Centre No.						Paper Reference (complete below)							Surname	Initial(s)
Candidate No.										/			Signature	

Paper Reference(s)

4420/03 4437/09

London Examinations IGCSE

Physics – 4420

Paper 3

Science (Double Award) – 4437

Paper 9

Foundation and Higher Tiers

Friday 16 May 2008 – Morning

Time: 1 hour 15 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for examination
Ruler, protractor, compasses, pencil and calculator

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s), the paper reference and your signature.
The paper references are shown above. Write the one for which you have been entered. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

Information for Candidates

The total mark for this paper is 50. The marks for parts of questions are shown in round brackets: e.g. **(2)**.
There are 16 pages in this question paper. All blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

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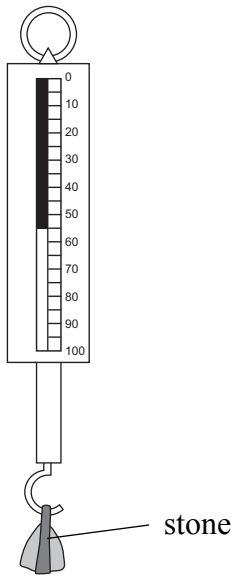
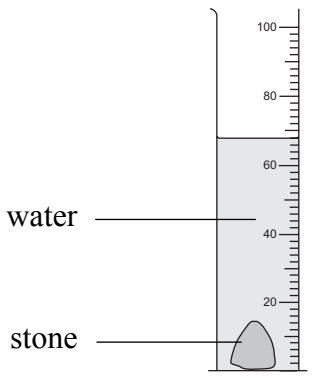
1. (a) The diagram shows a spring balance. It is marked in grams and used to measure mass.



What is the mass of the stone to the nearest 5 g?

Mass of stone = ... g
(1)

(b) The diagram shows measuring instrument **A**. It contains 50 cm^3 of water.
The stone has been carefully lowered into the water.



(i) Name measuring instrument **A**. .....
(1)

(ii) What is the total volume in cm^3 of the contents of **A**?

Total volume = ... cm^3
(1)

(iii) Calculate the volume in cm^3 of the stone.

Volume of stone = ... cm^3
(1)

Leave blank

(c) (i) Use the equation

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

to calculate the density in g/cm^3 of the stone. Give your answer to 2 significant figures.

.....

.....

Density = ... g/cm^3

(2)

(ii) Explain why it is **not** justified to give the answer to more than 2 significant figures.

.....

.....

.....

(2)

QUESTION 1 CONTINUES ON THE NEXT PAGE

Leave blank

(d) Another student repeats the experiment for a set of five stones.

She puts her results into a table.

Stone	Mass in g	Volume in cm^3	Density in g/cm^3
P	30	11	2.7
Q	35	13	2.7
R	40	15	2.7
S	48	18	2.7
T	62	23	2.7

All her measurements and calculations are correct.

(i) What conclusion can she come to about the five stones?

.....

.....

(2)

(ii) Can she be confident about her conclusion? Explain your answer.

.....

.....

.....

.....

.....

(2)

Q1

(Total 12 marks)

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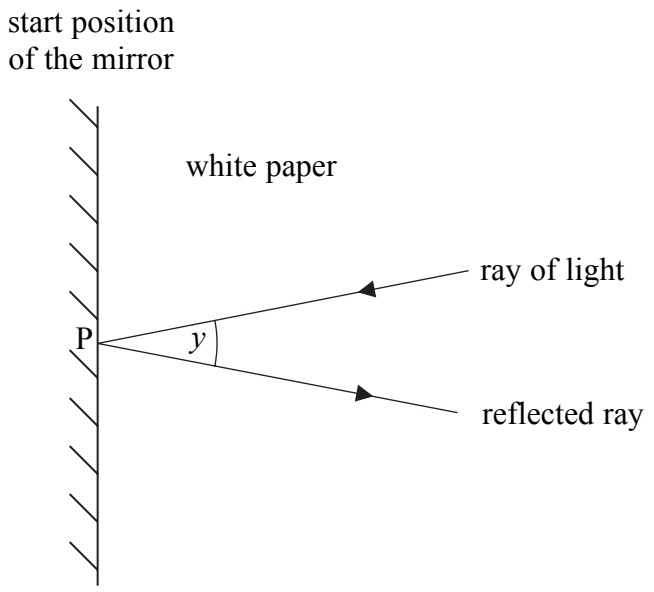
2. (a) The diagram shows an overhead view of a student's experiment with a mirror and a sheet of paper.



(i) What can the student use to produce the ray of light?

.....

(1)

(ii) How can the student mark the position of the reflected ray?

