MATHS

BOOKS - MBD

Surface Areas And Volumes

Example

1. 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid.

2. A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.

3. A toy isin the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

4. A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have ? Find the surface area of the solid.

5. A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter l of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.
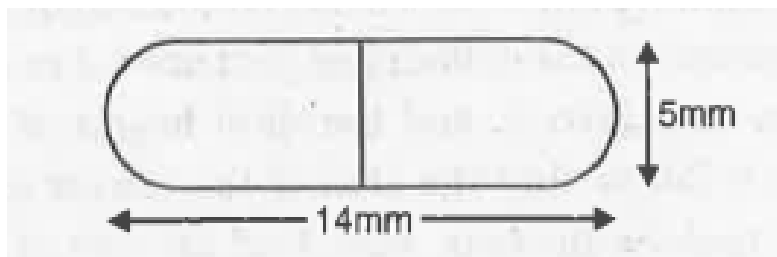
6. A medicine capsule isin the shape of a cylinder with twohemispheresstuck to each of

its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area.

7. A tent is in the shape of a cylinder surmounted by a conical top.If the height and diameter of the cylindrical part are 2.1m and 4 m respectively, and the slant height of the top

is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per m^2 (Note that the base of the tent will not be covered with canvas.)

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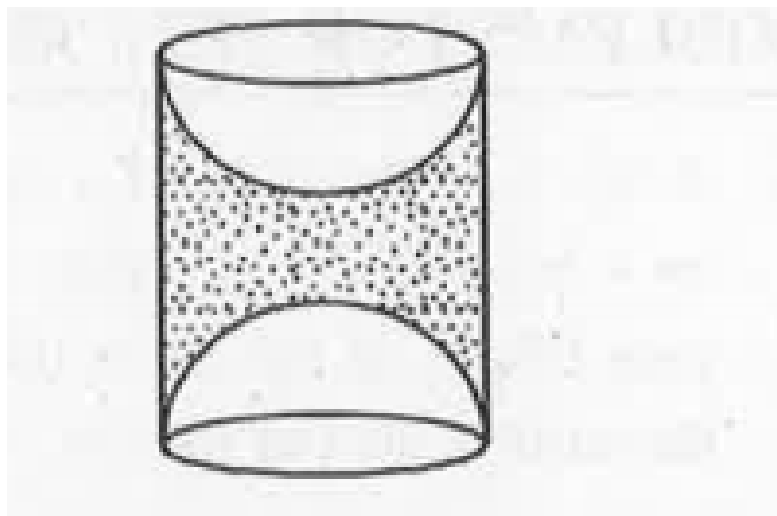
Find the total surface area of the remaining solid to the nearest cm^2.

9. A wooden article was made by scooping out a hemisphere form each end of a solid cylinder, as shown in Fig. If the height of the cylinder is 10cm and its base radius 3.5cm find

the total surface area of the article.

10. A metallic sphere of radius 4.2 cm is melted

and recast into the shape of cylinder of radius

6 cm. Find the height of the cylinder.

11. Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.

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12. A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread

out to form platform of 22 m by 14 m. Find the height of the platform.

13. 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 an embankment. Find the height of the embankment.

14. A container shaped like a right circular cylinder having diameter 12 cm and hight 15 cm isfull of ice-cream. The ice cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice-cream.

15. How many silver coins 1.75 cm in diameter and of thickness 2 mm, must be melted to

form a cuboid of dimensions $5.5cm \times 10cm \times 3.5cm$?

16. A cylindrical bucket, 32 cm high and with radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.

17. Water in a canal 6 m wide and 1.5 m deep is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed ?

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18. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in her field, which is 10 m in diameter and 2m deep.If water flowsthrough the pipe at the

rate of 3 km/h, in how much time will the tank be filled ?

19. A drinking glass is in the shape of a frustum of a cone of height 14 cm. The diameters of its two circular ends are 4 cm and 2 cm. Find the capacity of the glass.

