CLASS 10 · MATHEMATICS · CHAPTER 12

Surface Areas and Volumes - Exercise 12.2

Exercise 12.2 with independently verified solutions.

CHAPTER	RESOURCE	SOURCE
Surface Areas and Volumes	NCERT Exercises	NCERT Mathematics, Reprint 2026-27

PART 1

Verified NCERT questions and solutions

Verified NCERT questions and solutions

Solutions are checked independently and follow the supplied NCERT chapter edition.

QUESTION

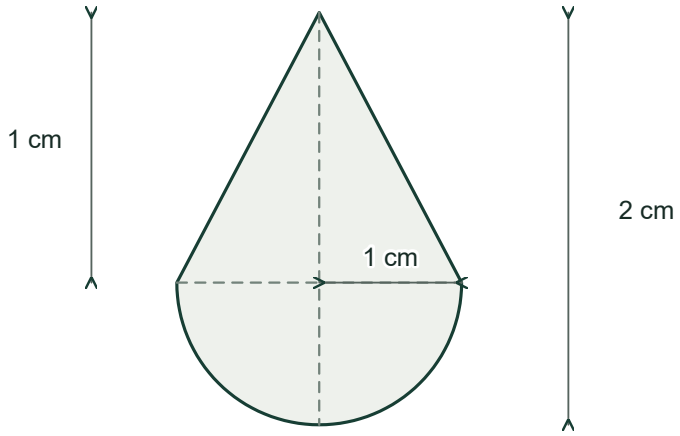
Question 1

cone on hemisphere · volume

A solid is a cone standing on a hemisphere. Both radii are 1 cm and the cone's height equals its radius. Find the volume in terms of π.

Solution

Board-exam working:



Cone joined to a hemisphere — axial/central section (not to scale).

$$r = 1\ \text{cm}, \qquad h = 1\ \text{cm}$$

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

$$= \frac{1}{3}\pi(1)^2(1) + \frac{2}{3}\pi(1)^3$$

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

Final answer

$$\boxed{\pi\ \text{cm}^3}$$

QUESTION

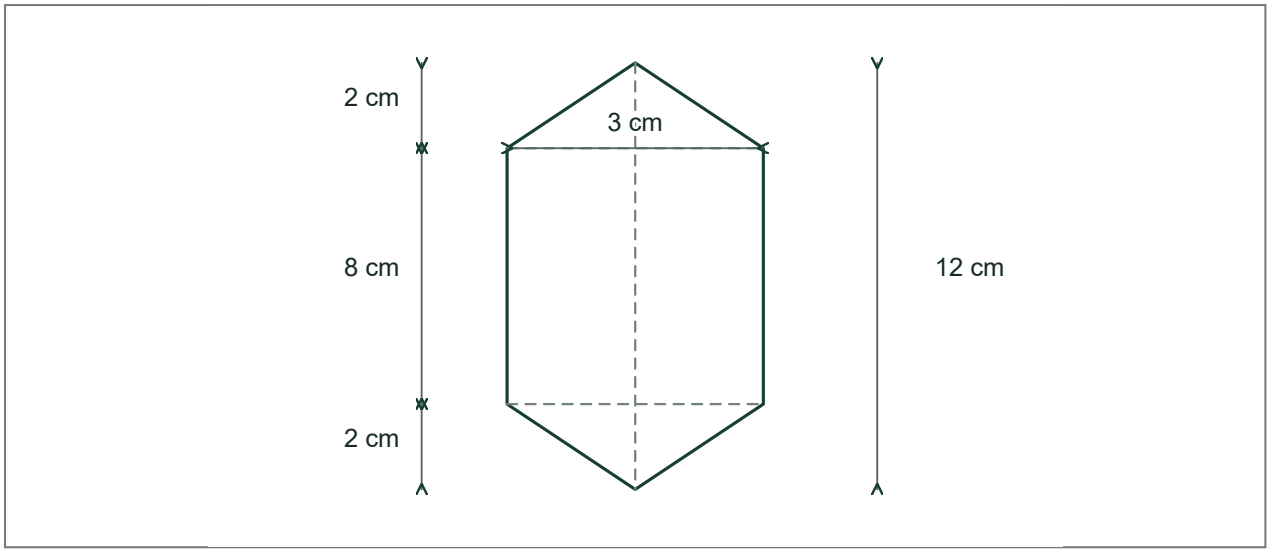
Question 2

cylinder with cones · volume

A model is a cylinder with a cone attached at each end. Its diameter is 3 cm and total length is 12 cm. Each cone is 2 cm high. Find the volume of air contained in the model.