.....

.....

(1)

(iii) Angle *y* is the angle between the ray of light and the reflected ray.

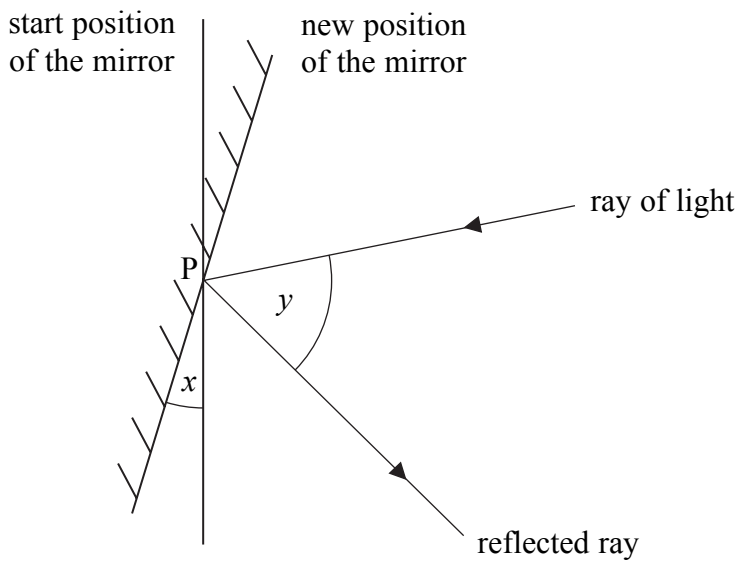
Use a protractor to measure angle *y* to the nearest degree.

Angle *y* = ... °

(1)

Leave blank

(b) The student turns the mirror about point **P** by an angle *x*.
This changes the angle *y*.



Use a protractor to measure angle *x* to the nearest degree.

Angle *x* = ... °

(1)

QUESTION 2 CONTINUES ON THE NEXT PAGE

Leave blank

(c) In a similar experiment another student makes a note of several pairs of angles x and y.

19° and 65°	*6° and 39°*	*11° and 49°*
25° and 77°	*23° and 73°*	*17° and 57°*

(i) Put these results into a suitable table with column headings and units.

(3)

(ii) Plot these points on the grid opposite. Label the axes.

Identify any point which is anomalous (unexpected).

Decide whether a straight line of best fit or a curved line of best fit is appropriate and draw it on your graph.

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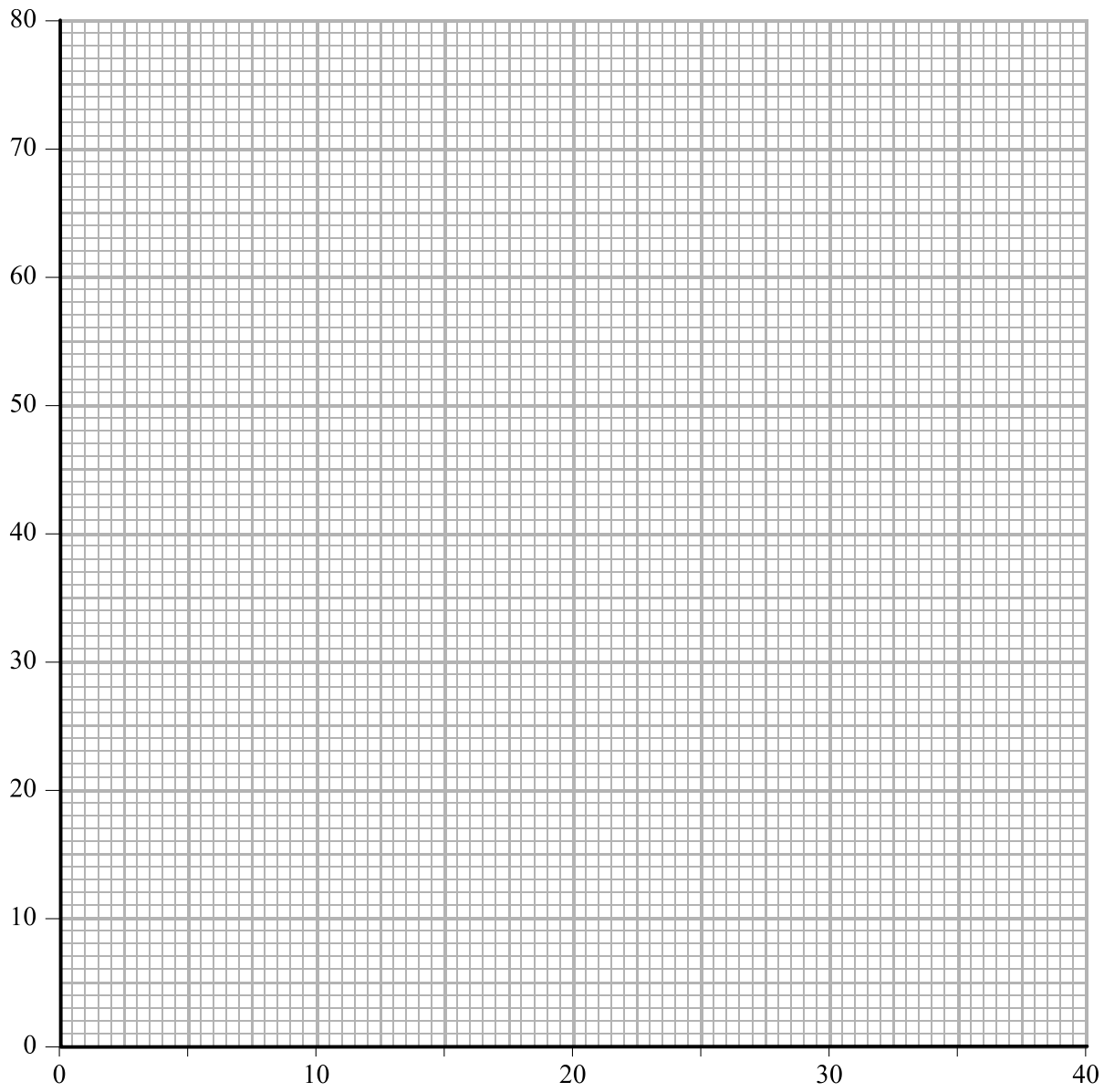