20. The slant height of a frustum of a cone is 4 cm and the perimeters (circumference) of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

21. A fez, the cap used by the Turks, is shaped like the frustum of a cone.If its radius on the open side is 10 cm, radius at the upper base is 4 cm and its slant height is 15 cm, find the area

of material used for making it.
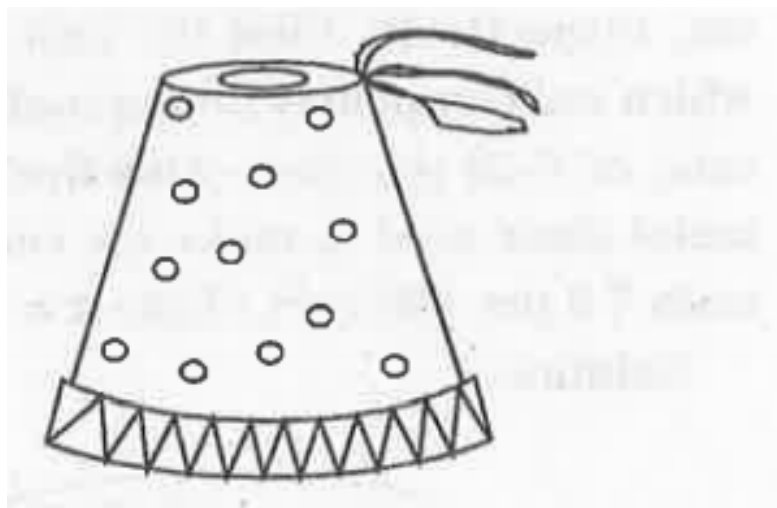
22. A container opened from the top is made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm,

respectively. Find the cost of the milk which can completely fill the container, at the rate, of Rs 20 per litre. Also find the cost of metal sheet used to make the container, if it costs Rs 8 per 100 cm^2. (Take π = 3.14.)

23. A cylindrical road-roller made of iron is 1 m long. Its internal diameter is 54 cm and the thikcness of the iron sheet used in making the

rolleris 9cm. Find the mass of the roller, if 1 cm^3 iron has 7.8 g mass. (Use π = 3.14)

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24. If the radii of the ends of a buckets 45 cm high are 28 cm and 7 cm , determine its capacity and surface area.

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25. 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 be $\frac{1}{27}$ of the volume of the given cone, at what height above the base is the session made?

26. 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 be $\frac{1}{64}$ of the volume of

given cone, at what height above the base is the section made?

27. If the radii of the ends of a bucket 54 cm high are 28 cm and 14 cm, determine its capacity and the surface area.

28. A right circular cone is cut by two planes parallel to the base and trisecting the height. Compare the volumes of three parts into which the cone is divided.

29. A solid cone of base radius t 10 cm is to be cut into two parts through the mid point of its height , by a plane parallel to the base. Find

the ratio in the volume of two parts of the cone

30. A lampshade is made by cutting the top of a hollow cone by a plane parallel to its base. The radii of the top and the base of the shade are 4 cm and 12 cm and the height of the shade is 6 cm. Find the area of the curved surface of the lampshade.

31. The perimeters of the ends of a frustum of a right circular cone are 44 cm and 33 cm. If the height of the frustum be 16 cm , find its volume, the slant surface and the total surface

32. A container made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8

cm and 20 cm respectively. Find the cost of the metal sheet used, if it costs Rs 5 per 100 cm2.

33. A copper wire 3 mm in diameter is wound about a cylinder whose length is 12 cm, and diameter 10 cm,so as to cover the curved surface of the cylinder. Find the length and mass of the wire, assuming the density of copper to 8.88 g per cm^3.

34. A right triangle, whose sides are 3cm and 4cm (other than hypotenuse)ismade to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Choose value of π as found appropriate.)

35. A cistern, internally measuring $150cm \times 120cm \times 110cm$, has 129600 cm^3 of

water in it. Porous bricks are placed in the water until the cistern isfull to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without the water overflowing, each brick being $22.5cm \times 7.5cm \times 6.5cm$?

36. In one for night of a given month, there was a rainfall of 10 cm in a river valley. If the area of the valley is 97280 km^2, show that the

total rainfall was approximately equivalent to the addition to the normal water of three rivers each 1072 km long, 75 m wide and 3 m deep.

