chapter 12

Surface Areas and Volumes

Previous Years Questions

12.1 Introduction

MCQ

1. The curved surface area of a cone having height 24 cm and radius 7 cm, is
   (a) 528 cm^2
   (b) 1056 cm^2
   (c) 550 cm^2
   (d) 500 cm^2

   (2023)

2. Curved surface area of a cylinder of height 5 cm is 94.2 cm^2. Radius of the cylinder is (Take $\pi = 3.14$)
   (a) 2 cm
   (b) 3 cm
   (c) 2.9 cm
   (d) 6 cm

   (2023)

3. A solid spherical ball fits exactly inside the cubical box of side $2a$. The volume of the ball is
   (a) $\frac{16}{3}\pi a^3$
   (b) $\frac{1}{6}\pi a^3$
   (c) $\frac{32}{3}\pi a^3$
   (d) $\frac{4}{3}\pi a^3$

   (2020 C)

4. The radius of a sphere (in cm) whose volume is $12\pi cm^3$, is
   (a) 3
   (b) $3\sqrt{3}$
   (c) $3^{2/3}$
   (d) $3^{1/3}$

   (2020)

5. A rectangular sheet of paper 40 cm × 22 cm, is rolled to form a hollow cylinder of height 40 cm. The radius of the cylinder (in cm) is
   (a) 3.5
   (b) 7

(c) $\frac{80}{7}$

(d) 5

(Foreign 2014)

VSA (1 mark)

6. Two cones have their heights in the ratio $1:3$ and radii in the ratio $3:1$. What is the ratio of their volumes?

   (2020)

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

   (Delhi 2017)

SA I (2 marks)

8. How many cubes of side 2 cm can be made from a solid cube of side 10 cm ?

   (2020)

9. A cone and a cylinder have the same radii but the height of the cone is 3 times that of the cylinder. Find the ratio of their volumes.

   (2020)

10. If the total surface area of a solid hemisphere is 462 cm^2, find its volume. [Take $\pi = \frac{22}{7}$]

    (AI 2014)

SA II (3 marks)

11. The radius of the base and the height of a solid right circular cylinder are in the ratio $2:3$ and its volume is 1617 cm^3. Find the total surface area of the cylinder. [Take $\pi = \frac{22}{7}$]

    (Term II, 2021-22C)

12. A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap?

    (2018)

13. The sum of the radius of base and height of a solid right circular cylinder is 37 cm. If the total surface area of the cylinder is 1628sq. cm, find the volume of the cylinder. (Use $\pi = \frac{22}{7}$)

    (Delhi 2016)

14. A right circular cone of radius 3 cm, has a curved surface area of 47.1 cm^2. Find the volume of the cone. (Use $\pi = 3.14$)

    (Delhi 2016)

15. A 5 m wide cloth is used to make a conical tent of base diameter 14 m and height 24 m. Find the cost of cloth used at the rate of ₹25 per metre. [Use $\pi = \frac{22}{7}$]

    (Foreign 2014)

LA (4/5 / 6 marks)

16. **Case Study:** John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items they decided the following dimensions:

    Cake: Cylindrical shape with diameter 24 cm and height 14 cm.

    Cap: Conical shape with base circumference 44 cm and height 24 cm.

    Based on the above information answer the following questions.

    (a) How many square cm paper would be used to make 4 such caps?

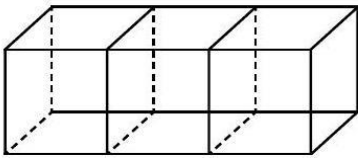
    (b) The bakery shop sells cakes by weight 0.5 kg, 1 kg, 1.5 kg, etc.). To have the required dimensions how much cake should they order if 650 cm^3 equals 100 g of cake?

    (Term II, 2021-22)

12.2 Surface Area of a Combination of Solids

SA II (3 marks)

17. Three cubes of side 6 cm each, are joined as shown in given figure. Find the total surface area of the resulting cuboid.

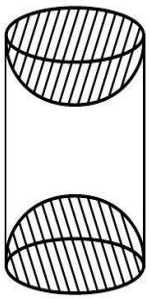


(Term II, 2021-22)

18. Two cones with same base diameter 16 cm and height 15 cm are joined together along their bases. Find the surface area of the shape so formed.

