CHAPTER TEST: SURFACE AREAS AND VOLUMES

Mathematics | Class IX (2026/SURVOL/09/001)

Time: 1.5 Hours Max. Marks: 40

GENERAL INSTRUCTIONS

– All questions are compulsory.

– The question paper consists of **five sections: A, B, C, D, and E**.

– Section A contains **8 Multiple Choice Questions (MCQs)** of **1 mark each**.

– Section B contains **4 Very Short Answer questions** of **2 marks each**.

– Section C contains **3 Short Answer questions** of **3 marks each**.

– Section D contains **2 Long Answer questions** of **5 marks each**.

– Section E contains **1 Case Study–based question** of **5 marks**.

– Use of calculators or any electronic devices is **not permitted**, unless stated otherwise.

– All necessary working steps must be clearly shown for full marks.

– The use of appropriate units and correct mathematical symbols is compulsory.

Section A: Multiple Choice Questions (8 Marks)

1. If the radius of a sphere is doubled, then the ratio of the volume of the new sphere to that of the original sphere is:

   (a) 2 : 1

   (b) 4 : 1

   (c) 8 : 1

   (d) 16 : 1

2. The total surface area of a cone whose radius is $\frac{r}{2}$ and slant height is $2l$ is:

   (a) $2\pi r(l + r)$

   (b) $\pi r(l + \frac{r}{4})$

   (c) $\pi r(l + r)$

   (d) $2\pi r l$

3. A cube of side 4 cm is cut into 1 cm cubes. The ratio of the total surface area of the bigger cube to that of the sum of the surface areas of all the smaller cubes is:

   (a) 1 : 2

(b) 1 : 4

(c) 1 : 8

(d) 1 : 16

4. The radius of a hemispherical balloon increases from 6 cm to 12 cm as air is being pumped into it. The ratio of the surface areas of the balloon in the two cases is:

(a) 1 : 4

(b) 1 : 3

(c) 2 : 3

(d) 2 : 1

5. If the curved surface area of a cylinder is 176 cm^2 and its base area is 38.5 cm^2, then its height is:

(a) 6 cm

(b) 8 cm

(c) 4 cm

(d) 12 cm

6. Two right circular cones have their heights in the ratio 1 : 3 and radii in the ratio 3 : 1. The ratio of their volumes is:

(a) 1 : 3

(b) 3 : 1

(c) 9 : 1

(d) 1 : 9

7. The lateral surface area of a cube is 256 m^2. The volume of the cube is:

(a) 512 m^3

(b) 64 m^3

(c) 216 m^3

(d) 1024 m^3

8. A solid sphere is cut into two halves. The ratio of the total surface area of the two hemispheres to that of the original sphere is:

(a) 2 : 1

(b) 3 : 2

(c) 4 : 3

(d) 1 : 1

Section B: Very Short Answer Questions (8 Marks)

1. Three cubes of side 5 cm each are joined end to end. Find the surface area of the resulting cuboid.

2. Find the capacity in litres of a conical vessel with radius 7 cm and slant height 25 cm.

3. The volume of a sphere is 38808 cm^3. Find its radius and hence its surface area.

4. A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of Rs 12.50 per m^2.

## Section C: Short Answer Questions (9 Marks)

1. The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in m^2.
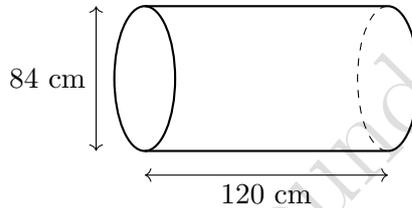

2. The volume of a right circular cone is 9856 cm^3. If the diameter of the base is 28 cm, find:

   (a) Height of the cone.
   (b) Slant height of the cone.
   (c) Curved surface area of the cone.

3. A lead sphere of diameter 6 cm is melted and recast into a right circular cone of height 12 cm. Find the radius of the base of the cone.

Section D: Long Answer Questions (10 Marks)

1. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the difference of the volumes of the cylinder and the toy.


