CLASS 10 · MATHEMATICS · CHAPTER 12

Surface Areas and Volumes - Exercise 12.1

Exercise 12.1 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

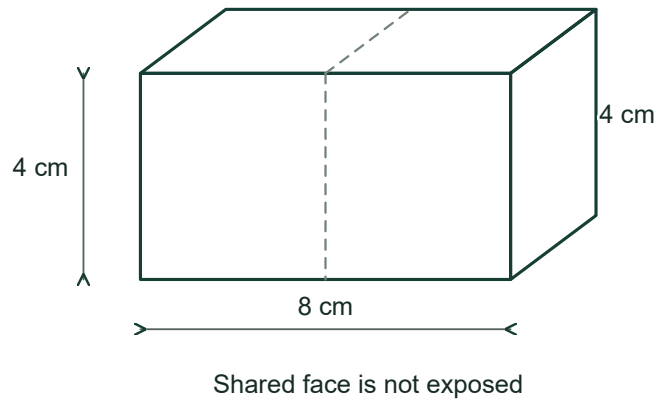
Question 1

joined cubes · cuboid surface area

Two cubes, each of volume 64 cm³, are joined end to end. Find the surface area of the resulting cuboid.

Solution

Board-exam working:



Two cubes joined to form a cuboid — solution sketch (not to scale).

Let a be the edge of each cube.

$$a^3 = 64 \Rightarrow a = 4 \text{ cm}$$

Joining the cubes end to end gives a cuboid of dimensions 8 cm × 4 cm × 4 cm.

$$TSA = 2(lb + bh + hl)$$

$$= 2[(8)(4) + (4)(4) + (4)(8)]$$

$$= 2(32 + 16 + 32) = 160 \text{ cm}^2$$

Final answer

$$\boxed{160 \text{ cm}^2}$$

QUESTION

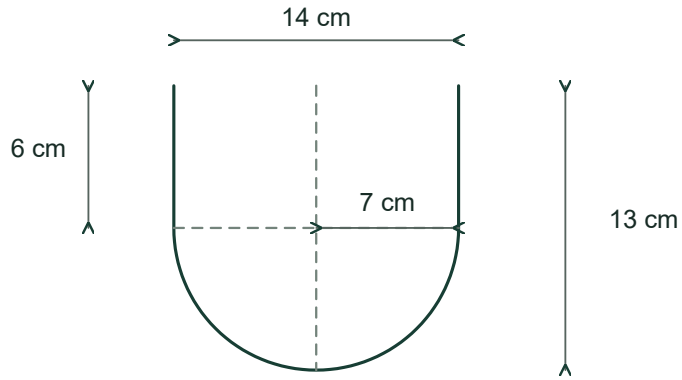
Question 2

hollow vessel · inner surface area

A vessel is a hollow hemisphere mounted by a hollow cylinder. The hemisphere's diameter is 14 cm and the vessel's total height is 13 cm. Find its inner surface area.

Solution

Board-exam working:



Open top; only the two inner curved surfaces

Open cylindrical vessel with a hemispherical bottom — axial/central section (not to scale).

$$r = \frac{14}{2} = 7 \text{ cm}$$

Cylinder height:

$$h = 13 - 7 = 6 \text{ cm}$$

The open vessel's inner area is the curved area of the cylinder plus that of the hemisphere.

