Perimeters, Area and Volumes Difficulty: Medium

Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Medium
Booklet	Question Paper 3

Time allowed: 105 minutes

Score: /91

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%
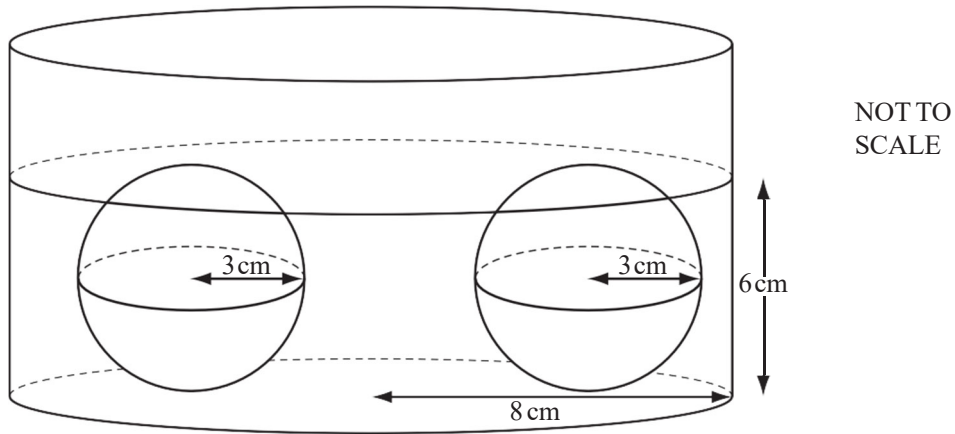
The diagram shows two solid spheres of radius 3 cm lying on the base of a cylinder of radius 8 cm.

Liquid is poured into the cylinder until the spheres are just covered.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(a) Calculate the volume of liquid in the cylinder in

   (i) cm^3,   [4]

   (ii) litres.   [1]

(b) One cubic centimetre of the liquid has a mass of 1.22 grams.

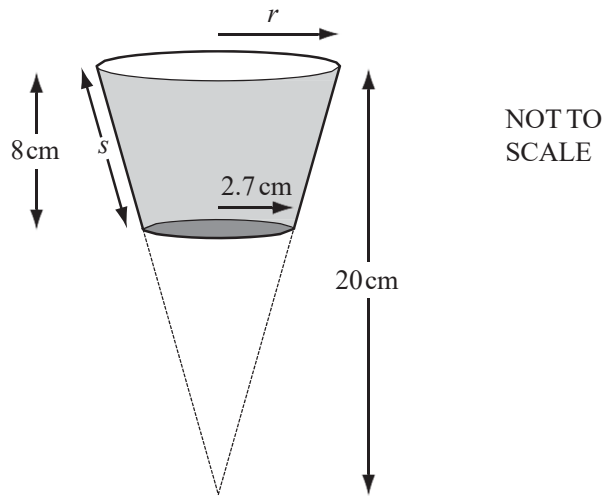Calculate the mass of the liquid in the cylinder.

Give your answer in kilograms.

[2]

(c) The spheres are removed from the cylinder.

Calculate the new height of the liquid in the cylinder.

[2]

NOT TO
SCALE

The diagram shows a plastic cup in the shape of a cone with the end removed.
The vertical height of the cone in the diagram is 20 cm.
The height of the cup is 8 cm.
The base of the cup has radius 2.7 cm.

(a) (i) Show that the radius, r, of the circular top of the cup is 4.5 cm.   [2]
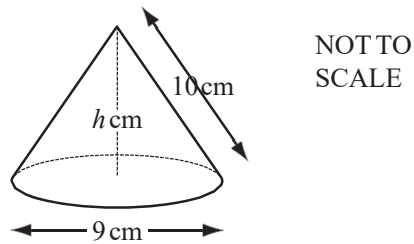
(ii) Calculate the volume of water in the cup when it is full.