Hemisphere

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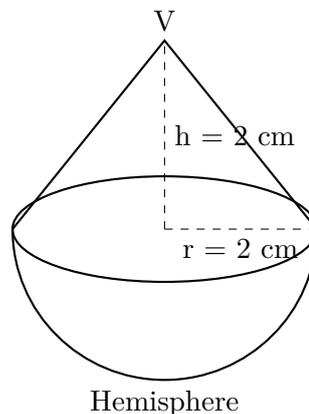
2. A village, having a population of 4000, requires 150 litres of water per head per day. It has a tank measuring 20 m × 15 m × 6 m. For how many days will the water of this tank last?
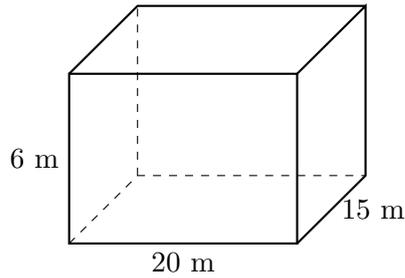
Section E

Case Study: The Aerospace Research Observatory

Architects are finalizing the design for a specialized aerospace research observatory situated in a remote desert location. The structure consists of a perfectly cylindrical main laboratory topped with a conical observation dome. The cylindrical section has a diameter of 14 meters and a height of 10 meters, providing ample space for heavy scientific equipment. The conical dome, designed for telescopic housing, shares the same base diameter as the cylinder and reaches a peak height of 24 meters above its own base. Engineers must calculate the total internal volume to regulate climate control systems effectively. Additionally, the exterior surface, excluding the base floor, requires a specialized heat-reflective coating costing 850 rupees per square meter. Determining the exact surface area is crucial for finalizing the project's multi-million dollar budget while ensuring structural efficiency.
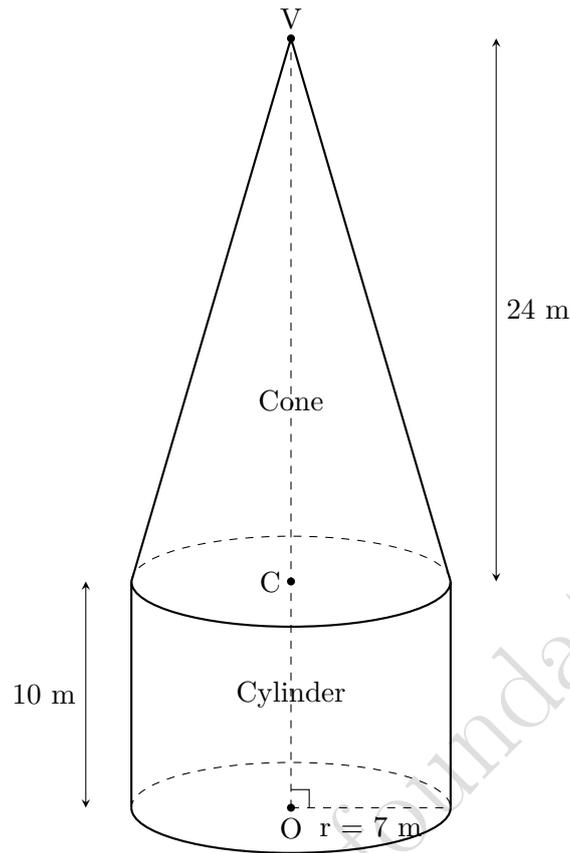
Multiple Choice Questions

1. What is the total volume of air enclosed within the cylindrical laboratory section?

   (a) 1,540 π cubic meters
   (b) 490 π cubic meters
   (c) 700 π cubic meters
   (d) 980 π cubic meters

2. What is the slant height (l) of the conical observation dome?

   (a) 26 meters
   (b) 25 meters
   (c) 31 meters
   (d) 28 meters

3. To calculate the amount of heat-reflective coating needed, what is the Curved Surface Area (CSA) of the conical dome?

   (a) 168 π sq. m
   (b) 175 π sq. m
   (c) 200 π sq. m
   (d) 182 π sq. m

4. What is the total surface area of the entire observatory that requires the heat-reflective coating (excluding the base floor)?

(a) 325 π sq. m

(b) 315 π sq. m

(c) 350 π sq. m

(d) 295 π sq. m

5. If the cost of the coating is calculated using $\pi \approx \frac{22}{7}$, what is the total estimated cost for the exterior treatment of the observatory?

(a) Rs. 824,500

(b) Rs. 935,000

(c) Rs. 860,200

(d) Rs. 748,000