37. An oil funnel made of tin sheet consists of a cylindrical portion 10 cm long attached to a frustum of a cone. If the total height is 22 cm, diameter of the cylindrical portion is 8 cm and the diameter of the top of the funnel is 18 cm,

find the area of the tin sheet required to make the funnel.
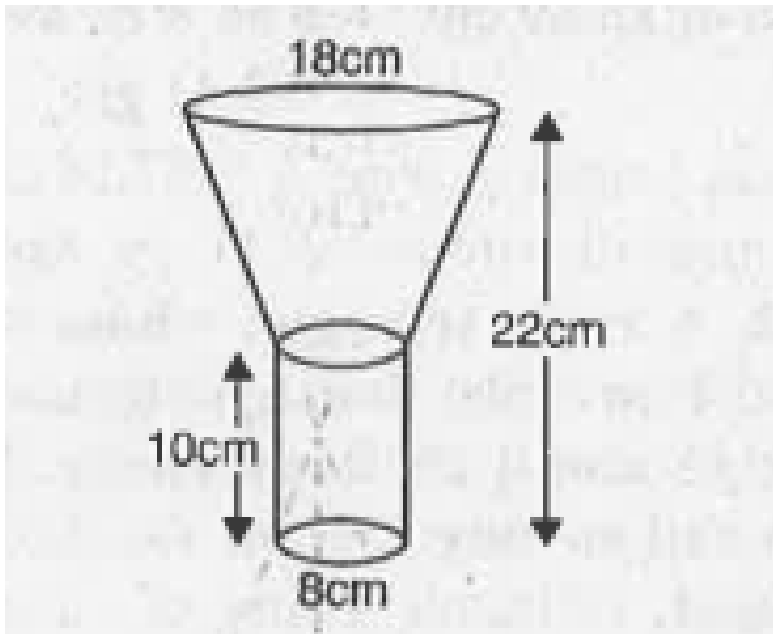
38. Derive the formula for the curved surface area and total surface area of a frustum of

acone, given to youinSection 13.5, using the symbols as explained.

39. Write the formula for volume of the frustum of the Cone

40. The formula for finding the surface area of the sphere is $\dfrac{4}{3}\pi^3$

41. Write the formula for volume of the frustum of the Cone

42. Write the formula to find the curved surface area of a cone

43. Find the volume of a cube with edge 6 cm

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44. Find the volume of a cube with edge 8 cm.

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45. Write the formula to find volume of a cylinder with radius 'r' and height 'h'.

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46. Write the formula to find and volume of a cone with radius 'r' and height 'h'.

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47. Write the formula to find the curved surface area of a cylinder with radius 'r' and height 'h'.

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48. Find the volume of sphere whose radius is

3 cm

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49. Find the volume of sphere whose radius is

21 cm

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50. Find the surface area of sphere whose

radius is 3 cm.

51. The length, breadth and height of the hall is 14m, 9m and 7m respectively. Find the area of the floor

52. The length, breadth and height of the hall is 15 m, 9 m and 7 m respectively. Find the area of the floor.

53. The length, breadth and height of the hall is 16 m, 9 m and 7 m respectively. Find the area of the floor.

54. Write the formula to find the volume of cuboid.

1. A toy is in the form of a cone mounted on a hemisphere of radius 3.5 cm. The total height of the toy is 15.5 cm. Find the surface area of the toy

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2. A solid cylinder of diameter 12 cm and height 15 cm is melted and recast into 12 toys in the shape of a right circular cone mounted

on a hemisphere. Find the radius of the hemisphere and total height of the toy, if height of the cone is three times the radius.

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

4. The volume of a cube is $1728 cm^3$. Find its edge and surface area.

5. The diameter of the base of a right circular cylinder is 28 cm and its height is 21 cm. Find its curved surface area

6. The diameter of the base of a right circular cylinder is 28 cm and its height is 21 cm. Find its total surface area

7. The diameter of the base of a right circular cylinder is 28 cm and its height is 21 cm. Find its volume.

8. The curved surface area of a right circular cone is 12320 cm^2. If the radius of its base is 56 cm, find its height.

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9. Find the volume and the surface area of a metallic sphere having diameter 8.4 cm

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10. The internal and external diameters of a hollow hemisphere vessel are 42 cm and 45.5 cm respectively. Find its capacity and also its outer curved surface area.

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11. The radius of a solid hemispherical toy is 3.5 cm. Find its total surface area.

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12. A hemisphere, the diameter of whose base is equal to the side of a cube, is placed upon the upper face of the cube. If the side of the cube is 14 cm, find the total surface area of the solid combination.

13. The side of a cube is 21 cm. A hemisphere whose base diameter is equal to the side of the cube is scooped out from one of the faces.

Find the total surface area of the solid so obtained

14. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the surface area of the solid.

15. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius.. Find the volume of the solid in terms of π.

