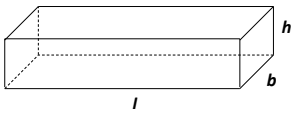
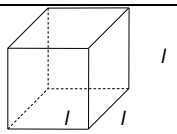
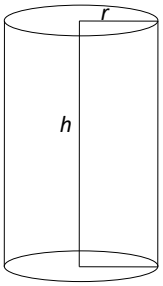
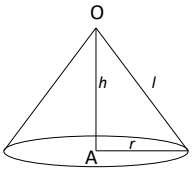
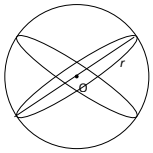
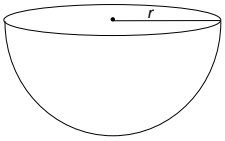
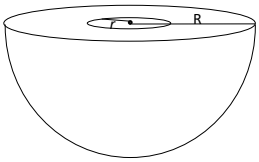
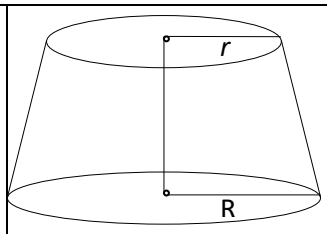
CHAPTER 13

Surface Areas and Volumes

S. No.	Name	Figure	Lateral/curved surface area	Total surface area	Volume	Nomenclature
1.	Cuboid		$2(l+b)\times h$	$2(lb + bh + hl)$	$l\times b\times h$	l =length b =breadth h =height
2.	Cube		$4l^2$	$6l^2$	l^3	l = edge of cube
3.	Right circular cylinder		$2\pi rh$	$2\pi r\ (h + r)$	$\pi r^2 h$	r = radius h = height
4.	Right circular cone		πrl	$\pi r\ (l + r)$	$\frac{1}{3}\pi r^2 h$	r = radius of base h = height l = slant height $=\sqrt{r^2+h^2}$
5.	Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$	r = radius of the sphere
6.	Hemisphere		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$	r = radius of the sphere
7.	Spherical shell		$2\pi\left(\mathrm{R}^2 + r^2\right)$	$3\pi R^2 - \pi r^2$	$\frac{4}{3}\pi\left(\mathrm{R}^3 - r\right.$	R = external radius r = internal radius

8.	Frustum of cone		$\pi(\mathrm{R}+r)$, where $l^2=h^2+(\mathrm{R}-r)^2$	$\pi\left[\mathrm{R}^2+r^2+l(\mathrm{R}+r)\right]$	$\frac{\pi h}{3}(R^2+r^2+Rr)$	R and r = radii of the base h = height l = slant height
9.	Diagonal of cuboid $=\sqrt{l^2+b^2+h^2}$					

SECTION A (1 Mark each)

I. (MCQ)

1. A cone of height 24cm and radius of base 6 cm is made up of modeling clay, find volume of cone to the nearest cm^2
a) 900 cm^2 b) 905 cm^2 c) 915 cm^2 d) 925 cm^2

2. The length, breadth and height of a room are 5 m, 4 m, and 3 m respectively. find the area of 4 walls and ceiling.
a) 72 cm^2 b) 74 cm^2 c) 64 cm^2 d) 76 cm^2

3. The volume of a cube is 5832 cm^2. Find the edge.
a) 16cm b) 18cm c) 28cm d) 26cm

4. In a box whose dimensions are 12 cm × 4 cm × 3 cm, how long stick can be placed?
a) 12cm b) 13cm c) 23cm d)14cm

5. Find the volume of the cylinder whose height is 12 cm and radius is 5 cm to the nearest cm^3.
a) 912 cm^3 b) 942 cm^3 c) 943 cm^3 d) 940 cm^3

6. If the lateral surface of a cylinder is 94.2 cm^2 and height is 5 cm, then find radius of its base.
(π = 3.14cm)
a) 4cm b) 3cm c) 3.5cm d) 2.5cm

7. The base of two right circular cones of the same height are 3:5. Find the ratio of their volumes.
a) 3:5 b) 9:25 c) 3:4 d) 9:5