Solution

Board-exam working:



Cylinder with a cone at each end — axial/central section (not to scale).

$$r = \frac{3}{2} = 1.5 \text{ cm}$$

Length of the cylindrical part:

$$h_c = 12 - 2 - 2 = 8 \text{ cm}$$

Total volume = cylinder + two cones.

$$V = \pi r^2 h_c + 2\left(\frac{1}{3}\pi r^2 h_{cone}\right)$$

$$= \pi(1.5)^2(8) + 2\left[\frac{1}{3}\pi(1.5)^2(2)\right]$$

$$= 18\pi + 3\pi = 21\pi \text{ cm}^3$$

$$= 21 \times \frac{22}{7} = 66 \text{ cm}^3$$

Final answer

$$\boxed{66\ \text{cm}^3}$$

QUESTION

Question 3

gulab jamun · syrup volume

A gulab jamun contains sugar syrup equal to about 30% of its volume. Find approximately how much syrup is present in 45 gulab jamuns, each shaped like a cylinder with two hemispherical ends, length 5 cm and diameter 2.8 cm.

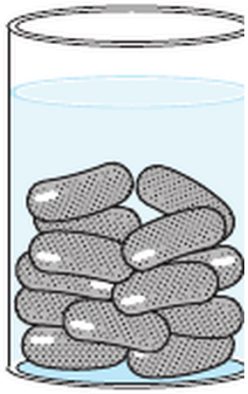


Fig. 12.15

Figure 12-15 from the supplied NCERT chapter.

Solution

Board-exam working:

$$r = \frac{2.8}{2} = 1.4\ \text{cm}$$

The two hemispherical ends form a sphere of total length 2r. Therefore, cylinder length:

$$h = 5 - 2(1.4) = 2.2\ \text{cm}$$

Volume of one gulab jamun:

$$V = \pi r^2 h + \frac{4}{3}\pi r^3$$

$$= \frac{22}{7}(1.4)^2(2.2) + \frac{4}{3} \times \frac{22}{7}(1.4)^3$$

$$\approx 25.05 \text{ cm}^3$$

Syrup in 45 pieces at 30%:

$$V_s = 45 \times \frac{30}{100} \times 25.05$$

$$\approx 338.18 \text{ cm}^3 \approx 338 \text{ cm}^3$$

Final answer

$$\boxed{338 \text{ cm}^3 \text{ (approximately)}}$$

QUESTION

Question 4

pen stand · conical depressions

A wooden pen stand is a cuboid measuring 15 cm × 10 cm × 3.5 cm with four conical depressions. Each depression has radius 0.5 cm and depth 1.4 cm. Find the volume of wood in the stand.

