

# CHAPTER TEST: SURFACE AREAS AND VOLUMES

Mathematics | Class IX (2026/SURVOL/09/002)

Time: 1.5 Hours

Max. Marks: 40

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## GENERAL INSTRUCTIONS

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- 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 the volume of the original sphere is:
  - (a) 2 : 1
  - (b) 4 : 1
  - (c) 8 : 1
  - (d) 1 : 8
2. The total surface area of a cube is  $96 \text{ cm}^2$ . The volume of the cube is:
  - (a)  $8 \text{ cm}^3$
  - (b)  $64 \text{ cm}^3$
  - (c)  $16 \text{ cm}^3$
  - (d)  $27 \text{ cm}^3$
3. A right circular cylinder and a right circular cone have the same radius and the same height. The ratio of their volumes is:

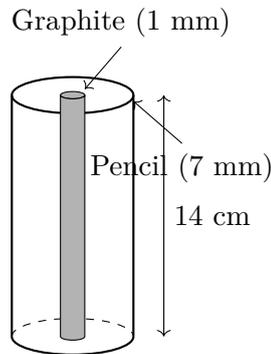
- (a) 1 : 3  
(b) 3 : 1  
(c) 2 : 3  
(d) 3 : 2
4. The curved surface area of a hemisphere of radius  $r$  is:  
(a)  $3\pi r^2$   
(b)  $2\pi r^2$   
(c)  $4\pi r^2$   
(d)  $\frac{2}{3}\pi r^2$
5. If a right circular cone has a vertical height of 4 cm and a radius of 3 cm, its slant height is:  
(a) 7 cm  
(b) 5 cm  
(c) 25 cm  
(d)  $\sqrt{7}$  cm
6. The number of lead balls, each 1 cm in diameter, that can be made from a sphere of diameter 12 cm is:  
(a) 144  
(b) 1728  
(c) 576  
(d) 12
7. If the curved surface area of a cylinder is  $176 \text{ cm}^2$  and its base radius is 2.8 cm, then its height is:  
(a) 10 cm  
(b) 20 cm  
(c) 15 cm  
(d) 5 cm
8. Two cubes of side 4 cm are joined end to end. The surface area of the resulting cuboid is:  
(a)  $160 \text{ cm}^2$   
(b)  $128 \text{ cm}^2$   
(c)  $192 \text{ cm}^2$   
(d)  $144 \text{ cm}^2$

### Section B (Very Short Answer Questions - 8 Marks)

1. A cylindrical pillar has a radius of 21 cm and a height of 4 m. Find the cost of painting its curved surface area at the rate of 25 per  $\text{m}^2$ .
2. Find the volume of a sphere whose surface area is  $154 \text{ cm}^2$ .
3. The radius of a cone is 7 cm and its slant height is 25 cm. Find its volume.
4. The dimensions of a cuboid are in the ratio 1 : 2 : 3 and its total surface area is  $88 \text{ cm}^2$ . Find the dimensions.

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

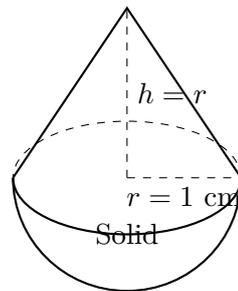
1. A hemispherical bowl has a radius of 3.5 cm. What would be the volume of water it would contain? Also, find the total surface area of the bowl (assuming it is closed with a lid).
2. A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior. The diameter of the pencil is 7 mm and the diameter of the graphite is 1 mm. If the length of the pencil is 14 cm, find the volume of the wood.



3. How many square metres of canvas is required for a conical tent whose height is 3.5 m and the radius of whose base is 12 m?

## Section D (Long Answer Questions - 10 Marks)

1. A solid is in the form of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of  $\pi$ . If this solid is placed in a cylindrical tub full of water such that it touches the bottom, find the volume of water left in the tub if the radius of the cylinder is 1 cm and its height is 2 cm.



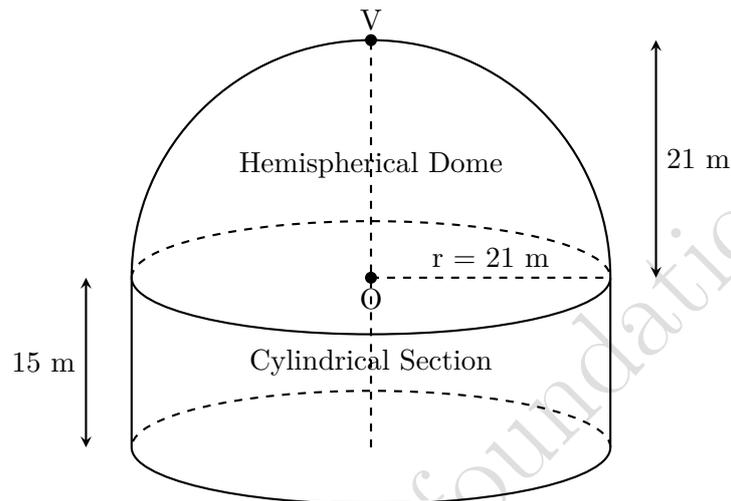
2. A village, having a population of 4000, requires 150 litres of water per head per day. It has a tank measuring 20 m  $\times$  15 m  $\times$  6 m. For how many days will the water of this tank last? ( $1 \text{ m}^3 = 1000 \text{ litres}$ ).

## Section E

### Case Study: The Greenhouse Botanical Atrium

Architectural planners are developing a sustainable botanical atrium designed as a vertical glass cylinder capped with a perfectly hemispherical glass dome. The cylindrical base of the

atrium stands 15 meters tall, providing a controlled environment for tropical flora, while the hemispherical dome adds a panoramic view of the sky. The radius of both the cylindrical section and the hemispherical cap is exactly 21 meters. To maintain the delicate ecosystem inside, the glass panels must be treated with a specialized UV-protective film. The project managers need to determine the total internal air volume to calibrate the oxygen replenishment systems accurately. Furthermore, the cost of the UV-protective film is 1,200 rupees per square meter of glass surface. Precise geometric analysis is essential to ensure that the ecological requirements meet the strictly allocated municipal construction budget.



### Multiple Choice Questions

- What is the Curved Surface Area (CSA) of the cylindrical portion of the atrium?
  - $630 \pi$  sq. m
  - $441 \pi$  sq. m
  - $882 \pi$  sq. m
  - $1,260 \pi$  sq. m
- What is the external surface area of the hemispherical glass dome?
  - $441 \pi$  sq. m
  - $882 \pi$  sq. m
  - $1,764 \pi$  sq. m
  - $1,323 \pi$  sq. m
- What is the total volume of air contained within the entire botanical atrium?
  - $12,789 \pi$  cubic meters
  - $6,615 \pi$  cubic meters
  - $15,246 \pi$  cubic meters
  - $18,900 \pi$  cubic meters
- If the ground floor (base) is not made of glass, what is the total surface area of glass requiring the UV-protective film?
  - $1,512 \pi$  sq. m

- (b)  $1,953 \pi$  sq. m  
(c)  $2,205 \pi$  sq. m  
(d)  $1,323 \pi$  sq. m
5. Using  $\pi \approx \frac{22}{7}$ , what is the total cost for applying the UV film to the entire glass surface area?
- (a) Rs. 4,504,800  
(b) Rs. 5,702,400  
(c) Rs. 6,240,000  
(d) Rs. 5,987,500

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