2025 By Lithanya

Chapter 11: Surface Areas & Volumes - NCERT Solutions for Class 9 Maths

Assume $\pi = \frac{22}{7}$ unless stated otherwise.

Ex 11.4 Question 1.

Find the volume of a sphere whose radius is (i) $7\ \text{cm}$ and (ii) $0.63\ \text{cm}$.

Answer.

(i) Radius of sphere $^{(r)} = 7\ \text{cm}$

Volume of sphere $= \frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 = \frac{4312}{3}$
$= 1437\frac{1}{3}\text{cm}^3$
(ii) Radius of sphere $^{(r)} = 0.63\ \text{m}$

Volume of sphere $= \frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \frac{22}{7} \times 0.63 \times 0.63 \times 0.63$
$= \frac{4}{3} \times \frac{22}{7} \times \frac{63}{100} \times \frac{63}{100} \times \frac{63}{100}$
$= 1.047816\ \text{m}^3 = 1.05\ \text{m}^3$ (approx.)

Ex 11.4 Question 2.

Find the amount of water displaced by a solid spherical ball of diameter:
(i) $28\ \text{cm}$
(ii) $0.21\ \text{m}$

Answer.

(i) Diameter of spherical ball
$= 28\ \text{cm}$
$\therefore$ Radius of spherical ball $(r) = \frac{28}{2}$
$= 14\ \text{cm}$

According to question, Volume of water replaced $=$ Volume of spherical ball
$= \frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14 = \frac{34496}{3}$
$= 11498\frac{2}{3}\text{cm}^3$
(ii) Diameter of spherical ball $= 0.21\ \text{m}$
$\therefore$ Radius of spherical ball (r)
$= \frac{0.21}{2}\text{m}$

According to question,

Volume of water replaced = Volume of spherical ball

$$= \frac{4}{3}\pi r^3$$
$$= \frac{4}{3} \times \frac{22}{7} \times \frac{0.21}{2} \times \frac{0.21}{2} \times \frac{0.21}{2}$$
$$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{200} \times \frac{21}{200} \times \frac{21}{200}$$
$$= 11 \times \frac{441}{100 \times 100 \times 100}$$
$$= 0.004851 \text{ m}^3$$

Ex 11.4 Question 3.

The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the metal weighs 8.9 g per cm^3 ?

Answer.

Diameter of metallic ball $= 4.2$ cm

$\therefore$ Radius of metallic ball $(r) = \frac{4.2}{2}$

$= 2.1$ cm

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

$= \frac{4}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{10} \times \frac{21}{10} \times \frac{21}{10}$

$= 38.808 \text{ cm}^3$

Density of metal $= 8.9$ g per cm^3

$\because$ Mass of $1 \text{ cm}^3 = 8.9$ g

$\therefore$ Mass of $38.808 \text{ cm}^3 = 8.9 \times 38.808$

$= 345.3912 \text{ g} = 345.39$ g (approx).

Ex 11.4 Question 4.

The diameter of the moon is approximately one-fourth the diameter of the earth. What fraction is the volume of the moon of the volume of the earth?

Answer.

Let diameter of earth be x

$\therefore$ Radius of earth $(r) = \frac{x}{2}$

Now, Volume of earth $= \frac{4}{3}\pi r^3$

[$\because$ Earth is considered to be a sphere]

$= \frac{4}{3} \times \pi \times \frac{x}{2} \times \frac{x}{2} \times \frac{x}{2} = \frac{1}{8} \times \frac{4}{3}\pi x^3$

According to question,

Diameter of moon $= \frac{1}{4} \times$ Diameter of earth $= \frac{1}{4} \times x = \frac{x}{4}$

$\therefore$ Radius of moon $(R) = \frac{x}{8}$

Now, Volume of Moon $= \frac{4}{3}\pi \text{R}^3$

[$\because$ Moon is considered to be a sphere]

$= \frac{4}{3} \times \pi \times \frac{x}{8} \times \frac{x}{8} \times \frac{x}{8} = \frac{1}{512} \times \frac{4}{3}\pi x^3$

$= \frac{1}{64} \times \left[\frac{1}{8} \times \frac{4}{3}\pi x^3\right] = \frac{1}{64} \times$ Volume of Earth

[From eq. (i)]

$\therefore$ Volume of moon is $\frac{1}{64}$th the volume of earth.

Ex 11.4 Question 5.

How many litres of milk can a hemispherical bowl of diameter $\mathbf{10.5}$ hold?

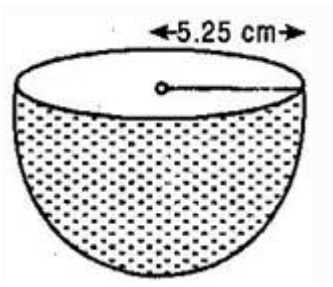
Answer.