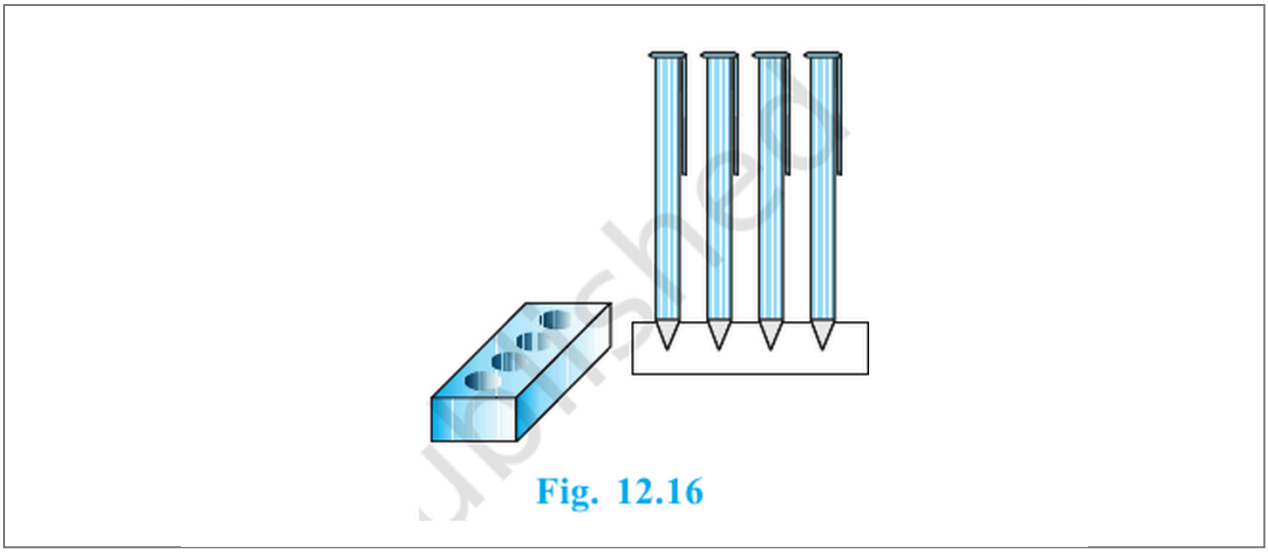


Figure 12-16 from the supplied NCERT chapter.

Solution

Board-exam working:

Volume of the cuboid:

$$V_c = 15 \times 10 \times 3.5 = 525 \text{ cm}^3$$

Volume of one conical depression:

$$V_1 = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3} \times \frac{22}{7} \times (0.5)^2 \times 1.4$$

$$= \frac{11}{30} \text{ cm}^3$$

Volume removed by four depressions:

$$4V_1 = 4 \times \frac{11}{30} = \frac{22}{15} \text{ cm}^3$$

Volume of wood:

$$V = 525 - \frac{22}{15} = 523.533\ldots \text{ cm}^3$$

$$V \approx 523.53 \text{ cm}^3$$

Final answer

$$\boxed{523.53 \text{ cm}^3 \text{ (approximately)}}$$

QUESTION

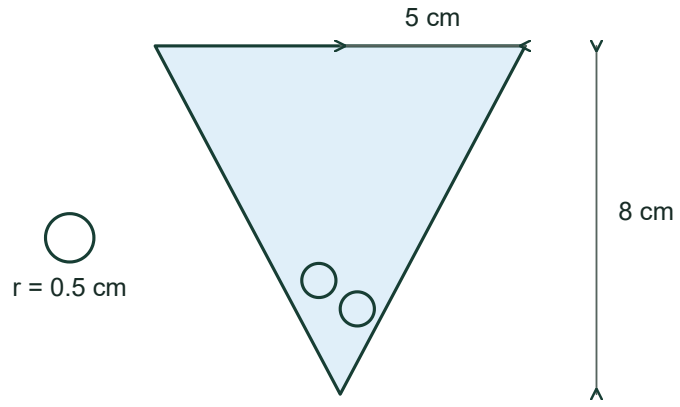
Question 5

lead shots · displaced water

An inverted conical vessel has height 8 cm and open-top radius 5 cm. It is full of water. Spherical lead shots of radius 0.5 cm are dropped in, causing one-fourth of the water to flow out. Find the number of shots.

Solution

Board-exam working:



Shots shown schematically, not their total number

Water displacement by spherical lead shots — axial/central section (not to scale).

Volume of water initially in the cone:

$$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(5)^2(8) = \frac{200\pi}{3}\ \text{cm}^3$$

One-fourth flows out, so displaced volume:

$$V_d = \frac{1}{4} \times \frac{200\pi}{3} = \frac{50\pi}{3}\ \text{cm}^3$$

Volume of one spherical shot:

$$V_s = \frac{4}{3}\pi(0.5)^3 = \frac{\pi}{6}\ \text{cm}^3$$

If n shots are dropped:

$$n \times \frac{\pi}{6} = \frac{50\pi}{3}$$

$$n = \frac{50\pi}{3} \times \frac{6}{\pi} = 100$$

Final answer

$$\boxed{100 \text{ lead shots}}$$

QUESTION

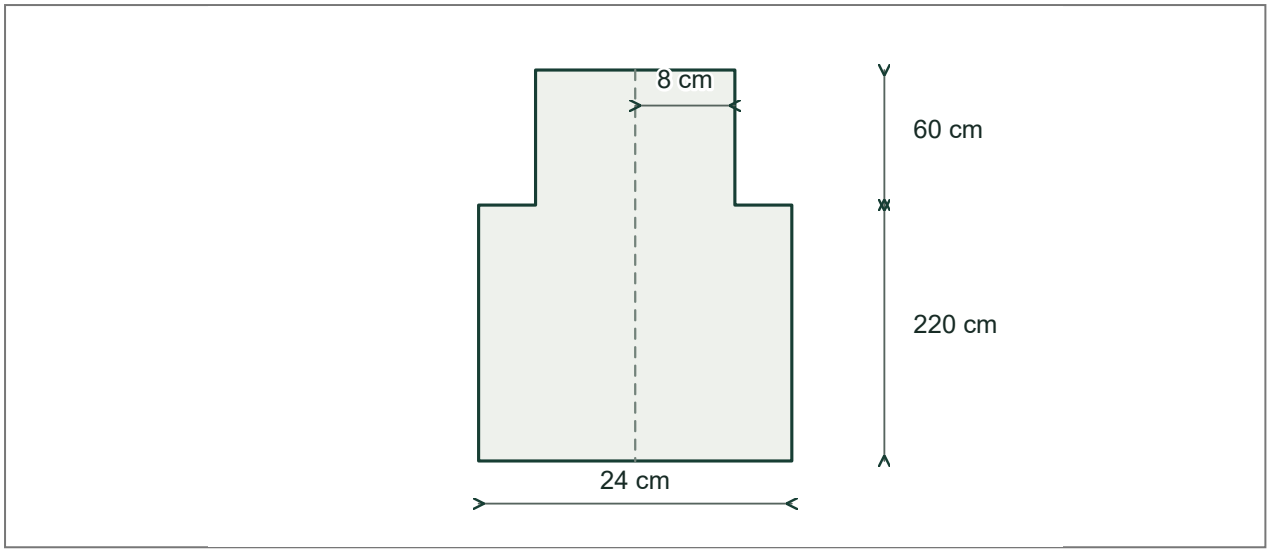
Question 6

iron pole · mass from volume

A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm surmounted by another cylinder of height 60 cm and radius 8 cm. Find its mass if 1 cm³ of iron has mass approximately 8 g. Use π = 3.14.

Solution

Board-exam working:



Iron pole formed by two cylinders — axial/central section (not to scale).

Lower cylinder:

$$r_1 = 12\ \text{cm}, \qquad h_1 = 220\ \text{cm}$$

Upper cylinder:

$$r_2 = 8\ \text{cm}, \qquad h_2 = 60\ \text{cm}$$

Total volume:

$$V = \pi r_1^2 h_1 + \pi r_2^2 h_2$$

$$= 3.14[(12)^2(220) + (8)^2(60)]$$

$$= 3.14[31680 + 3840] = 111532.8\ \text{cm}^3$$

Mass in grams:

$$M = 111532.8 \times 8 = 892262.4\ \text{g}$$

Convert to kilograms:

$$M = \frac{892262.4}{1000} = 892.2624\ \text{kg}$$

Final answer

$$\boxed{892.2624 \text{ kg (approximately)}}$$

QUESTION

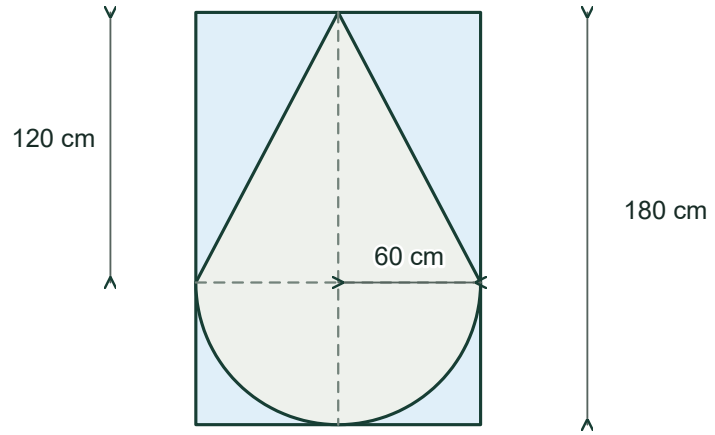
Question 7

water displacement · cone and hemisphere

A cone of height 120 cm and radius 60 cm stands on a hemisphere of radius 60 cm inside an upright cylinder full of water. The cylinder has radius 60 cm and height 180 cm. Find the volume of water left.

Solution

Board-exam working:



Blue: water left outside the solid

Cone and hemisphere inside a water-filled cylinder — axial/central section (not to scale).