(7)

(iii) Use your graph to predict the value of y when $\boldsymbol{x}$ is 20°.

y = ... °

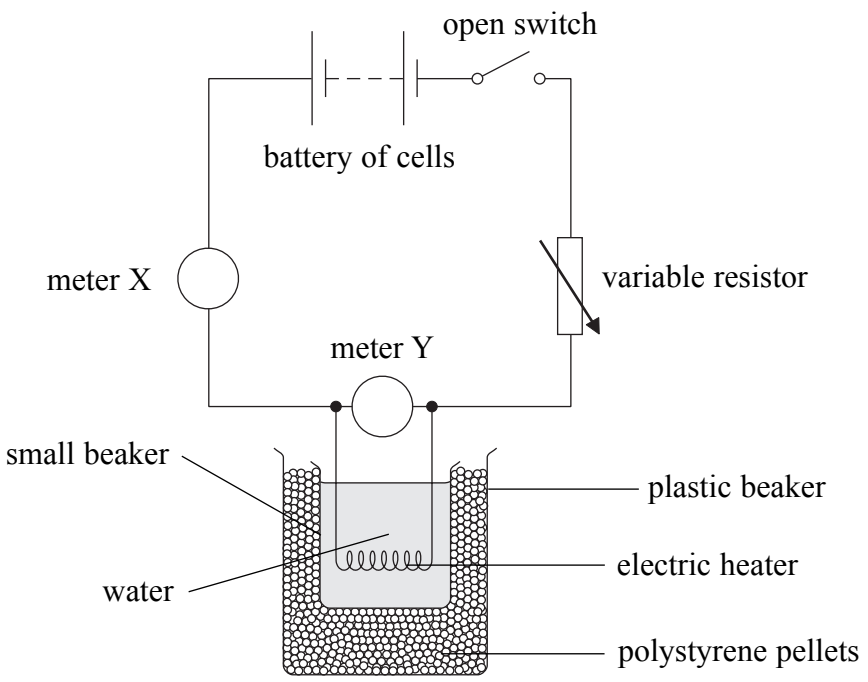
(1)

Q2

(Total 15 marks)

Leave blank

3. A student designed a small electric heater. The diagram shows how he used his heater.



(a) Suggest the purpose of the polystyrene pellets.

.....

.....

.....

(1)

(b) The student measured the temperature of the water in the small beaker using a thermometer.
What should be done to the water before measuring its temperature?

.....

.....

.....

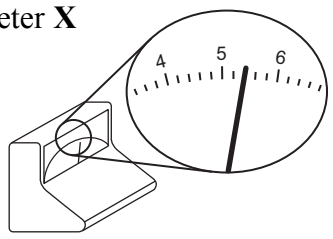
(1)

Leave blank

(c) The student then closed the switch and noted the readings on meters **X** and **Y**.

