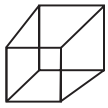
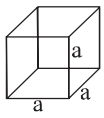
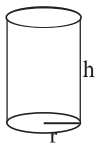
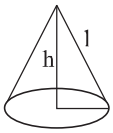
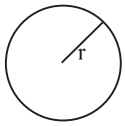
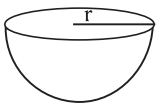
CHAPTER-13
SURFACE AREAS AND VOLUMES

KEY POINTS

S. No.	Name	Figure	Lateral/ Curved Surface Area	Total surface Area	Volume	Symbols used for
1.	Cuboid		$2(l+b) \times h$	$2(lb+bh+hl)$	lbh	l =Length b=breadth h=height
2.	Cube		$4a^2$	$6a^2$	a^3	a=side
3.	Right Circular Cylinder		$2\pi rh$	$2\pi r(h+r)$	πr^2h	h=height r=radius of base
4.	Right Circular Cone		πrl	$\pi r(l+r)$	$\frac{1}{3}\pi r^2h$	h=height r=radius of base
5.	Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$	r = radius
6.	Hemisphere Solid		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$	r = radius
7.	Hemisphere hollow		$2\pi r^2$	$2\pi r^2$	$\frac{2}{3}\pi r^3$	r = radius

PART-A

Q.1 The lateral surface area of a cube is 256 cm^2. Find its volume.

Q.2 A matchbox measures 4cm x 2.5 cm x 1.5 cm. What will be the volume of a packet containing 12 such boxes?

Q.3 The ratio of height of two cylinders is 5:3 , as well as the ratio of their radii is 2:3. Find the ratio of the volumes of the cylinders.

Q.4 Find the area of canvas required for a conical tent of height 24m and base radius 7m.

Q.5 Find the ratio of total surface area of a sphere and a hemisphere of same radius.

Q.6 The surface area of the cuboid is 1372 sq. cm. If its dimensions are in the ratio of 4:2:1. Then find its length.

Q.7 If the radius and slant height of a cone are r/2 and 2l. Then find its total surface area.

Q.8 A cone and a hemisphere have equal base and equal volumes. Find the ratio of their heights.

Q.9 The radius of a spherical balloon increase from 6cm to 12 cm as air is being pumped into it. Find the ratio of the surface areas of the balloon in two cases.

Q.10 The largest possible right circular cone is cut out of a cube of edge r cm. What is the volume of cone?

PART-B

Q.11 A rectangular sheet of dimensions 33 cm × 18 cm is rolled along its breadth to form a cylinder. Find the radius of the cylinder.

Q.12 A roller 1.5m long has a diameter of 70 cm. How many revolutions will it make to level a play ground measuring 50m x 33m?

Q.13 The dimensions of a cuboid are in the ratio of 1:2:3 and its total surface area is 88m^2. Find its dimensions.

Q.14 A solid cylinder has a total surface area of 231 cm^2. The curved surface area is 2/3 of the total surface area. Find the volume of cylinder.

Q.15 The total surface area of a cube is 150sq. cm. Find the perimeter of any one of its faces.

Q.16 Three metal cubes whose edge measures 3cm, 4cm and 5cm respectively are melted to form a single cube. Find the edge of the cube.

Q.17 The length, breadth and height of room are 5m, 4m and 3m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of ₹ 7.50 per m^2.

Q.18 Three spheres of radii 3cm, 4cm and 5cm are melted together to form a single sphere. Find the radius of new sphere.

Q.19 The curved surface area of a cylinder is 176 cm^2 and its base area is 38.5cm^2. Find the volume of the cylinder.

Q.20 A cylinder and a cone have the same height and the same radius. The volume of the cylinder is 24cm^3. What will be the volume of the cone?

Q.21 What is the volume of the largest cone that can be inscribed completely in a hollow hemisphere of radius 7 cm?

Q.22 Find the maximum length of the rod that can be placed in a cuboid of dimesions 22.5 cm × 10 cm × 7.5 cm.

PART-C

Q.23 A cuboidal vessel is 10m long and 8m wide. How high must it be made to hold 380m^3 of a liquid?

Q.24 A wall of length 10m was to be built across an open ground. The height of the wall is 4m and thickness of the wall is 24cm. If this wall is to be built up with bricks whose dimensions are 24cm x 10cm x 8cm, how many bricks would be required?

Q.25 1.1 cm^3 of gold is drawn into a wire of 0.1 mm in diameter. Find the length of the wire in metre.

Q. 26 A hemispherical bowl of internal diameter 36cm contain a liquid. This liquid is to be filled in cylindrical bottles of radius 3cm and height 6 cm. How many bottles are required to empty the bowl?

