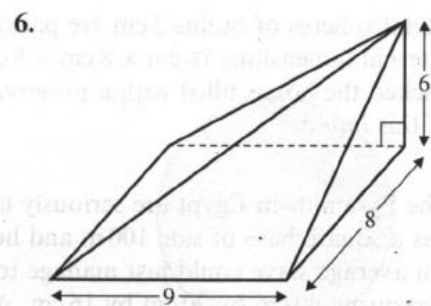
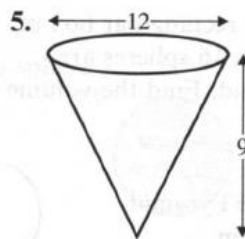
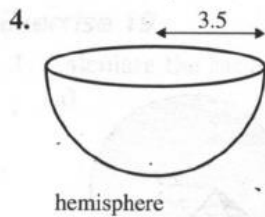
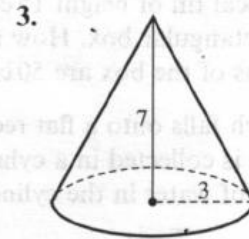
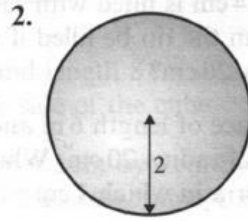
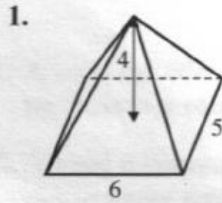


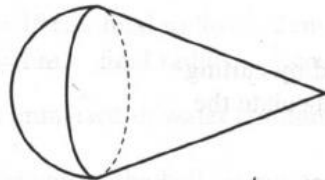
**Volume and Surface Area**

**Exercise A**

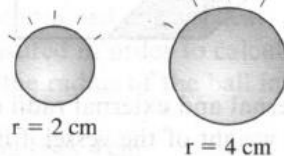
In Questions 1 to 6 find the volume of each object.  
All lengths are in cm.



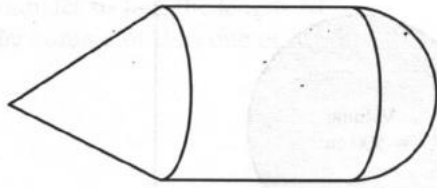
7. A solid sphere is made of metal of density  $9 \text{ g/cm}^3$ . Calculate the mass of the sphere if the radius is 5 cm.
8. Find the volume of a hemisphere of radius 5 cm.
9. Calculate the volume of a cone of height and radius 7 m.
10. A cone is attached to a hemisphere of radius 4 cm. If the total height of the object is 10 cm, find its volume.



11. Find the height of a pyramid of volume  $20 \text{ m}^3$  and base area  $12 \text{ m}^2$ .
12. A single drop of oil is a sphere of radius 3 mm. The drop of oil falls on water to produce a thin circular film of radius 100 mm. Calculate the thickness of this film in mm.
13. Gold is sold in solid spherical balls. Which is worth more: 10 balls of radius 2 cm or 1 ball of radius 4 cm?



14. A toy consists of a cylinder of diameter 6 cm 'sandwiched' between a hemisphere and a cone of the same diameter. If the cone is of height 8 cm and the cylinder is of height 10 cm, find the total volume of the toy.



15. Water is flowing into an inverted cone, of diameter and height 30 cm, at a rate of 4 litres per minute. How long, in seconds, will it take to fill the cone?

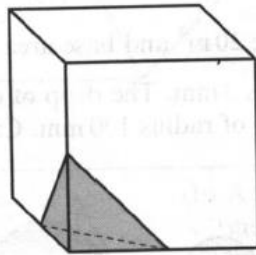
16. Metal spheres of radius 2 cm are packed into a rectangular box of internal dimensions 16 cm  $\times$  8 cm  $\times$  8 cm. When 16 spheres are packed the box is filled with a preservative liquid. Find the volume of this liquid.

17. The Pyramids in Egypt are seriously large! One Pyramid has a square base of side 100 m and height 144 m. An average slave could just manage to carry a brick measuring 40 cm by 20 cm by 16 cm. Assuming no spaces were left for mummies or treasure, work out how many bricks would be needed to make this Pyramid.



18. The cylindrical end of a pencil is sharpened to produce a perfect cone at the end with no overall loss of length. If the diameter of the pencil is 1 cm, and the cone is of length 2 cm, calculate the volume of the shavings.

19. One corner of a solid cube of side 8 cm is removed by cutting through the mid-points of three adjacent sides. Calculate the volume of the piece removed.