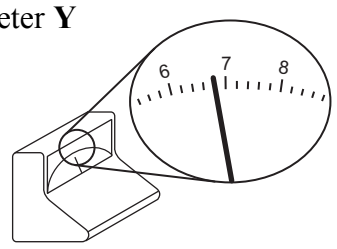
(i) Each diagram shows a meter.
What is the numerical reading on each meter?

meter **X**



Reading = ...
(1)

meter **Y**



Reading = ...
(1)

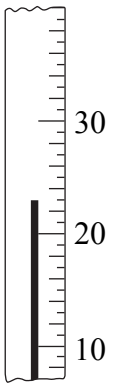
(ii) Name meter **X**.

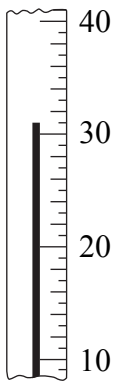
.....
(1)

(iii) Name meter **Y**.

.....
(1)

(iv) After 5 minutes he opened the switch and measured the new temperature of the water.
The diagrams show two thermometers. What is the reading on each thermometer and what is the difference between the readings?





Reading = ... °C Reading = ... °C Difference = ... °C
(2)

QUESTION 3 CONTINUES ON THE NEXT PAGE

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(d) The student repeated the experiment several times. Each time he used an identical mass of water at the same starting temperature. He adjusted the variable resistor to give different values of current and voltage before heating the water for five minutes.

He expected to find that the temperature increase is proportional to the power.
Suggest and explain **two** experimental reasons why this did not happen.

1 .....

.....

.....

(2)

2 .....

.....

.....

(2)

Q3

(Total 12 marks)

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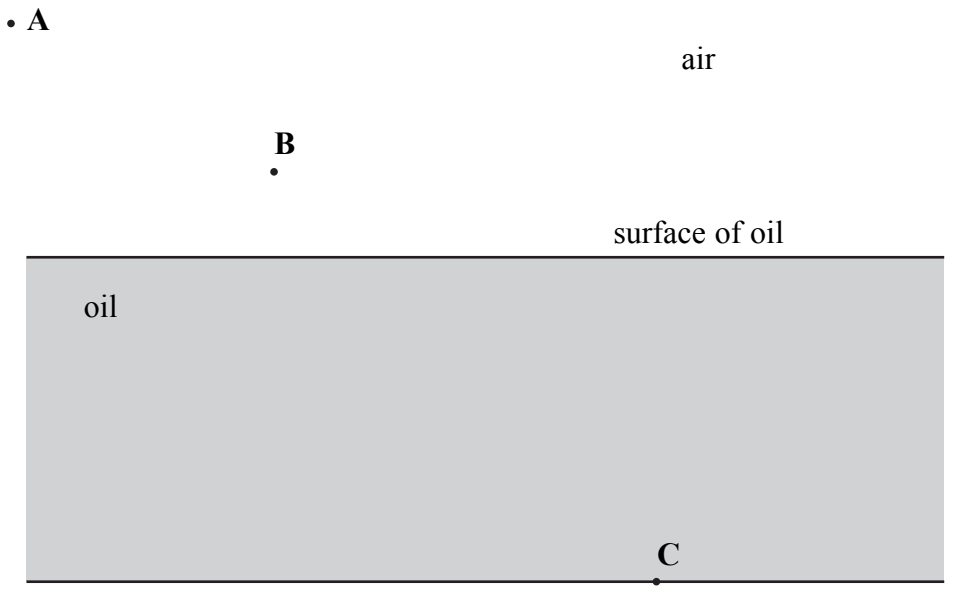
4. A student plans to investigate the path of a ray of light as it travels from air to oil at different angles.
The diagram shows a container of oil and points **A**, **B** and **C**.



(a) Draw a line through points **A** and **B** to show the ray of light in air. Continue your line to the surface of the oil. Label the point where your line meets the surface as point **D**.

(1)

(b) Draw a line from **D** to **C** to show the ray of light in the oil.

(1)

(c) Use a protractor to draw a line at point **D** which is perpendicular to the surface of the oil. This line should go upwards and downwards.

On the diagram label this line **normal**.

(1)

(d) Use a protractor to measure, to the nearest degree,

(i) the angle between **AD** and the normal,

Angle = ...°

(1)

(ii) the angle between **CD** and the normal,

Angle = ...°

(1)

Leave blank

(e) A friend of the student says that this investigation will be difficult to carry out.

Describe **two** problems which the student will have. In each case, explain how the student might solve the problem.

Problem 1 .....

.....

.....

.....

.....

(3)

Problem 2 .....

.....

.....

.....

.....

(3)

Q4

(Total 11 marks)

TOTAL FOR PAPER: 50 MARKS

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