8. The height of a right circular cone is 12 cm and the radius of its base is 9 cm. find the slant height.
a) 15cm b) 25cm c) 14cm d) 16cm

9. A conical military tent is the diameter of the base is 24 m and slant height of the tent is 13 m, find the curved surface area of the cone.
a) 3412/7 cm^2 b) 3432/7 cm^2 c) 3423/7 cm^2 d) 3425/7 cm^2

10. A joker's cap is in the form of right circular cone of base radius 7 cm and the slant height is 25 cm. Find the area of the sheet required to make the cone.
a) 540 cm^2 b) 550 cm^2 c) 515 cm^2 d) 525 cm^2

11. The radius of the sphere is 6 cm. Find the volume of sphere to nearest cm^3.
a) 906cm^3 b) 905 cm^3 c) 915 cm^3 d) 904 cm^3

12. 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid.
a) 162cm^2 b)160 cm^2 c) 164 cm^2 d) 116 cm^2

13. Find the radius of the sphere whose surface area is 154 cm^2.
a) 3cm b) 3.5cm c) 4.5cm d) 4cm

14. A wooden box of dimensions 8m × 6m × 7m has to carry rectangular boxes of dimensions
8cm × 6cm × 7cm. Find how many such boxes can be carried.
a) 1000 b) 10000 c) 1000000 d) 100

15. Radius of a cylinder is 14cm and height is 12cm. Find the C.S.A of the cylinder.
a) 1056 cm^2 b) 1059 cm^2 c) 1016 cm^2 d) 1025 cm^2

II. (Fill in the blank)

16. The volume of a hemisphere is _____ the volume of a cylinder if its height and radius is same as that of the cylinder.

17. Solid figures are _____ while plane figures are _____.

18. A circle is revolved about any of its diameters, hollow _____ is generated.

19. If the radius of a sphere is halved, its volume becomes _____ time the volume of original sphere.

20. The volume and surface area of a sphere are numerically equal, then the radius of sphere is _____ units.

21. In a right circular cone, the cross section made by a plane parallel to the base is a _____.

22. _____ is measured in square units and _____ is measured in cubic units.

III. (VSAQ)

23. A cylinder, a cone and a hemisphere are of equal base and have the same height. What is the ratio in their volumes?

24. Volume and surface area of a solid hemisphere are numerically equal. What is the diameter of hemisphere?

25. Two cubes have their volumes in the ratio 1: 27. Find the ratio of their surface areas.

26. The slant height of the frustum of a cone is 5cm. If the difference between the radii of its two circular ends is 4cm, write the height of the frustum.

27. An iron solid sphere of radius 3cm is melted and recast into small spherical balls of radius 1cm each. Assuming that there is no wastage in the process, find the number

of small spherical balls made from the given sphere.

28. A solid ball is exactly fitted inside the cubical box of side *a*. Find the volume of the ball.

29. An open metallic bucket is in the shape of a frustum of a cone mounted on a hollow cylindrical base made of the same metallic sheet. Write the formula to find surface area of the metallic sheet used.

30. The radii of two cones are in the ratio 2: 3 and their volumes in the ratio 1: 3. Find the ratio of their heights.

31. A solid piece of iron in the form of a cuboid of dimension 49 cm × 33 cm × 24 cm is melted to form a solid sphere. Find the radius of sphere.

32. A mason constructs a wall of dimensions 270 cm × 300 cm × 350 cm with the bricks each of size 22.5 cm × 11.25 cm × 8.75 cm and it is assumed that $\frac{1}{8}$ space is covered by the mortar. Find the number of bricks used to construct the wall.

SECTION B [2 marks each]

33. An underground water tank is in the form of a cuboid of edges 48m, 36m and 28m. Find the volume of the tank.

34. A cylinder of radius 12cm contains water to a depth of 20 cm. A spherical iron ball is dropped into the cylinder and thus the level of water is raised by 6.75₹. Find the radius of the ball. (Π = 22/7)

35. The volume of a cube is 1728cm³. Find its edge and surface area.

36. A conical vessel whose internal radius is 5cm and height 24 cm is full of water. The water is emptied in a cylindrical vessel with inner radius 10 cm. Find the height to which water rises in the cylinder.