[The volume, V, of a cone with radius r and height h is $V = \dfrac{1}{3}\pi r^2 h$.]   [4]

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(b) (i) Show that the slant height, s, of the cup is 8.2 cm. [3]

(ii) Calculate the curved surface area of the outside of the cup.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.] [5]

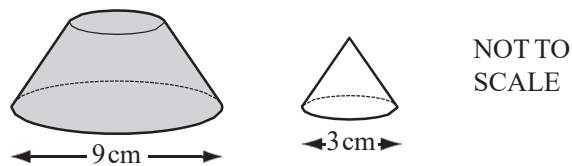NOT TO SCALE

10 cm

h cm

9 cm

A solid cone has diameter 9 cm, slant height 10 cm and vertical height *h* cm.

(a) (i) Calculate the curved surface area of the cone.
    [The curved surface area, A, of a cone, radius r and slant height l is $A = \pi r l$.]   [2]

   (ii) Calculate the value of h, the vertical height of the cone.   [3]
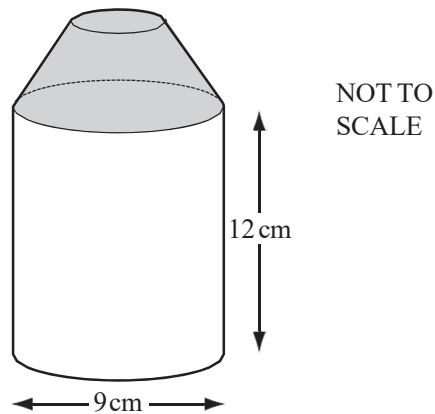
(b)

NOT TO SCALE

9 cm   3 cm

Sasha cuts off the top of the cone, making a smaller cone with diameter 3 cm.
This cone is **similar** to the original cone.

(i) Calculate the **vertical** height of this small cone.   [2]

(ii)   Calculate the curved surface area of this small cone.   [2]
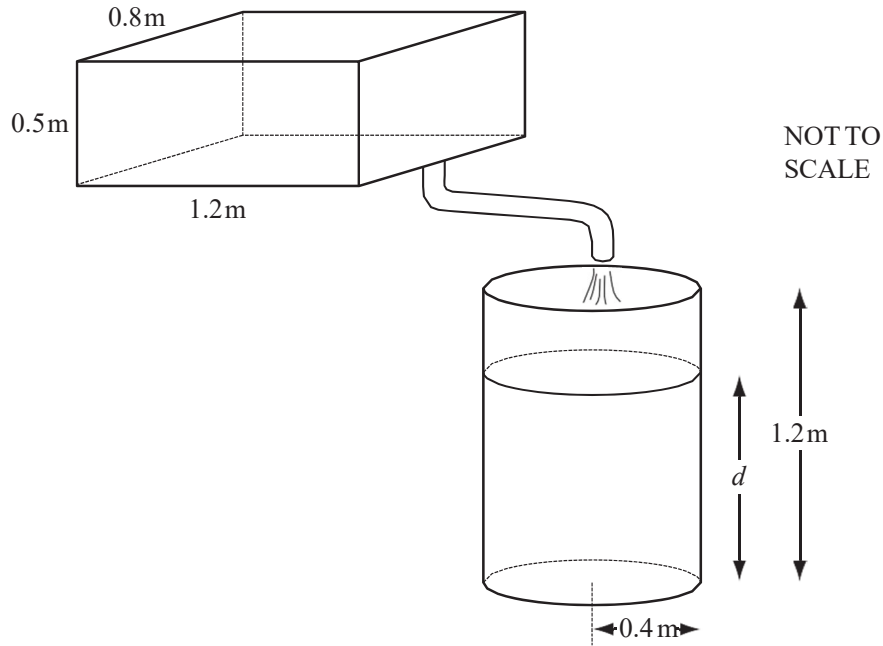
(c)

NOT TO
SCALE

12 cm

9 cm

The shaded solid from **part (b)** is joined to a solid cylinder with diameter 9 cm
and height 12 cm.
Calculate the **total** surface area of the whole solid.   [5]

A rectangular tank measures $1.2\,m$ by $0.8\,m$ by $0.5\,m$.