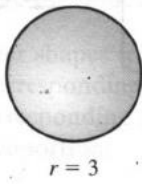


20. A hollow spherical vessel has internal and external radii of 6 cm and 6.4 cm respectively. Calculate the weight of the vessel if it is made of metal of density 10 g/cm<sup>3</sup>.

## Exercise B

1. Work out the *curved* surface area of these objects. Leave  $\pi$  in your answers. All lengths are in cm.

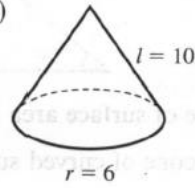
(a)



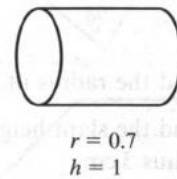
(b)



(c)

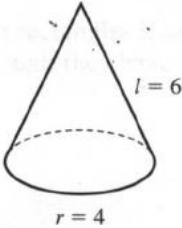


(d)

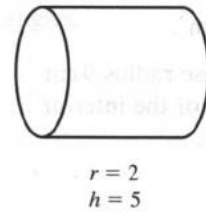


2. Work out the *total* surface area of these objects. Leave  $\pi$  in your answers. All lengths are in cm.

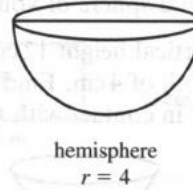
(a)



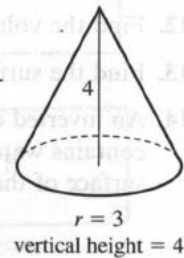
(b)



(c)

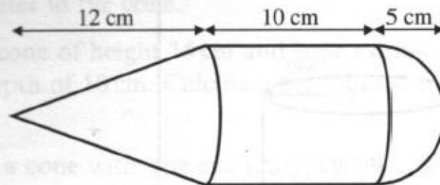


(d)

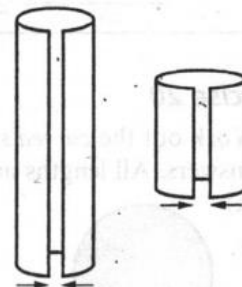


3. A solid cylinder of height 10 cm and radius 4 cm is to be plated with material costing £11 per  $\text{cm}^2$ . Find the cost of the plating.
4. A tin of paint covers a surface area of  $60\text{m}^2$  and costs £4.50. Find the cost of painting the outside surface of a cylindrical gas holder of height 30 m and radius 18 m. The top of the gas holder is a flat circle.
5. A solid wooden cylinder of height 8 cm and radius 3 cm is cut in two along a vertical axis of symmetry. Calculate the total surface area of the two pieces.

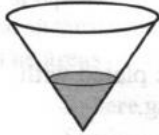
6. Calculate the total surface area of the combined cone/cylinder/hemisphere.



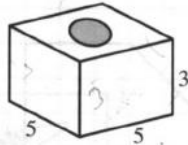
7. A man is determined to spray the entire surface of the earth (including the oceans) with a revolutionary new weed killer. If it takes him 10 seconds to spray  $1\text{m}^2$ , how long will it take to spray the whole world? (radius of the earth = 6370 km; ignore leap years)
8. A rectangular piece of card 10 cm by 30 cm is rolled up to make a tube (with no overlap). Find the radius of the tube if:
- the long sides are joined,
  - the short sides are joined.



9. Find the radius of a sphere of surface area  $34\text{ cm}^2$ .
10. Find the slant height of a cone of curved surface area  $20\text{ cm}^2$  and radius  $3\text{ cm}$ .
11. Find the height of a solid cylinder of radius  $1\text{ cm}$  and *total* surface area  $28\text{ cm}^2$ .
12. Find the volume of a sphere of surface area  $100\text{ cm}^2$ .
13. Find the surface area of a sphere of volume  $28\text{ cm}^3$ .
14. An inverted cone of vertical height  $12\text{ cm}$  and base radius  $9\text{ cm}$  contains water to a depth of  $4\text{ cm}$ . Find the area of the interior surface of the cone not in contact with the water.



15. A circular paper of radius  $20\text{ cm}$  is cut in half and each half is made into a hollow cone by joining the straight edges. Find the slant height and base radius of each cone.
16. A solid metal cube of side  $6\text{ cm}$  is recast into a solid sphere.
  - (a) Find the radius of the sphere.
  - (b) By how much is the surface area of the original cube greater than the surface area of the new sphere?
17. A solid cuboid, measuring  $5\text{ cm} \times 5\text{ cm} \times 3\text{ cm}$ , has a hole of radius  $2\text{ cm}$  drilled right through. Calculate the surface area of the object.



18. A cone of radius  $6\text{ cm}$  has a *total* surface area of  $300\text{ cm}^2$ . Calculate the volume of the cone.