Surname	
Other Names	
Candidate's Signature	

GCSE 9 - 1 Questions

Spheres and Cones 2

Calculator Allowed

INSTRUCTIONS TO CANDIDATES

Write your name in the space provided.

Write your answers in the spaces provided in this question paper.

Answer ALL questions.

Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.

You should have a ruler, compass and protractor where required.

Total Marks :

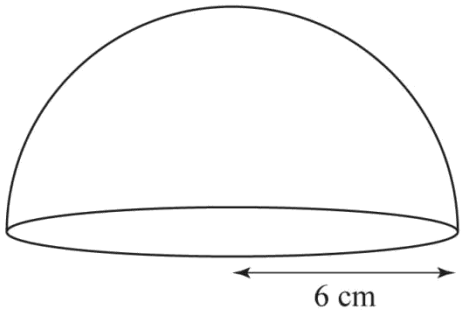
1) Calculate the volume of a sphere of diameter 70 cm.

Answer _____ [3]

2) Find the radius of a sphere which has a surface area of 1000 cm^2.

Answer _____ cm [2]

3)

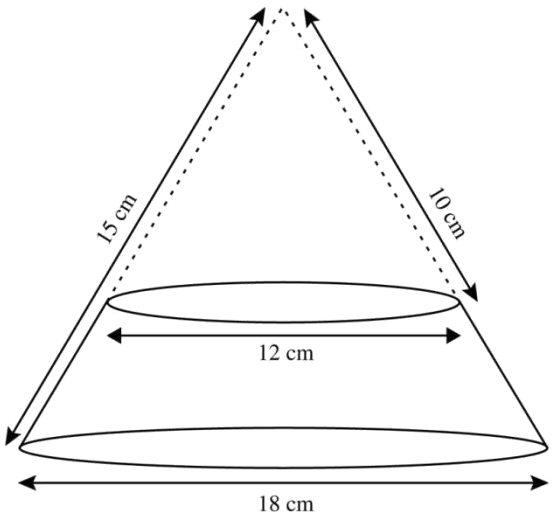


A solid glass paperweight in the shape of a hemisphere is shown above.

Calculate the volume of the paperweight.

Answer _____ [3]

4) Find the curved surface area of the frustum of a cone in the diagram below.



Answer _____ cm^2 [4]

5) A hollow water container is shown below.

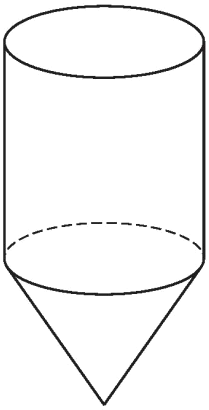


Diagram not drawn to scale

The radius of the circle formed at the join between the cone and the cylinder is 12 cm.
The height of the cylinder is five times the height of the cone.

When full, the container holds 20 litres of water.

Calculate the total height of the container.

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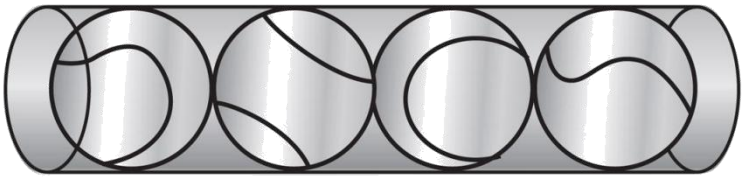
[7]

6) Four tennis balls each of diameter d mm, just fit into a cylindrical tube as shown.



Source: National Curriculum Mathematics, Levels 9 and 10, K. M. Vickers, Canterbury Educational Ltd.

Show that the ratio of the **space occupied** by the tennis balls to the **space not occupied** is 2:1

[4]

7) The diagram shows a square-based pyramid.
The length of each side of the base is 5 cm and the perpendicular height is 9 cm.

Calculate the volume of this pyramid.
State the units of your answer. [3]

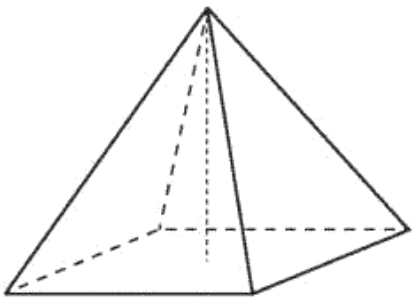


Diagram not drawn to scale

8) A thin hollow container is in the shape of a cylindrical upper part and a conical lower part as shown below.

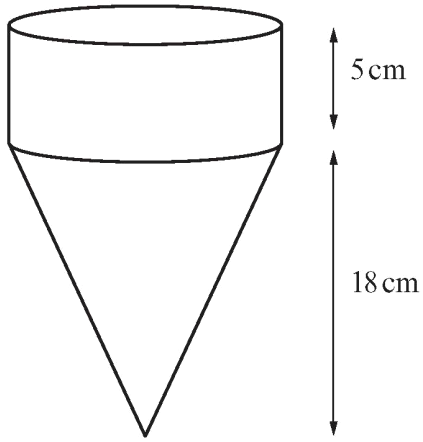


Diagram not drawn to scale

The total capacity of the container is 1244 cubic centimetres.