16. Rachel, an engineering student, was asked to make a model shaped like a cyclinder. with two cones attached at its two ends by using a

thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model the Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)

17. A gulab jamun, containssugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab

jamuns, each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm.
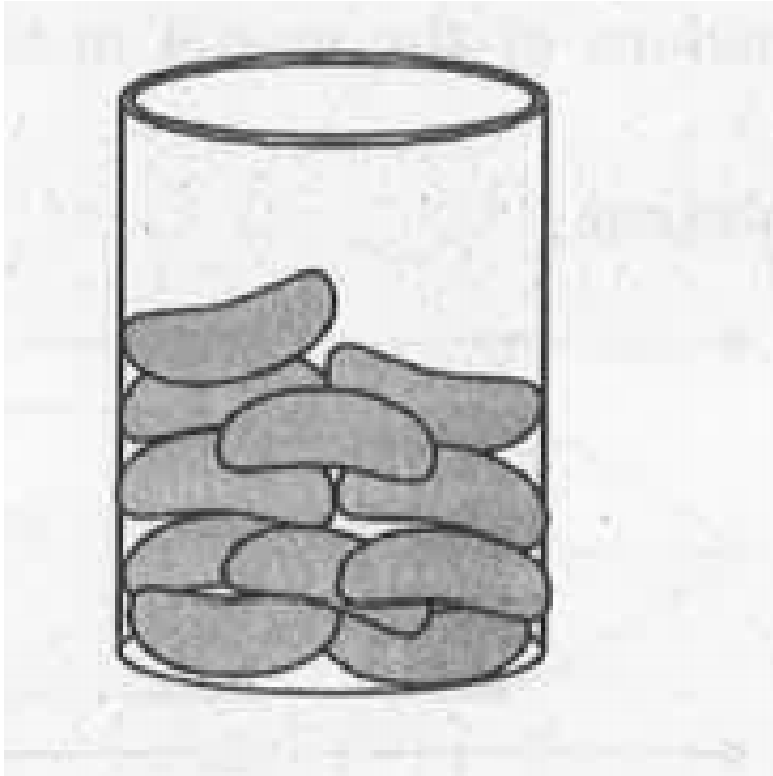
18. A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand.
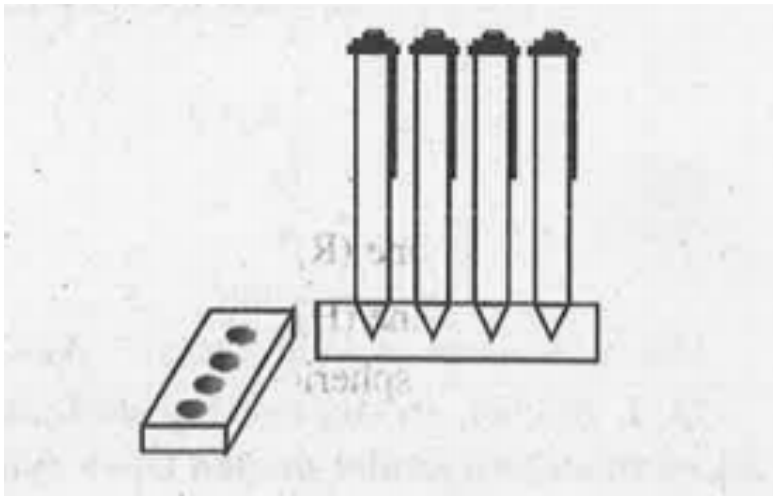
19. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out.Find the number of lead shots dropped in the vessel.

20. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass. (Use π = 3.14)

21. A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a

hemisphere of radius 60 cm is placed uprightina right circular cylinder full of water such that it touches the bottom..Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm

22. A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter, the diameter of the spherical part is 8.5 cm. By measuring

the amount of water it holds, a child finds its volume to be $345cm^3$. Check whether she is correct, taking the above as the inside measurements, and π = 3.14.

23. A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 4.2 cm and the total height of the toy is 10.2 cm, find the volume of the wooden toy.

24. A circus tent is cylindrical upto a height of 3 m and conical above it. If the diameter of the base is 105 m and the slant height of the conical part is 53 m, find the total cost of the canvas used to make the tent when the cost per square metre of the canvas is ? 10.

25. A tent is the form of a cylinder of diameter 15 m and height 2.4 m, surmounted by a cone of equal base and height 4 m. Find the capacity of the tent and the cost of the canvas at Rs. 50 per square metre.

26. The interior of a building is in the form of a right circular cylinder of diameter 4.2 m and height 4 m, surmounted by a cone. The vertical

height of the cone is 2.1 m. Find the outer surface area and volume of the building.

27. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the surface area of the solid.

28. A solid is composed of a cylinder with hemispherical ends. If the whole length of the solid is 108 cm and the diameter of the hemispherical ends is 36 cm, find the cost of polishing the surface of the solid at the rate of 10 paise per cm^2.

29. A well of diameter 2 m is dug 14 m deep. The earth taken out of it is spread evenly all

around it to a width of 5 m do form an embankment. Find the height of the embankment.

30. 50 circular plates each of radius 7 cm and 1 thickness $\frac{1}{2}$ cm are placed one above another to form a solid right circular cylinder. Find the total surface area and volume of the cylinder so formed.

31. A sphere of diameter 5 cm is dropped into a cylindrical vessel partly filled with water. The diameter of the base of the vessel is 10 cm. If the sphere is completely submerged, by how much will the level of water rise ?

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32. 500 persons took dip in a rectangular tank which is 80 m long and 50 m broad. What is the rise in the level of water in the tank. If the

average displacement of water by a person is $0.04m^3$?

33. A hemispherical bowl of internal radius 9 cm is full of liquid. This liquid is to filled into cylindricalshaped small bottles each of diameter 3 cm and height 4 cm. How many bottles are necessary to empty the bowl ?

34. Water flows out through a circular pipe, whose internal diameter is 2 cm, at the rate of 0.7 m per second into a cylindrical tank, the radius of whose base is 40 cm. By how much will the level of water rise in half an hour ?

35. The rain water from a roof $22m \times 20m$ drains into a cylindrical vessel having diameter of base 2 m and height 3.5 m. If the vessel is just full, find the rainfall in cm

36. A hollow sphere of internal and external diameters 4 cm and 8 cm respectively is melted into a cone of base diameter 8 cm. Find the height of the cone.

37. The diameter of a copper sphere is 6 cm. The sphere is melted and is drawn into a long

wire of uniform circular cross section. If the length of the wire is 36 cm, find its radius.

38. A sphere of radius 8 cm is melted and recast into a right circular cone of height 32 cm. Find the radius of the base of the cone

39. A metallic sphere of radius 10.5 cm is melted and then recast into small cones, each of radius 3.5 cm and height 3 cm. Find how many cones are obtained ?

40. A solid sphere of radius 3 cm is melted and then recast into small spherical balls each of diameter 0.6 cm. Find the number of small balls thus obtained.

41. Three solid glass balls of radii 1 cm, r cm and 8 cm are melted into a solid sphere of radius 9 cm, Determine the value of r.

42. The internal and external radii of a hollow sphere are 3 cm and 5 cm respectively. The sphere is melted to form a solid cylinder of

height $2\dfrac{2}{3}$ cm . find the diameter and curved surface area of the cylinder.

43. The base radius and height of a right circular solid cone are 2 cm and 8 cm respectively. It is melted and recast into spheres of diameter 2 cm each. Find the number of spheres so formed.

44. The internal and external diameters of a hollow hemispherical shell are 6 cm and 10 cm respectively.It is melted and recast into a solid cone of base diameter 14 cm. Find the height of the cone so formed

45. The sum of the radius of the base and the height of a solid cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 cm^2, find the volume of the cylinder.

46. A cylindrical water tank of diameter 2.8 m and height 4.2 m is being fed by a pipe of diameter 7 cm through which water flows at the rate of 4 m/s. Calcuate in minutes the time it takes to fill the tank.

47. The volumes of a sphere and a right circular cylinder are equal and the diameter of the sphere equalsthe dianieter of the base of the cylinder. Determine the height of the cylinder in terms of the diameter of the sphere.

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48. Lead spheres of diameter 6 cm are dropped into a cylindrical beaker containing

some water and are fully submerged. If the diameter of the beaker is 18 cm and water rises by 40 cm, find the number of lead spheres dropped in the water.

49. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the

vessel, onefourth of the water flows out. Find the number of lead shots dropped in the vessel.

50. A path 2 m wide surrounds a circular pond of diameter 40 m. How many cubic metres of gravel are required to gravel the path to a depth of 20 cm ?

51. A lead pencil consists of cylinder of wood with a solid cylinder of graphite fitted into it. The diameter of the pencil is 7 mm. the diameter of the graphite is 1 mm and the length of the pencil is 10 cm. Calculate the weight of the whole pencil in grams correct to three places of decimals if the specific gravity of the the wood is 0.6 and of the graphite 2.3.