(a) Water flows from the full tank into a cylinder at a rate of $0.3\ m^3$/min.

Calculate the time it takes for the full tank to empty.
Give your answer in minutes and seconds. [3]

(b) The radius of the cylinder is $0.4\,m$.

Calculate the depth of water, d, when all the water from the rectangular tank is in the cylinder.
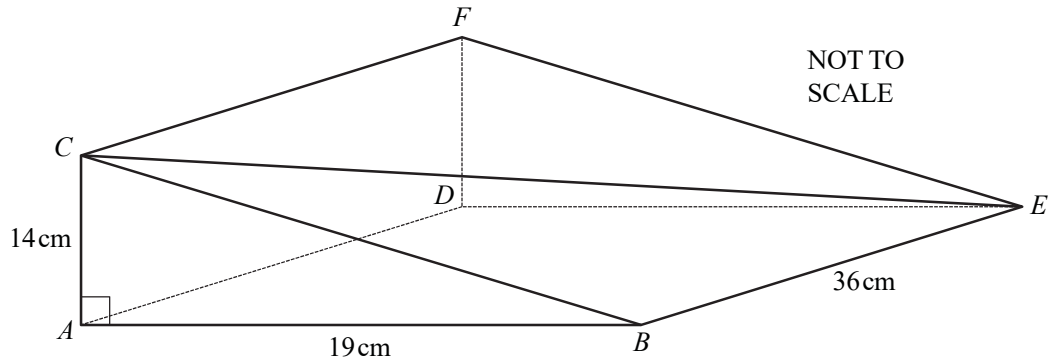
[3]

(c) The cylinder has a height of $1.2\ m$ and is open at the top.
The inside surface is painted at a cost of $\$2.30$ per m^2.

Calculate the cost of painting the inside surface. [4]

In the diagram, *ABCDEF* is a prism of length 36 cm.
The cross-section *ABC* is a right-angled triangle.
AB = 19 cm and *AC* = 14 cm.

Calculate

(a) the length *BC*,   [2]

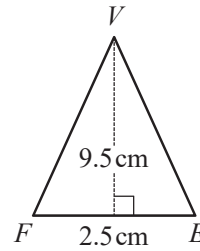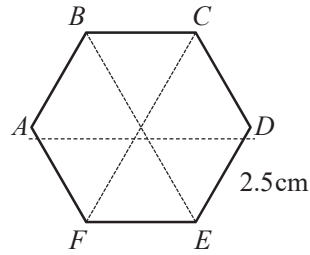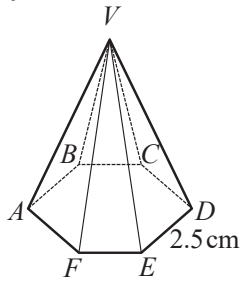(b) the total surface area of the prism,   [4]

(c) the volume of the prism,   [2]

(d) the length *CE*,

                                                                                                                                    [2]

(e) the angle between the line *CE* and the base *ABED*.

                                                                                                                                    [3]
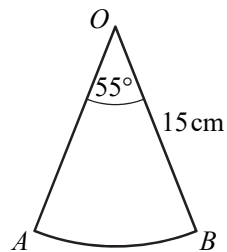
(a)

NOT TO
SCALE

A solid pyramid has a **regular hexagon** of side 2.5 cm as its base.
Each sloping face is an isosceles triangle with base 2.5 cm and height 9.5 cm.

Calculate the **total** surface area of the pyramid. [4]
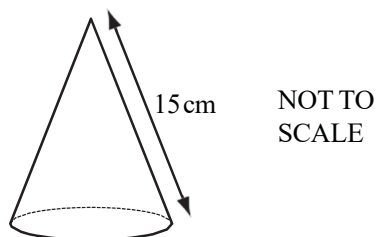
(b)

NOT TO
SCALE

A sector *OAB* has an angle of 55° and a radius of 15 cm.