Calculate the diameter of the cylinder.

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[6]

9) The sphere and cone below have equal volumes.

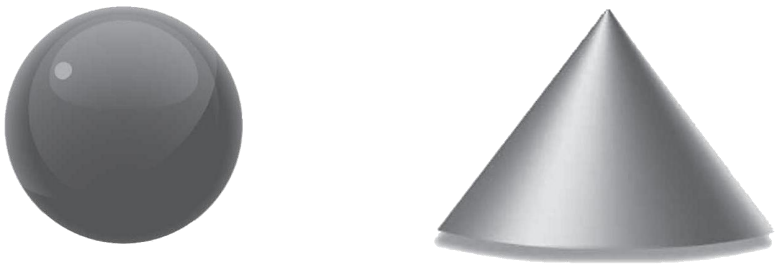

Diagram not drawn to scale

The radius of the sphere is 6·7 cm.
The height of the cone is 10·4 cm.

Calculate the radius of the base of the cone.
Give your answer correct to 1 decimal place.

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10) A and B are two hollow cones.

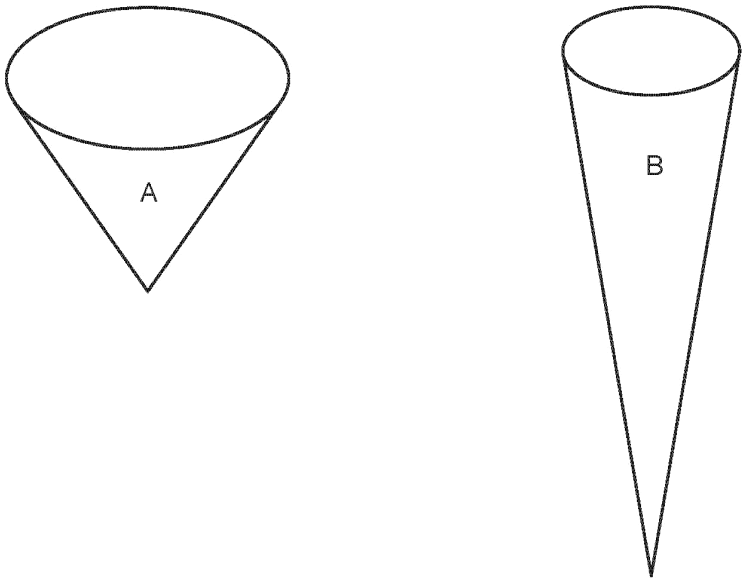

Diagram not drawn to scale

The base radius of cone B is half the base radius of cone A.
The height of cone B is twice the height of cone A.

Cone A is completely filled with water.
Is it ever possible to pour all of this water into cone B without it overflowing?
You must show working to justify your answer. [3]

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11) An ornamental garden spike is in the form of a square based pyramid with a cone attached to the centre of its base as shown below.

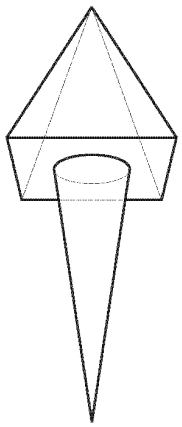

Diagram not drawn to scale

The radius of the base of the cone is 4 cm.
The height of the cone is twice the height of the pyramid.
The volume of the cone is equal to the volume of the pyramid.

(a) Calculate the length of the base of the pyramid. [5]

(b) The total volume of the spike (cone and pyramid together) is $335{\cdot}1\,cm^3$.

Calculate the total length of the spike (from the tip of the cone to the top of the pyramid).
[4]

12) A solid object is made out of two identical cones and a sphere.
The three shapes are joined together as shown in the diagram, with the sphere touching the centres of the circular bases of both cones.

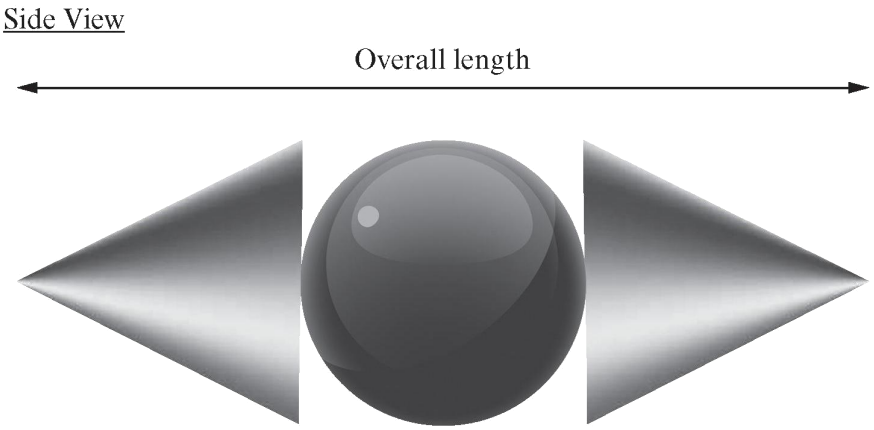

Diagram not drawn to scale

The radius of the sphere and the radius of the circular base of each cone is 3 cm.
The volume of the whole object is 245 cm^3.