Diameter of hemispherical bowl

$= 10.5$ cm

$\therefore$ Radius of hemispherical bowl (r)

$= \frac{10.5}{2} = 5.25$ cm



Volume of milk in hemispherical bowl

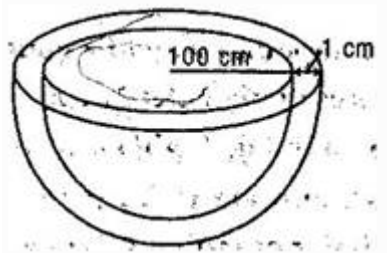
$$= \frac{2}{3}\pi r^3$$
$$= \frac{2}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 5.25$$
$$= \frac{2}{3} \times \frac{22}{7} \times \frac{525}{100} \times \frac{525}{100} \times \frac{525}{100}$$
$$= 11 \times \frac{21}{4} \times \frac{21}{4} = 303.187 \text{ cm}^3$$
$$= \frac{303.187}{1000} \text{liters} \quad \left[\because 1000 \text{ cm}^3 = 1l\right]$$
$$= 0.303187 \text{ liters}$$
$$= 0.303 \text{ liters (approx.)}$$

Ex 11.4 Question 6.

A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.

Answer.

Inner radius of hemispherical tank $^{(r)} = 1 \text{ m} = 100 \text{ cm}$



Thickness of sheet $= 1$ cm

$\therefore$ Outer radius of hemispherical tank $(R) = 100 + 1 = 101$ cm

Volume of iron of hemisphere

$= \frac{2}{3}\pi \left[R^3 - r^3\right]$
$= \frac{2}{3} \times \frac{22}{7} \times \left[(101)^3 - (100)^3\right]$
$= \frac{44}{21}[1030301 - 1000000]$
$= 63487.81 \text{ cm}^3$
$= 0.06348 \text{ m}^3$

Ex 11.4 Question 7.

Find the volume of a sphere whose surface area is 154 cm^2.

Answer.

Surface area of sphere $= 154 \text{ cm}^2$

$\Rightarrow 4\pi r^2 = 154$
$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 154$
$\Rightarrow r^2 = \frac{154 \times 7}{4 \times 22} = \frac{49}{4}$
$\Rightarrow r = \frac{7}{2} \text{cm}$

Now, Volume of sphere

$= \frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$
$= \frac{1}{3} \times 11 \times 49 = \frac{539}{3} = 179\frac{2}{3} \text{cm}^3$

Ex 11.4 Question 8.

A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of Rs. 498.96. If the cost of white-washing is at the rate of Rs. 2.00 per square meter, find:
(i) the inner surface area of the dome.
(ii) the volume of the air inside the dome.

Answer.

Cost of white washing from inside $=$ Rs. 498.96

Rate of white washing $=$ Rs. 2

$\therefore$ Area white washed

$= \frac{498.96}{2} = 249.48 \text{ cm}^2$

Inside surface area of the dome
$= 249.48 \text{ cm}^2$
$\Rightarrow 2\pi r^2 249.48$
$\Rightarrow r^2 = \frac{249.48 \times 7}{2 \times 22}$
$= 5.67 \times 7$

$\Rightarrow r = 6.3$

So, Volume of the dome
$= \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times 6.3 \times 6.3 \times 6.3$
$= 523.9 \text{ cm}^3$

Ex 11.4 Question 9.

Twenty seven solid iron spheres, each of radius r and surface area $\mathbf{S}$ are melted to form a sphere with surface area S'. Find the:
(i) radius r' of the new sphere.
(ii) ratio of S and S.

Answer.

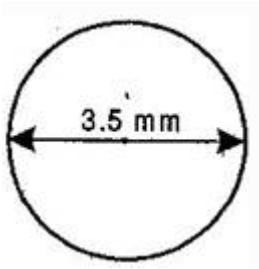
(i) Let radius of sphere be r and radius of new sphere be R.
$27\times$ Volume of sphere $=$ Volume of new sphere
$\Rightarrow 27 \times \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \mathrm{R}^3$
$\Rightarrow \sqrt[3]{3^3 \times r^3} = \mathrm{R}$
$\Rightarrow 3r = R$
$\frac{\text{Surface area of sphere (S)}}{\text{Surface area of sphere (S}')} = \frac{4\pi r^2}{4\pi \mathrm{R}^2}$
$= \frac{r^2}{\mathrm{R}^2} = \frac{r^2}{(3r)^2} = \frac{r^2}{9r^2} = \frac{1}{9}$

Ex 11.4 Question 10.

a capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in mm^3) is needed to fill this capsule?

Answer.

Diameter of spherical capsule $= 3.5 \text{ mm}$



$\therefore$ Radius of spherical capsule (r)
$= \frac{3.5}{2} = \frac{35}{20} = \frac{7}{4}\text{mm}$

Medicine needed to fill the capsule
$= \text{ Volume of sphere } = \frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times \frac{7}{4}$
$= \frac{11 \times 7 \times 7}{3 \times 2 \times 4} = \frac{539}{34}\text{mm}^3$
$= 22.46 \text{ mm}^3 \text{ (Approx.)}$