Calculate the area of the sector and show that it rounds to 108 cm^2, correct to 3 significant figures. [3]
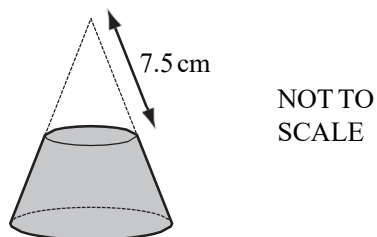
(c)

15 cm   NOT TO SCALE

The sector radii *OA* and *OB* in **part (b)** are joined to form a cone.

(i) Calculate the base radius of the cone.
   [The curved surface area, *A*, of a cone with radius *r* and slant height *l* is $A = \pi r l$.]   [2]

(ii) Calculate the perpendicular height of the cone.   [3]

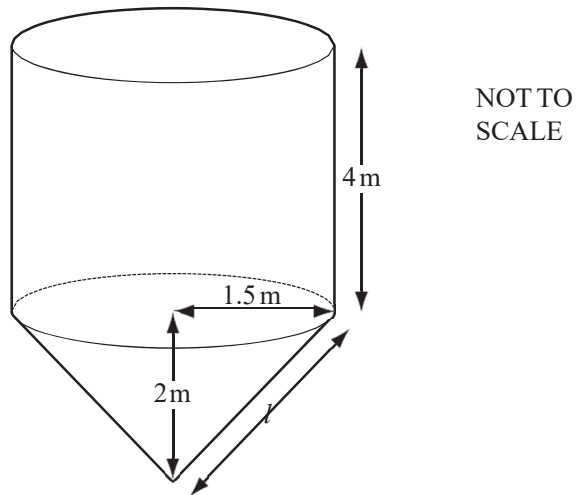(d)

7.5 cm   NOT TO SCALE

A solid cone has the same dimensions as the cone in **part (c)**.
A small cone with slant height 7.5 cm is removed by cutting parallel to the base.

Calculate the volume of the remaining solid.

[The volume, *V*, of a cone with radius *r* and height *h* is $V = \frac{1}{3}\pi r^2 h$.]   [3]

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NOT TO
SCALE

An open water storage tank is in the shape of a cylinder on top of a cone.
The radius of both the cylinder and the cone is 1.5 m.
The height of the cylinder is 4 m and the height of the cone is 2 m.

(a) Calculate the total surface area of the outside of the tank.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.] **[6]**
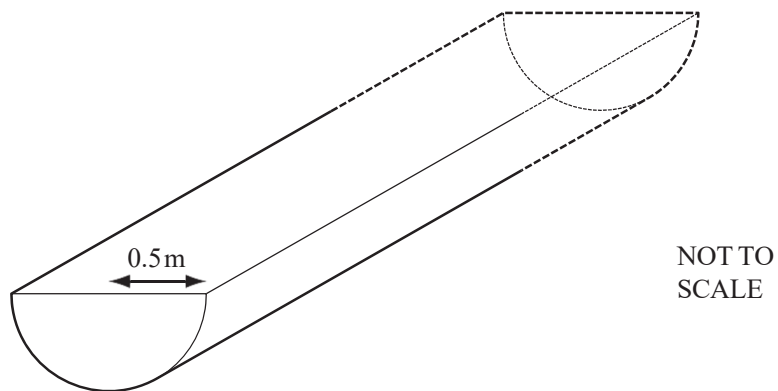
(b) The tank is completely full of water.

(i) Calculate the volume of water in the tank and show that it rounds to 33 m^3, correct to the nearest whole number.

[The volume, V, of a cone with radius r and height h is $V = \dfrac{1}{3}\pi r^2 h$.] **[4]**

(ii)

0.5 m

NOT TO
SCALE

The cross-section of an irrigation channel is a semi-circle of radius 0.5 m.
The 33 m^3 of water from the tank completely fills the irrigation channel.

Calculate the length of the channel.

[3]

(c) (i) Calculate the number of litres in a full tank of 33 m^3.

[1]

(ii) The water drains from the tank at a rate of 1800 litres per minute.

Calculate the time, in minutes and seconds, taken to empty the tank.

[2]

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