37. The diameter of a solid hemispherical toy is 7cm. Find its total surface area.

38. The length of a cold storage is double its breadth. Its height is 3m. The area of its four walls is 108 m^2. Find its length.

SECTION C[3 marks each]

39. The height of a cone is 5m. Find the height of another cone whose volume is 16 times its volume and radius equal to its diameter.

40. In a marriage ceremony a conical tent was built in such a way that it can accommodate 150 persons. If each person has $4m^2$ of the space on the ground and $20m^3$ of air to breathe. What should be the height of the conical tent.

41. From a solid cylinder of height 2.4cm and diameter 1.4cm a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest cm^2 .

42. 50 circulars plates, each of radius 7cm and thickness ½ cm are placed, one above the other to form a solid right circular cylinder. Find the total surface area and volume of the cylinder.

43. Water is flowing at the rate 3km/hr through a circular pipe of 20cm diameter into circular cistern of diameter 10m and depth 2m. In how much time will the cistern be filled?

SECTION D [4 marks each

44. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is 1/27 th of the given cone, at which height above the base is the section made.

45. A bucket of height 8 cm and made up of copper sheet is in the form of a frustum of a right circular cone with the radii of its lower and upper ends as 3 cm and 9 cm respectively. Calculate the

i) height of the cone of which the bucket is a part.

ii) volume of water which can be filled in the bucket.

iii) area of the copper sheet required to make the bucket.

46. A solid wooden toy is in the form of a cone mounted on a hemisphere. If the radius of the hemisphere and that of the base of the cone be 4.2 cm and the total height of the toy is 10.2 cm, find the volume of the wood used in the toy.

47. A circus tent is made of canvas and is in the form of a right circular cylinder and a right circular cone above it. The diameter and height of the cylindrical part of the tent are 126 m and 5 m respectively. The total height of the tent is 21 m. Find the total cost of the tent if the canvas used costs Rs.12 per m^2.

48. A toy is in the shape of a right circular cylinder with a hemisphere on one end and a cone on the other. The radius and height of the cylindrical part are 5 cm and 13 cm respectively. The radii of the hemispherical and conical parts are the same as that of the cylindrical part. Find the surface area of the toy, if the total height of the toy is 30 cm.

49. The diameters of the internal and external surfaces of a hollow spherical shell are 10 cm and 6 cm respectively. If it is melted and recast into a solid cylinder of height 2 ⅔ cm, find the diameter of the cylinder.

50. A rectangular reservoir is 120 m long and 75 m wide. At what speed per hour must water flow into it through a square pipe of 20 cm wide so that the water rises by 2.4 m in 18 hours?

ANSWERS

1) 905 cm^2 2) 74cm^2 3) 18 cm 4) 13cm 5) 943 cm^3 6) 3cm 7) 110 cm^2

8) 15 cm 9) $\frac{3432}{7}$ m^2 10) 550 cm^2 11) 905 cm^2 12) 160 cm^2 13) 3.5cm

14) 1000000 15) 1056 cm^2 16) two-third 17) 3D, 2D 18) sphere

19) one-eighth 20) 3 21) circle 22) area; volume 23) 3: 1: 2

24) 6 units 25) 1: 9 26) 48 cm^2 27) twenty-seven 28) $\frac{4}{3}\pi a^3$

29) CSA of (frustum of cone + cylinder) + area of circular base 30) 3: 4

31) 21 cm 32) 11,200 33) 48384 m^3 34) 9cm 35) 12cm, 864cm^2

36) 2cm 37) 115.50cm^2 38) 12m 39) 20m 40) 15m 41) 18cm^2

42) 1408 cm^2 , 3850 cm^3 43) 1hr 40min. 44) 20cm 45 i) 12cm ii) 312π cm^3

iii) 405.43 cm^2 46) 266.11 cm^3 47) Rs.178200 48) 770 cm^2 49) 14cm

50) 30 km/hr.

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