$$A = 2\pi rh + 2\pi r^2$$

$$= 2 \times \frac{22}{7} \times 7 \times (6 + 7)$$

$$= 572 \text{ cm}^2$$

Final answer

$$\boxed{572 \text{ cm}^2}$$

QUESTION

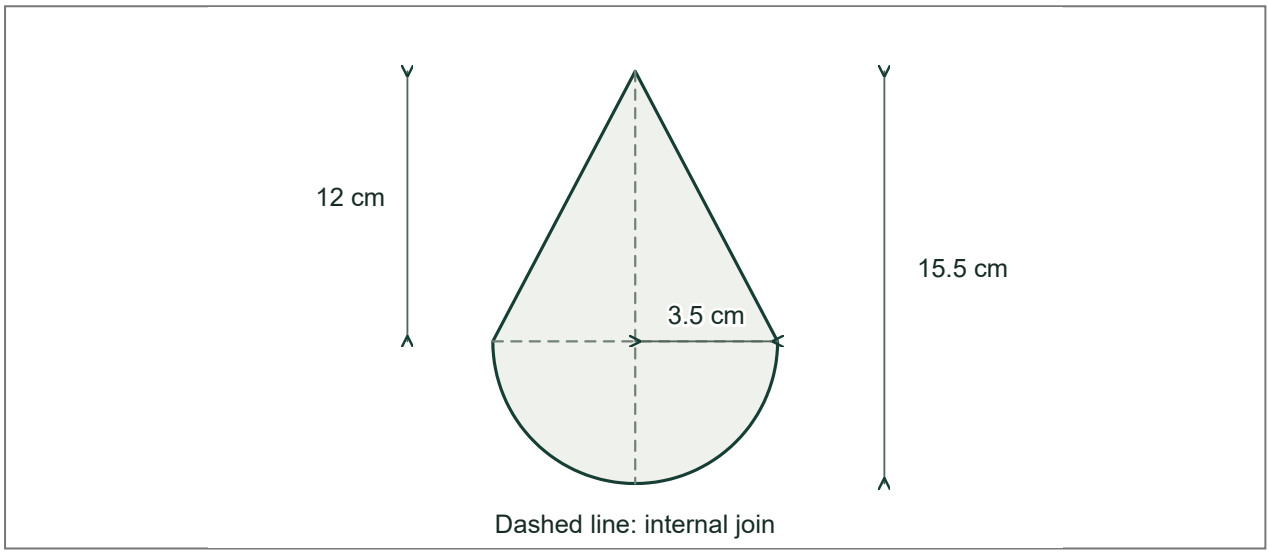
Question 3

cone on hemisphere · surface area

A toy is a cone of radius 3.5 cm mounted on a hemisphere of the same radius. Its total height is 15.5 cm. Find its total surface area.

Solution

Board-exam working:



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

$$r = 3.5 \text{ cm}$$

Cone height:

$$h = 15.5 - 3.5 = 12 \text{ cm}$$

Slant height:

$$l = \sqrt{r^2 + h^2} = \sqrt{3.5^2 + 12^2} = 12.5 \text{ cm}$$

Only the curved surfaces are exposed.

$$A = \pi r l + 2\pi r^2 = \pi r(l + 2r)$$

$$= \frac{22}{7} \times 3.5 \times (12.5 + 7) = 214.5 \text{ cm}^2$$

Final answer

$$\boxed{214.5 \text{ cm}^2}$$

QUESTION

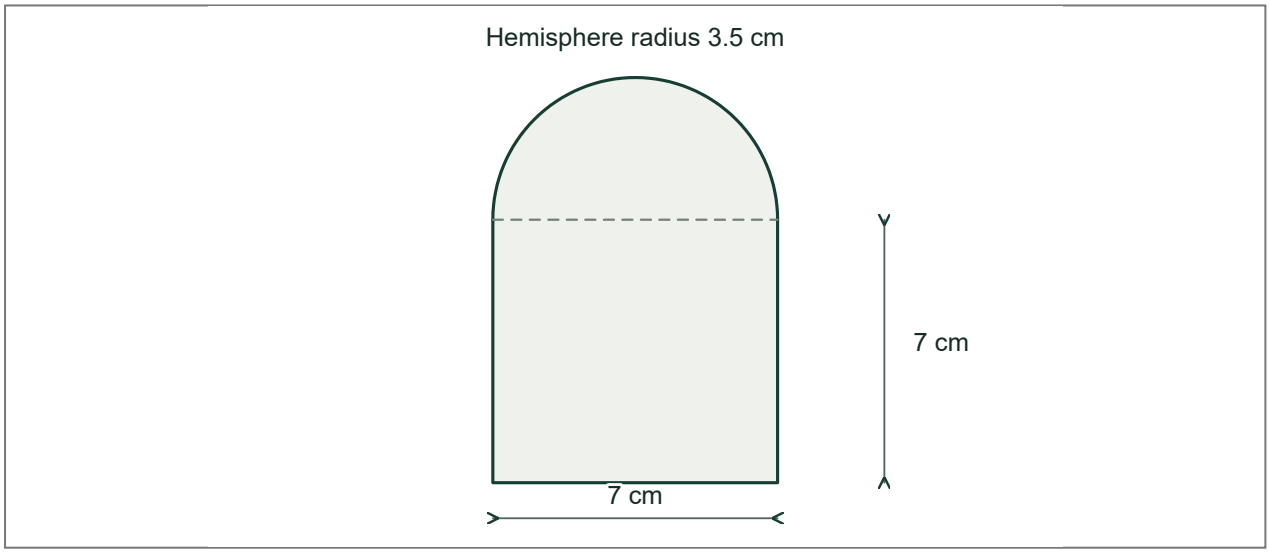
Question 4

cube with hemisphere · greatest diameter

A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.

