

# CHAPTER TEST: SURFACE AREAS AND VOLUMES

Mathematics | Class IX (2026/SURVOL/09/003)

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 surface area of a sphere is  $616 \text{ cm}^2$ , then its radius is:
  - (a) 7 cm
  - (b) 14 cm
  - (c) 3.5 cm
  - (d) 21 cm
2. The length of the longest pole that can be put in a room of dimensions  $10 \text{ m} \times 10 \text{ m} \times 5 \text{ m}$  is:
  - (a) 15 m
  - (b) 16 m
  - (c) 10 m
  - (d) 12 m
3. A cone and a hemisphere have equal bases and equal volumes. The ratio of their heights is:
  - (a) 1 : 2

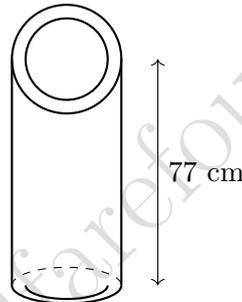
- (b) 2 : 1  
(c) 1 : 3  
(d) 3 : 1
4. The number of planks of dimensions  $4 \text{ m} \times 50 \text{ cm} \times 20 \text{ cm}$  that can be stored in a pit which is 16 m long, 12 m wide and 4 m deep is:
- (a) 1900  
(b) 1920  
(c) 1800  
(d) 1840
5. The curved surface area of a right circular cone of slant height 10 cm and base radius 7 cm is:
- (a)  $220 \text{ cm}^2$   
(b)  $440 \text{ cm}^2$   
(c)  $310 \text{ cm}^2$   
(d)  $110 \text{ cm}^2$
6. If the volume and the surface area of a sphere are numerically equal, then its radius is:
- (a) 3 units  
(b) 4 units  
(c) 5 units  
(d) 2 units
7. The radius of a cylinder is doubled and the height is halved. The ratio of the new volume to the previous volume is:
- (a) 1 : 2  
(b) 2 : 1  
(c) 1 : 1  
(d) 4 : 1
8. A hollow spherical shell is made of a metal of density  $\rho$ . If its internal and external radii are  $r$  and  $R$  respectively, its mass is:
- (a)  $\frac{4}{3}\pi(R^3 - r^3)\rho$   
(b)  $\frac{4}{3}\pi(R^3 + r^3)\rho$   
(c)  $4\pi(R^2 - r^2)\rho$   
(d)  $\frac{4}{3}\pi(R - r)^3\rho$

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

1. Find the total surface area of a hemisphere of radius 10 cm. (Use  $\pi = 3.14$ )
2. A cuboidal water tank is 6 m long, 5 m wide and 4.5 m deep. How many litres of water can it hold? ( $1 \text{ m}^3 = 1000\ell$ )
3. The height of a cone is 15 cm. If its volume is  $1570 \text{ cm}^3$ , find the radius of the base. (Use  $\pi = 3.14$ )
4. Find the ratio of the total surface area of a sphere and the curved surface area of a cylinder having the same radius and height equal to the diameter of the sphere.

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

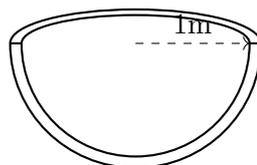
1. A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, the outer diameter being 4.4 cm. Find its total surface area.



2. A conical tent is 10 m high and the radius of its base is 24 m. Find the slant height of the tent and the cost of the canvas required to make the tent, if the cost of  $1 \text{ m}^2$  canvas is Rs 70.
3. The volumes of two spheres are in the ratio  $64 : 27$ . Find the ratio of their surface areas.

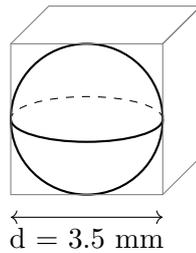
### Section D: Long Answer Questions (10 Marks)

1. 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.



Hemispherical Tank

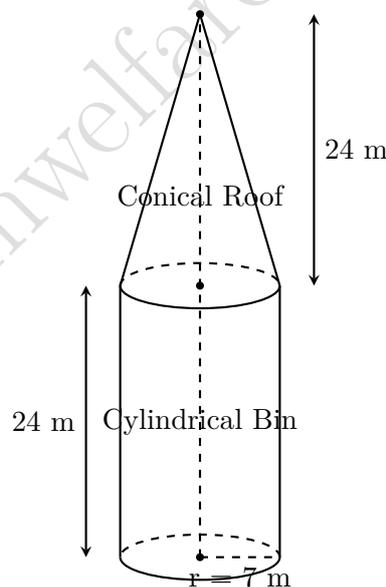
2. A capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in  $\text{mm}^3$ ) is needed to fill this capsule? Also, if this capsule is placed exactly inside a smallest possible cubical box, find the volume of the empty space left in the box.



## Section E

### Case Study: The Agricultural Infrastructure Project

An agricultural cooperative is constructing a state-of-the-art grain storage silo to minimize post-harvest losses. The structure is designed as a vertical right circular cylinder with a conical roof to facilitate efficient drainage of rainwater and snow. The cylindrical portion has a uniform diameter of 14 meters and stands 24 meters high. The conical roof, which is perfectly fitted atop the cylinder, has a vertical height of 24 meters from its base to the apex. Engineers must calculate the total internal volume to determine the maximum capacity of wheat the silo can store. Furthermore, the exterior of the conical roof needs to be painted with a specialized weather-resistant zinc coating. Each liter of this coating covers 10 square meters and costs 1,800 rupees, making precise surface area calculations essential for cost management.



### Multiple Choice Questions

1. What is the total volume of the cylindrical portion of the storage silo?
  - (a)  $1,176 \pi$  cubic meters
  - (b)  $168 \pi$  cubic meters
  - (c)  $840 \pi$  cubic meters
  - (d)  $2,352 \pi$  cubic meters

2. What is the slant height ( $l$ ) of the conical roof required to find the surface area?
- (a) 26 meters
  - (b) 25 meters
  - (c) 31 meters
  - (d) 28 meters
3. What is the volume of the conical roof section?
- (a)  $490 \pi$  cubic meters
  - (b)  $392 \pi$  cubic meters
  - (c)  $588 \pi$  cubic meters
  - (d)  $1,176 \pi$  cubic meters
4. What is the total storage capacity (total volume) of the entire silo structure?
- (a)  $1,568 \pi$  cubic meters
  - (b)  $1,764 \pi$  cubic meters
  - (c)  $2,150 \pi$  cubic meters
  - (d)  $1,960 \pi$  cubic meters
5. If the zinc coating is only applied to the curved surface of the conical roof, using  $\pi \approx \frac{22}{7}$ , what is the total cost of the coating?
- (a) Rs. 99,000
  - (b) Rs. 84,000
  - (c) Rs. 108,000
  - (d) Rs. 115,200