    (2019 C)

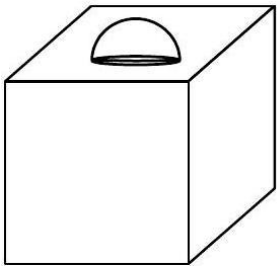
19. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm. Find the total surface area of the article.



(NCERT, 2018)

20. In the given figure, there is a decorative block, made up of two solids - a cube and a hemisphere. The base of the block is a cube of side 6 cm and the hemisphere fixed on the top has a diameter of 3.5 cm. Find the total surface area of the

    block. (Use $\pi = \frac{22}{7}$)

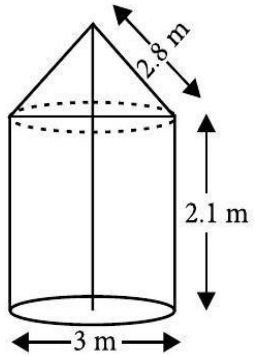


(Delhi 2016)

21. A toy is in the form of a cone of base radius 3.5 cm mounted on a hemisphere of base diameter 7 cm. If the total height of the toy is 15.5 cm, find the total surface area of the toy. (Use $\pi = \frac{22}{7}$)

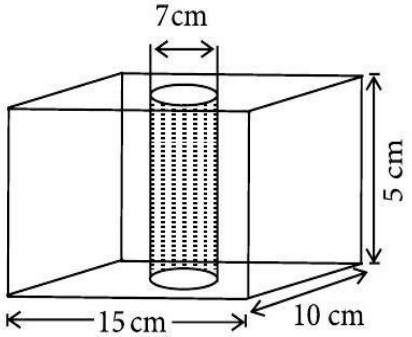
    (Delhi 2016)

22. In the given figure, a tent is in the shape of a cylinder surmounted by a conical top of same diameter. If the height and diameter of cylindrical part are 2.1 m and 3 m respectively and the slant height of conical part is 2.8 m, find the cost of canvas needed to make the tent if the canvas is available at the rate of ₹500/sq. metre. (Use $\pi = \frac{22}{7}$)



(AI 2016)

23. In the given figure, from a cuboidal solid metallic block, of dimensions 15 cm × 10 cm × 5 cm, a cylindrical hole of diameter 7 cm is drilled out. Find the surface area of the remaining block. [Use $\pi = \frac{22}{7}$]



(Delhi 2015)

24. Due to sudden floods, some welfare associations jointly requested the government to get 100 tents fixed immediately and offered to contribute 50% of the cost. If the lower part of each tent is of the form of a cylinder of diameter 4.2 m and height 4 m with the conical upper part of same diameter but of height 2.8 m, and the canvas to be used costs ₹ 100 per sq. m, find the amount, the associations will have to pay. What values are shown by these associations? [Use $\pi = \frac{22}{7}$]

(Al 2015)

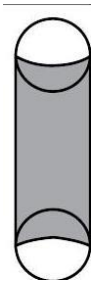
25. A cubical block of side 10 cm is surmounted by a hemisphere. What is the largest diameter that the hemisphere can have? Find the cost of painting the total surface area of the solid so formed, at the rate of ₹ 5 per 100 sq. cm [Use $\pi = 3.14$].

(Al 2015)

LA (4/5 / 6 marks)

26. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in the figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.

    (2023)



27. **Case Study:** A 'circus' is a company of performers who put on shows of acrobats, clowns etc. to entertain people started around 250 years back, in open fields, now generally performed in tents.

    One such 'Circus Tent' is shown below.

    The tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of cylindrical part are 9 m and 30 m respectively and height of conical part is 8 m with same diameter as that of the cylindrical part, then find

    (i) the area of the canvas used in making the tent.

    (ii) the cost of the canvas bought for the tent at the rate ₹200 per sq. m, if 30 sq. m canvas was wasted during stitching.

    (Term II, 2021-22)

28. From a solid cylinder of height 2.8 cm and diameter 4.2 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [Take $\pi = \frac{22}{7}$]
    (Delhi 2014)

29. A hemispherical depression is cut out from one face of a cubical block of side 7 cm, such that the diameter of the hemisphere is equal to the edge of the cube. Find the surface area of the remaining solid.