Q.27 Find the lateral curved surface area of a cylindrical petrol storage tank that is 4.2m in diameter and 4.5m high. How much steel was actually used if 1/12 of steel actually used was wasted in making the closed tank?

Q.28 Water in a canal, 30 dm wide and 12 dm deep is flowing with a speed of 20 km per hour. How much area will it irrigate in 30 min if 9 cm of standing water is desired ? (10dm=1m)

Q.29 The radius of a sphere is 10cm. If the radius is increased by 1 cm. then prove that volume of the sphere is increased by 33.1%.

Q.30 The diameter of a hemisphere is decreased by 30%. What will be the percentage change in its total surface area?

Q.31 A sphere and a cube have the same surface area. Find the ratio of their volumes.

Q.32 The volume of a sphere is 4851 cm^3. How much should its radius be reduced so that its volume becomes $\frac{4312}{3}$ cm^3?

Q.33 A semicircular sheet of paper of diameter 14 cm is bent to form an open conical cup. Find the capacity of the cup.

Q.34 If c, t and v are curved surface area, total surface area and volume of a cylinder then show that

$$th^2 = ch^2 + 4v^2 + 8v^2rh$$

where r and h are radius and height.

PART-D

Q.35 A cuboidal tank can store 5040 litres of water. The external dimensions of the tank are 2.2m x 1.7m x 1.7m. If the walls of the tank are 5 cm thick, then what is the thickness of the bottom of the tank?

Q.36 A metallic sheet is of the rectangular shape with dimensions 48cm x 36cm. From each one of its corners, a square of 8cm is cut off An open box is made of the remaining sheet. Find the volume of the box.

Q.37 A right triangle having sides 6cm, 8cm and 10cm is revolved about the side of length 8cm. Find the volume of the solid so formed.

Q.38 A right circular cone is 5.4 cm high and radius of its base is 2cm. It is melted and recast into another right circular cone with radius of base as 1.5 cm. Find the height of new cone formed.

Q.39 A cylindrical tub of radius 12 cm contains water to the depth of 20cm. A spherical ball is dropped into the tub raising the level of water by 6.75cm. What is the radius of ball?

Q.40 A cylinder is within the cube touching all the vertical faces. A cone is inside the cylinder. If their height are the same with the same base. Find the ratio of their volumes.

Q.41 A plot of land is in the form of rectangle has dimension 240m × 180m. A drain let 10m wide is dug around it (on the outside). and the earth dug out is evenly spread out over the plot increasing its surface level by 25cm. Find the depth of the drainlet.

Q.42 A residential colony has a population of 5400 and 60 litres of water is required per person per day. For the effective utilization of rain water, a group of people decided to the WATER HARVESTING. They constructed a water reservoir measuring 48m x 27m x 25m to collect the rain water.

For how many days the water of this tank is sufficient-if during rain the height of water level is 5 m.

Q.43 50 students of class IX planned a visit to an old age home and to spend the whole day with its inmates. Each one prepared a cylindrical flower vase using card board to gift the inmates. The radius of cylinder is 4.2cm and the height is 11.2 cm.

What is the amount spent for purchasing the card board at the rate of 20 per $100m^2$.

Q.44 Rahul wanted to make a temporary shelter for street dogs, by making a box like structure with tarpaulin that covers all the four sides and the top of the house. How much tarpaulin would be required to make the shelter of height 2.5 m with base dimensions 4m × 3m. Assuming stitching margin is negligible.

Q.45 Twenty Seven solid iron spheres each of radius r and surface area S are melted to form a sphere with surface area S^1. Find the

i) radius R of the new sphere.

ii) ratio of S and S^1.

Q. 46 The diameter of a metallic ball is 4.2cm. What is the mass of the ball, if the density of the metal is 8.9g per cm^3.

Q.47 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 7mm and the diameter of the graphite is 1mm. If the length of the pencil is 14cm. Find the volume of the wood and that of the graphite.

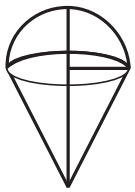
Q.48 A soft drink is available in two packs. (i) a tin can with a rectangular base of length 5cm and width 4cm, having a height of 15cm and (ii) a plastic cylinder with circular base of diameter 7cm and height 10cm. Which container has greater capacity and by how much?

Q.49 A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40cm and height 1m. If the outer side of each of the cone is to be painted and the cost of painting is ₹ 12 per m^2, What will be the cost of painting of all these cones? (Use $\pi = 3.14$ and $\sqrt{1.04} = 1.02$)

Q.50 A sphere of diameter 6cm is dropped in a right circular cylinder vessel partly filled with water. The diameter of the cylindrical vessel is 12cm. If the sphere is completely submerged in water, by how much will the level of water rise in the cylindrical vessel?