Volume of the cylinder:

$$V_c = \pi r^2 h = \pi (60)^2 (180) = 648000\pi \text{ cm}^3$$

Volume of the cone:

$$V_{cone} = \frac{1}{3}\pi(60)^2(120) = 144000\pi \text{ cm}^3$$

Volume of the hemisphere:

$$V_h = \frac{2}{3}\pi(60)^3 = 144000\pi \text{ cm}^3$$

Volume of the inserted solid:

$$V_s = 144000\pi + 144000\pi = 288000\pi \text{ cm}^3$$

Water left:

$$V_w = 648000\pi - 288000\pi = 360000\pi \text{ cm}^3$$

$$= 360000 \times \frac{22}{7} \approx 1131428.57 \text{ cm}^3$$

Final answer

$$\boxed{360000\pi \text{ cm}^3 \approx 1131428.57 \text{ cm}^3}$$

QUESTION

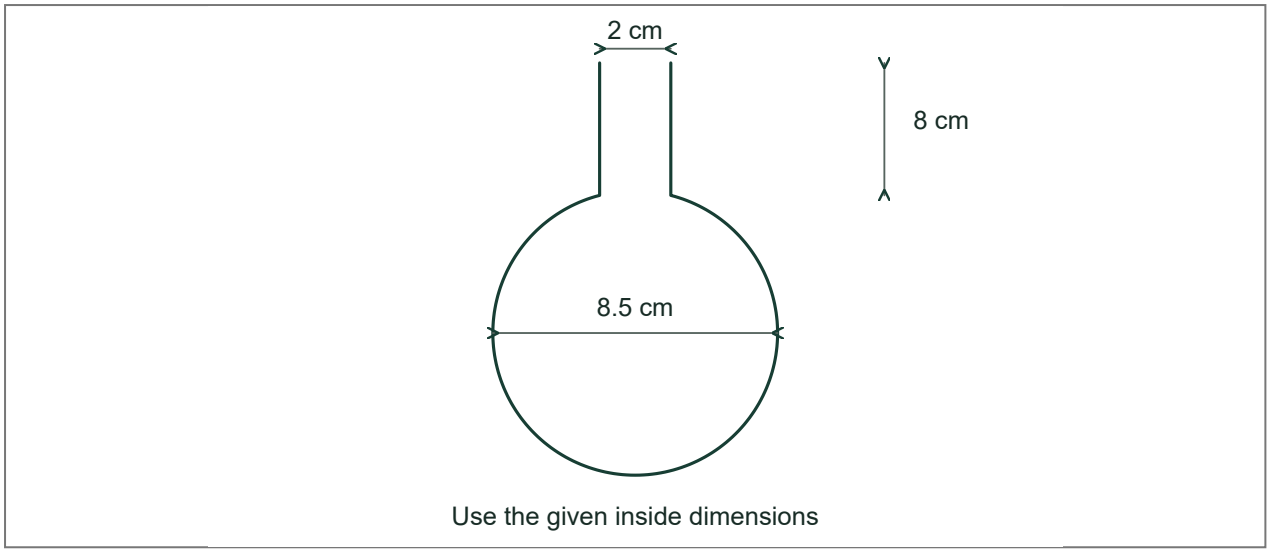
Question 8

spherical vessel · capacity check

A spherical glass vessel has a cylindrical neck 8 cm long and 2 cm in diameter. The spherical part has diameter 8.5 cm. A child measures its capacity as 345 cm³. Check whether she is correct, using the inside measurements and π = 3.14.

Solution

Board-exam working:



Spherical vessel with a cylindrical neck — axial/central section (not to scale).

Spherical part:

$$R = \frac{8.5}{2} = 4.25 \text{ cm}$$

Cylindrical neck:

$$r = \frac{2}{2} = 1 \text{ cm}, \qquad h = 8 \text{ cm}$$

Calculated vessel volume:

$$V = \frac{4}{3}\pi R^3 + \pi r^2 h$$

$$= \frac{4}{3}(3.14)(4.25)^3 + 3.14(1)^2(8)$$

$$= 321.392\ldots + 25.12$$

$$\approx 346.51 \text{ cm}^3$$

The measured value 345 cm³ is not equal to the calculated capacity of about 346.51 cm³.

Final answer

No. The calculated capacity is approximately 346.51 cm^3, not 345 cm^3.