[Use $\pi = \frac{22}{7}$]

(Foreign 2014)

12.3 Volume of a Combination of Solids

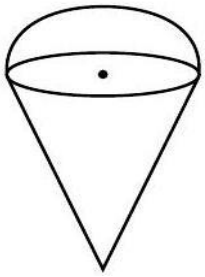
SA II (3 marks)

30. A room is in the form of cylinder surmounted by a hemi-spherical dome. The base radius of hemisphere is one-half the height of cylindrical part. Find total height of the room if it contains

$$\left(\frac{1408}{21}\right) \text{m}^3 \text{ of air. } \left(\text{ Take } \pi = \frac{22}{7}\right)$$

31. An empty cone is of radius 3 cm and height 12 cm. Ice-cream is filled in it so that lower part of the cone which is $\left(\frac{1}{6}\right)^{\text{th}}$ of the volume of the cone is unfilled but hemisphere is formed on the top. Find volume of the ice-cream.

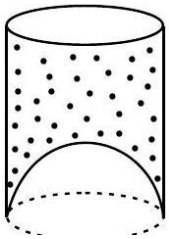
(Take $\pi = 3.14$)



32. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid. (Use $\pi = \frac{22}{7}$)

(2019)

33. A juice seller was serving his customers using glasses as shown in the given figure. The inner diameter of the cylindrical glass was 5 cm but bottom of the glass had a hemispherical raised portion which reduced the capacity of theglass. If theheight of theglasswas 10



cm, find the apparent and actual capacity of the glass. (Use $\pi = 3.14$)

(NCERT, Al 2019)

34. A cylindrical tub, whose diameter is 12 cm and height 15 cm is full of ice-cream. The whole ice-cream is to be divided into 10 children in equal ice-cream cones, with conical base surmounted by hemispherical top. If the height of conical portion is twice the diameter of base, find the diameter of conical part of ice-cream cone.

(Foreign 2017)

35. A solid wooden toy is in the form of a hemisphere surmounted by a cone of same radius. The radius of hemisphere is 3.5 cm and the total wood used in the making of toy is $166\frac{5}{6}$ cm^3. Find the height of the toy. Also, find the cost of painting the hemispherical part of the toy at the rate of $10 per cm^2$. [Use $\pi = \frac{22}{7}$]

(Delhi 2015)

36. A metallic cylinder has radius 3 cm and height 5 cm. To reduce its weight, a conical hole is drilled in the cylinder. The conical hole has a radius of $\frac{3}{2}$ cm and its depth is $\frac{8}{9}$ cm. Calculate the ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape.

(Foreign 2015)

37. A solid right-circular cone of height 60 cm and radius 30 cm is dropped in a right-circular cylinder full of water of height 180 cm and radius 60 cm. Find the volume of water left in the cylinder, in cubic metres. [Use $\pi = \frac{22}{7}$]

(Foreign 2015)

38. The largest possible sphere is carved out of a wooden solid cube of side 7 cm. Find the volume of the wood left. [Use $\pi = \frac{22}{7}$]

(Al 2014)

LA (4/5 / 6 marks)

39. Water is being pumped out through a circular pipe whose internal diameter is 8 cm. If the rate of flow of water is 80 cm/s, then how many litres of water is being pumped out through this pipe in one hour?

    (2021 C)

40. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form a platform. Find the height of the platform. (Take $\pi = \frac{22}{7}$)

    (2020 C)

41. In Figure-4, a solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. (Take $\pi = 3 \cdot 14$)

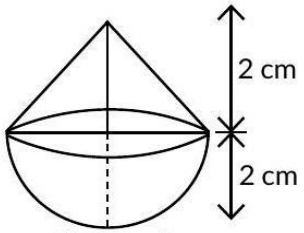


Figure - 4

    (2020 C)

42. A solid toy is in the form of a hemisphere surmounted by a right circular cone of same radius. The height of the cone is 10 cm and the radius of the base is 7 cm. Determine the volume of the toy. Also find the area of the coloured sheet required to cover the toy.

    (Use $\pi = \frac{22}{7}$ and $\sqrt{149} = 12.2$)

    (2020)