Solution

Board-exam working:



Largest hemisphere on a cube — axial/central section (not to scale).

The hemisphere's base must fit within the square top face, so its greatest diameter equals the cube's side.

$$d = 7 \text{ cm}, \qquad r = 3.5 \text{ cm}$$

Surface area = cube TSA − covered circular area + hemisphere CSA.

$$A = 6a^2 - \pi r^2 + 2\pi r^2 = 6a^2 + \pi r^2$$

$$= 6(7)^2 + \frac{22}{7}(3.5)^2$$

$$= 294 + 38.5 = 332.5 \text{ cm}^2$$

Final answer

$$d = 7 \text{ cm}, \qquad A = 332.5 \text{ cm}^2$$

QUESTION

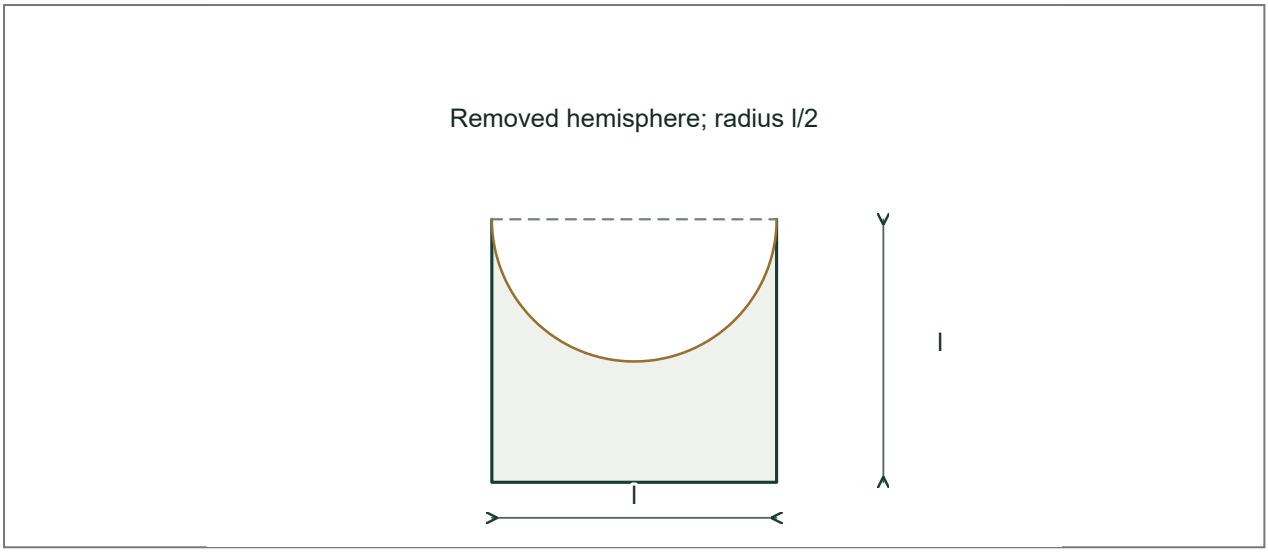
Question 5

cubical block · hemispherical depression

A hemispherical depression is cut from one face of a cubical block so that the hemisphere's diameter l equals the cube's edge. Determine the surface area of the remaining solid.

Solution

Board-exam working:



Hemispherical depression in a cube — axial/central section (not to scale).

$$r = \frac{l}{2}$$

Start with the surface area of the cube, remove the circular opening and add the curved area of the depression.

$$A = 6l^2 - \pi r^2 + 2\pi r^2$$

$$= 6l^2 + \pi \left(\frac{l}{2}\right)^2$$

$$= 6l^2 + \frac{\pi l^2}{4} = \frac{l^2}{4}(24 + \pi)$$

Final answer

$$\boxed{\frac{l^2}{4}(24 + \pi)}$$

QUESTION

Question 6

capsule · surface area

A medicine capsule is a cylinder with two hemispheres at its ends. Its total length is 14 mm and its diameter is 5 mm. Find its surface area.