Q.51 Marbles of diameter, 1.4cm are dropped into a cylindrical beaker, of diameter 7cm. containing some waters. Find the number of marbles that should be dropped into the beaker, so that the water level rises by 5.6cm.

Q.52 Right circular cylinder having diameter 12cm and height 15cm is full of ice-cream. The Ice-Cream is to be filled in cones of height 12cm and diameter 6cm having a hemispherical shaped on the top. Find the number of such cones which can be filled with Ice-Cream.



Q.53 A toy is in the form of a cone mounted on a hemisphere of diameter 7cm. The total height of the toy is 14.5 cm. Find the volume and the total surface area of the toy. (Take $\pi = \frac{22}{7}$)

Q.54 If h, c and v respectively, are the height, the curved surface and volume of the cone, prove that

$3\pi vh^3 - c^2h^2 + 9v^2 = 0$

Q.55 A wooden box with dimensions 36 cm × 24 cm × 12 cm is 2 cm thick. Find the weight of the wood if density of the wood is 100 gm/m^3.

Q.56 A rectangular reservoir is 210 m long and 75 m wide. Water is flowing into it through a square pipe of side 25 cm such that water rises to 3.5 m in 15 hours. Find the speed of the water.

Q.57 A hemispherical bowl is to be painted from inside at the rate of Rs. 20 per 100 m^2. The total cost of painting is Rs. 30.80. Find

(i) Inner surface area of the bowl.

(ii) Volume of air inside the bowl.

CHAPTER-13
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ANSWERS

1. $512\,cm^2$
2. $180\,cm^2$
3. 20 : 27
4. $550m^2$
5. 4 : 3
6. 28cm
7. $\pi r\left(1+\frac{r}{4}\right)$
8. 2:1
9. 1:4
10. $v=\frac{1}{12}\pi r^3$
11. 2.8 cm
12. 500
13. 2m, 4m, 6m
14. $269.5cm^2$
15. 20cm
16. 6 cm
17. Rs. 555
18. 6 cm
19. $308\ cm^3$
20. $8\ cm^3$
21. $359.33cm^3$
22. 25.7 cm
23. 4.75 m
24. 5000
25. 140 m
26. 72
27. $59.4m^2, 95.04m^2$
28. $4,00,000\ m^2$
30. 51%
31. $\sqrt{6}:\sqrt{\pi}$
32. 3.5cm
33. $79.2\ cm^3$
35. 10cm
36. $5120cm^3$
37. $96\pi cm^3$
38. 9.6cm
39. 9 cm
40. V1 : V2 : V3 = 42:33:11
41. 1.227 m
42. 20 days
43. ₹ 3511.20
44. $47m^2$
45. i) R=3r (ii) S : S^1 = 1: 9
46. 345.39g
47. $5.28cm^3$, $0.11\ cm^3$
48. Plastic Cylinder, $85\ cm^3$
49. ₹ 384.34
50. 1 cm
51. 150
52. 10
53. $231cm^3$, $204.05cm^2$
55. 3968 g
56. 58.8 km/hr
57. (i) $154\ m^2$, (ii) $251.5\ m^3$

PRACTICE TEST

Time : 50 Min. **Surface Areas and Volumes** M.M. 20

1. If l, b and h are the length, breadth and height of a room then what will be the total area of the four walls? (1)

2. The volume of a sphere is 310.4 cm^3. Find its radius. (1)

3. The circumference of the base of a cylinder is 30.8 cm. Its curved surface area is 289.52 cm^2. Find the height of the cylinder (2)

4. The side of a cube is double the length of the cuboid. The breadth and height of the cuboid are half of its length. Find the ratio of the curved surface area of cube to cuboid. (2)

5. The seed of a corn has dimensions 1.8 cm × 0.8 cm × 0.2 cm. The height of the corn-tube is 13.7 cm and its radius is 4.2 cm. Assuming that the corn-seeds have negligible distance between them and all seeds are of same size, find the number of seeds on the corn-tube. (3)

6. The length, breadth and height of a cuboid are increased by 30%. Find the percent increase in the total surface area. (3)

7. Ajay prepared a dish and kept it in a hemispherical bowl of 30 cm diameter. He distributed the dish in cylinder cups of diameter 15 cm and height 4 cm. among his friends and himself. How many friends were with Ajay? (4)

8. A river 15 m deep 50 m wide is flowing at the rate of 2 cm per second. How many litres of water will fall from the river into the sea in 9 hours? (4)