Calculate the overall length of the object.

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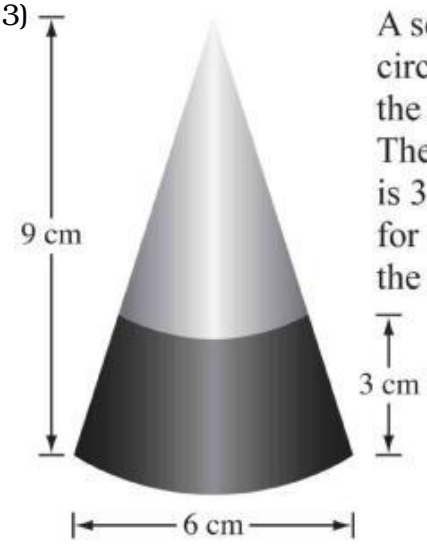
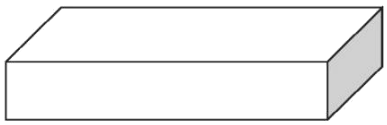


A solid paper weight is made in the shape of a right circular cone. Its height is 9 cm and the diameter of the base is 6 cm.
The top section is glass and the base section, which is 3 cm high, is made of metal which weighs 14 g for each cubic centimetre. Calculate the weight of the metal in the base.

Answer _____ g [5]

14) Twelve spherical balls, each of diameter 10 cm, are to be packed into containers.
There are two types of container available.

Container A	Container B
Cylinders: radius 5·5 cm and height 63 cm	Boxes: cuboids 42 cm by 32 cm by 11 cm



Diagrams not drawn to scale

(a) Calculate the volume of one spherical ball. [2]

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(b) Compare the total volume of empty space when the 12 balls are packed into cylindrical containers, with the total volume of empty space when they are packed into box containers. Assume that the minimum number of containers required is used in each case. [6]

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15) Two solid, identical spheres are attached to the ends of a solid cylinder, as shown below.

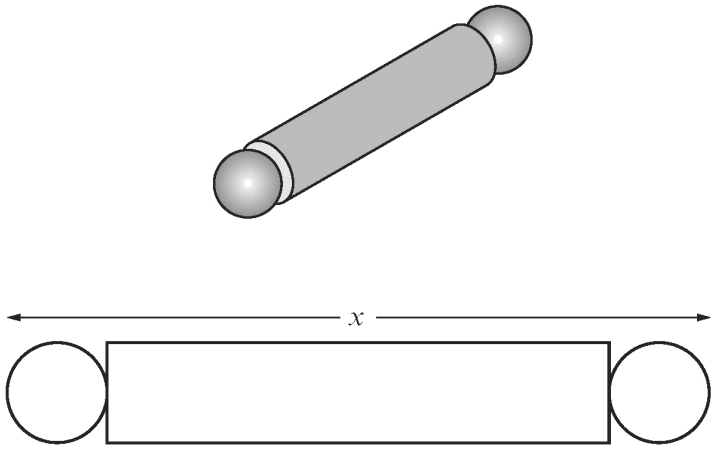

Diagram not drawn to scale

The radius, r, of each sphere is the same as the radius of the cylinder.
The length of the cylinder is $9r$.
The volume of the whole object is $3340\,\text{cm}^3$.

Calculate the total length, x, of the object. [6]

16) A part of an engine is made up of a hemisphere attached to a cylinder of radius r cm, as shown below.

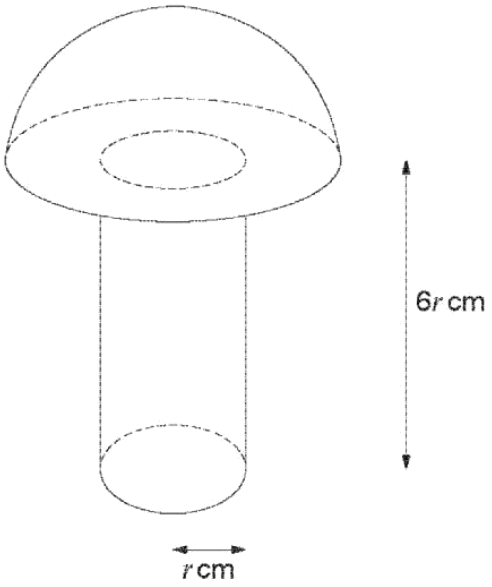

Diagram not drawn to scale

The height of the cylinder is $6r$ cm.
The radius of the hemisphere is two times the radius of the cylinder.

The volume of the whole part is $3244{\cdot}48\,\text{cm}^3$.

Calculate the total height of the whole engine part. [6]