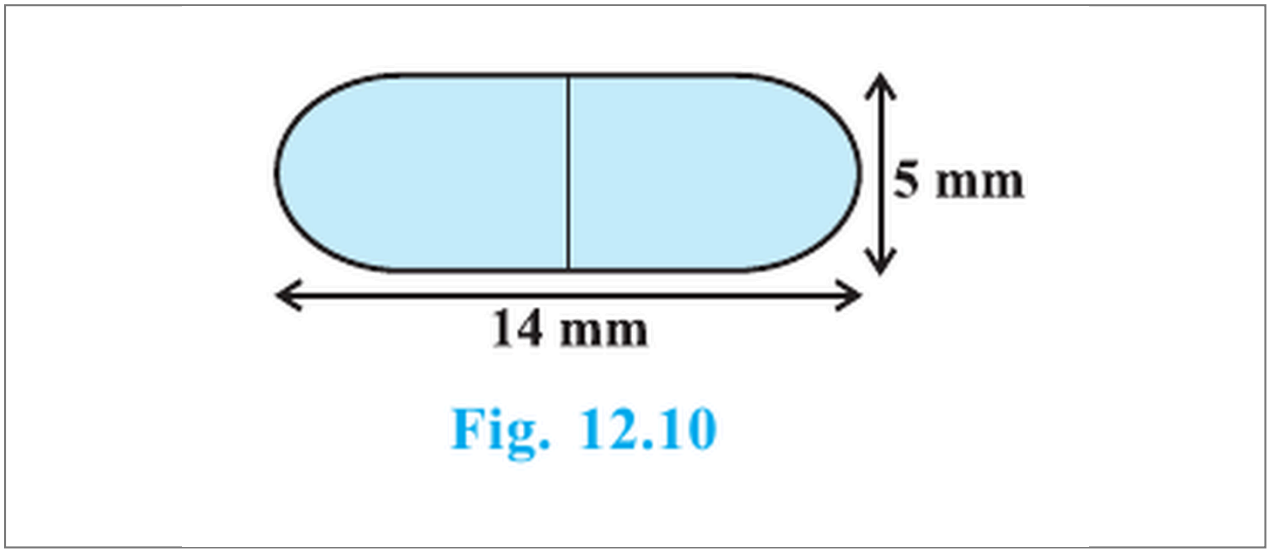


Figure 12-10 from the supplied NCERT chapter.

Solution

Board-exam working:

$$r = \frac{5}{2} = 2.5 \text{ mm}$$

The two hemispherical ends together have length equal to the diameter, so the cylindrical length is:

$$h = 14 - 5 = 9 \text{ mm}$$

Surface area = cylinder CSA + surface area of a sphere.

$$A = 2\pi r h + 4\pi r^2 = 2\pi r(h + 2r)$$

$$= 2 \times \frac{22}{7} \times 2.5 \times (9 + 5)$$

$$= 220 \text{ mm}^2$$

Final answer

$$\boxed{220 \text{ mm}^2}$$

QUESTION

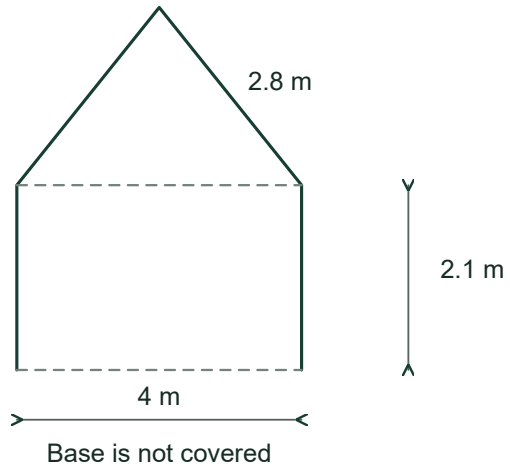
Question 7

tent · canvas area and cost

A tent is a cylinder surmounted by a cone. The cylindrical part is 2.1 m high and 4 m in diameter; the conical top has slant height 2.8 m. Find the canvas area and its cost at ₹500 per m². The base is not covered.

Solution

Board-exam working:



Tent: cone on an open cylinder — axial/central section (not to scale).

$$r = \frac{4}{2} = 2 \text{ m}, \qquad h = 2.1 \text{ m}, \qquad l = 2.8 \text{ m}$$

Canvas area = cylinder CSA + cone CSA.

$$A = 2\pi rh + \pi rl = \pi r(2h + l)$$

$$= \frac{22}{7} \times 2 \times [2(2.1) + 2.8]$$

$$= \frac{44}{7} \times 7 = 44 \text{ m}^2$$

Cost:

$$44 \times \text{Rs. } 500 = \text{Rs. } 22000$$

Final answer

Canvas area = 44 m²; cost = ₹22,000.

