CHAPTER TEST: SURFACE AREAS AND VOLUMES (HOTS)

Mathematics | Class IX | (2026/SAV-HOTS/09/001)

Time: 1.5 Hours **Max. Marks: 40**

General Instructions:

- All questions are compulsory.
- Section A: 8 MCQs (1 mark each).
- Section B: 4 Short Answer Questions (2 marks each).
- Section C: 3 Short Answer Questions (3 marks each).
- Section D: 3 Long Answer/HOTS questions (5 marks each).

Section A: Multiple Choice Questions (1 Mark Each)

1. The radius of a sphere is increased by 10%. The percentage increase in its volume is:

   (a) 30% (b) 33.1% (c) 44.1% (d) 31.1%

2. 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 : 1 (d) $\sqrt{2} : 1$

3. The number of planks of dimensions ($4m \times 50cm \times 20cm$) that can be stored in a pit which is $16m$ long, $12m$ wide and $4m$ deep is:

   (a) 1900 (b) 1920 (c) 1800 (d) 1840

4. If the surface area of a sphere is 154 cm^2, then its volume is:

   (a) 179.67 cm^3 (b) 180.5 cm^3 (c) 175.25 cm^3 (d) 121.12 cm^3

5. A right circular cylinder just encloses a sphere of radius r. The curved surface area of the cylinder is:

   (a) $2\pi r^2$ (b) $4\pi r^2$ (c) $3\pi r^2$ (d) $6\pi r^2$

6. 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

7. If a sphere, a cylinder and a cone have the same radius and same height, the ratio of their volumes is:

   (a) 4 : 3 : 1 (b) 1 : 3 : 2 (c) 2 : 3 : 1 (d) 3 : 4 : 1

8. The lateral surface area of a cube is 256 cm^2. The volume of the cube is:

   (a) 512 cm^3 (b) 64 cm^3 (c) 216 cm^3 (d) 256 cm^3

Section B: Short Answer Questions (2 Marks Each)

1. A cone, a hemisphere and a cylinder stand on equal bases and have the same height. Find the ratio of their volumes.

2. The radius of a sphere is $2r$. What is its volume? If this sphere is melted to form a cone of height r, find the radius of the base of the cone.

3. If the volume of a sphere is numerically equal to its surface area, find the diameter of the sphere.

4. A right circular cone has a height of 8.4 cm and radius of its base 2.1 cm. It is melted and recast into a sphere. Find the radius of the sphere.

Section C: Short Answer Questions (3 Marks Each)

1. The volume of a right circular cone is 9856 cm^3. If the diameter of the base is 28 cm, find: (i) height of the cone, (ii) slant height, (iii) curved surface area.

2. A semi-circular sheet of metal of diameter 28 cm is bent to form an open conical cup. Find the capacity of the cup.

3. 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.

Section D: Long Answer / HOTS Questions (5 Marks Each)

1. **(Advanced Application)** A metal cube of edge 12 cm is melted and formed into three smaller cubes. If the edges of the two smaller cubes are 6 cm and 8 cm, find the edge of the third smaller cube. Also, verify if the sum of surface areas of the three smaller cubes is equal to the surface area of the original cube.

2. A cylindrical tube of radius 12 cm contains water to a depth of 20 cm. A spherical iron ball is dropped into the tube and the level of water is raised by 6.75 cm. Find the radius of the ball. (Use $\pi = 22/7$).

3. **(HOTS)** A right triangle with sides 6 cm, 8 cm and 10 cm is revolved about the side 8 cm and then about the side 6 cm. Find the volumes of the two cones so formed. Find the difference in their volumes and the ratio of their curved surface areas.