QUESTION

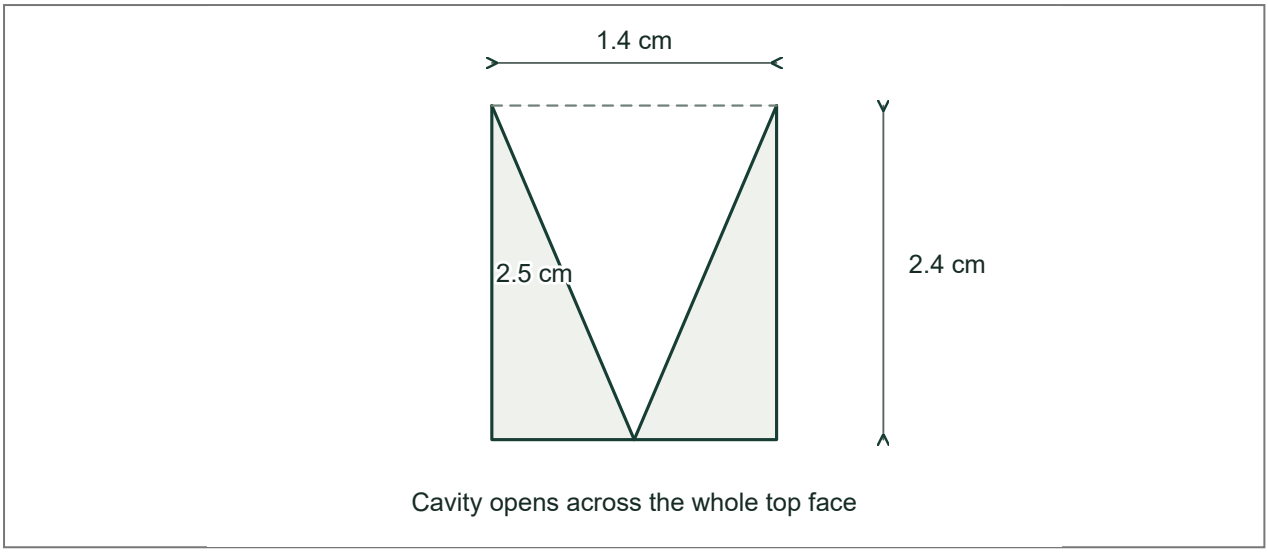
Question 8

conical cavity · remaining surface area

A conical cavity of height 2.4 cm and diameter 1.4 cm is hollowed from a solid cylinder with the same height and diameter. Find the total surface area of the remaining solid to the nearest cm².

Solution

Board-exam working:



Conical cavity inside a cylinder — axial/central section (not to scale).

$$r = \frac{1.4}{2} = 0.7 \text{ cm}, \qquad h = 2.4 \text{ cm}$$

Slant height of the conical cavity:

$$l = \sqrt{r^2 + h^2} = \sqrt{0.7^2 + 2.4^2} = 2.5 \text{ cm}$$

Remaining surface = outer cylinder CSA + bottom base + inner cone CSA.

$$A = 2\pi rh + \pi r^2 + \pi rl$$

$$= \pi r(2h + r + l)$$

$$= \frac{22}{7} \times 0.7 \times (4.8 + 0.7 + 2.5)$$

$$= 17.6 \text{ cm}^2 \approx 18 \text{ cm}^2$$

Final answer

$$\boxed{18 \text{ cm}^2 \text{ (nearest cm}^2\text{)}}$$

QUESTION

Question 9

scooped hemispheres · surface area

A wooden article is made by scooping a hemisphere from each end of a solid cylinder. The cylinder is 10 cm high and has radius 3.5 cm. Find the article's total surface area.

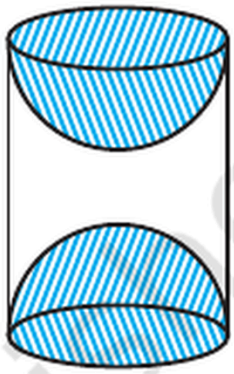


Fig. 12.11

Figure 12-11 from the supplied NCERT chapter.

Solution

Board-exam working:

The exposed surface is the cylinder's curved surface plus the curved surfaces of two hemispherical cavities.

$$A = 2\pi rh + 2(2\pi r^2)$$

$$= 2\pi r(h + 2r)$$

$$= 2 \times \frac{22}{7} \times 3.5 \times (10 + 7)$$

$$= 22 \times 17 = 374 \text{ cm}^2$$

Final answer

$$\boxed{374 \text{ cm}^2}$$