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

Paper Reference(s)

4335/03 4437/08

London Examinations IGCSE

Chemistry – 4335

Paper 3

Science (Double Award) – 4437

Paper 8

Foundation and Higher Tiers

Thursday 18 November 2010 – Morning

Time: 1 hour 15 minutes

Materials required for examination
Ruler, pencil and calculator

Items included with question papers
Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Total	

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. Write your answers in the spaces provided in this question paper.
Show all stages 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 individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 5 questions in this question paper.
There are 16 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

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Turn over

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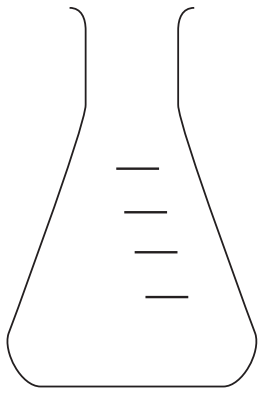
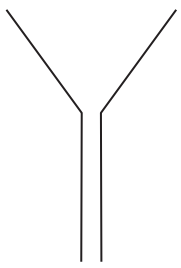
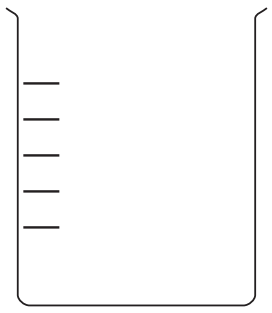
1. The diagrams show some pieces of apparatus used in a chemistry laboratory.

A 	**B** 	**C** 
D 	**E** 	**F** 

(a) Choose from the letters **A**, **B**, **C**, **D**, **E** and **F** to identify the pieces of apparatus in the table.

Name of apparatus	Letter
Beaker	
Evaporating basin	
Filter funnel	

(3)

(b) Which **two** pieces of apparatus can be used to measure volumes of liquids?

Choose from the letters **A**, **B**, **C**, **D**, **E** and **F**.

.....

(2)

Leave blank

(c) Some of these pieces of apparatus can be used in an experiment to prepare crystals of zinc sulphate.

The experiment is carried out following these steps:

1. Pour some dilute sulphuric acid into a beaker.
2. Add a spatula full of zinc carbonate to the acid and stir the mixture with a glass rod.
3. Add another spatula full of zinc carbonate to the sulphuric acid and stir the mixture.
4. Keep adding zinc carbonate until there is no more effervescence and some solid remains unreacted.
5. Filter the contents of the beaker into an evaporating basin.
6. Heat the evaporating basin until crystals begin to form.
7. Leave the evaporating basin and its contents to cool, and filter off the crystals.
8. Spread out the crystals on a filter paper and leave them to dry in a warm place.

(i) Choose from the letters **A**, **B**, **C**, **D**, **E** and **F** to identify **one** piece of apparatus that is **not** used in the experiment to prepare crystals of zinc sulphate.

.....

(1)

(ii) What is the purpose of **Step 4** in the experiment?

.....

(1)

(iii) Identify the substance left in the filter paper in **Step 5**.

.....

(1)

Q1

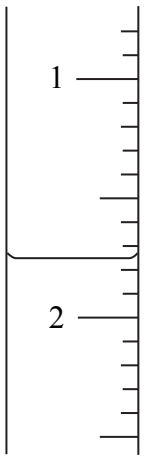
(Total 8 marks)

Leave blank

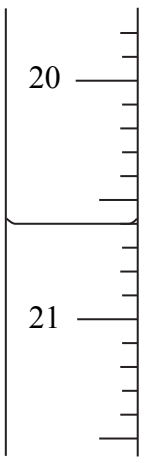
2. Some kitchen cleaners contain alkalis.
A small amount of kitchen cleaner was dissolved in distilled water to make a solution.
Samples of this solution were titrated with an acid until neutralisation was complete.

(a) The diagrams show the readings on the burette before and after a student added the acid.

Before



After



Use the diagrams to help you complete the table.

Give the readings to the nearest 0.05 cm^3.

Burette reading after adding acid (cm^3)	
Burette reading before adding acid (cm^3)	
Volume of acid added (cm^3)	

(3)

Leave blank

(b) A second student did the titration four times, using a solution of a different kitchen cleaner.

The table shows the results.

Burette reading after adding acid (cm^3)	28.75	28.90	28.90	28.55
Burette reading before adding acid (cm^3)	1.40	2.80	2.15	2.35
Volume of acid added (cm^3)	27.35	26.10	26.75	26.20
Titration results to be used (✓)				

(i) Which titration results should be used to calculate the average volume of acid added? Place ticks (✓) in the table.

(1)

(ii) Use your ticked results to calculate the average volume of acid added.

(2)

Q2

(Total 6 marks)

Leave blank

3. Sodium thiosulphate solution reacts with dilute hydrochloric acid.
The equation for this reaction is:

$$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

As the reaction proceeds, a pale yellow precipitate forms.

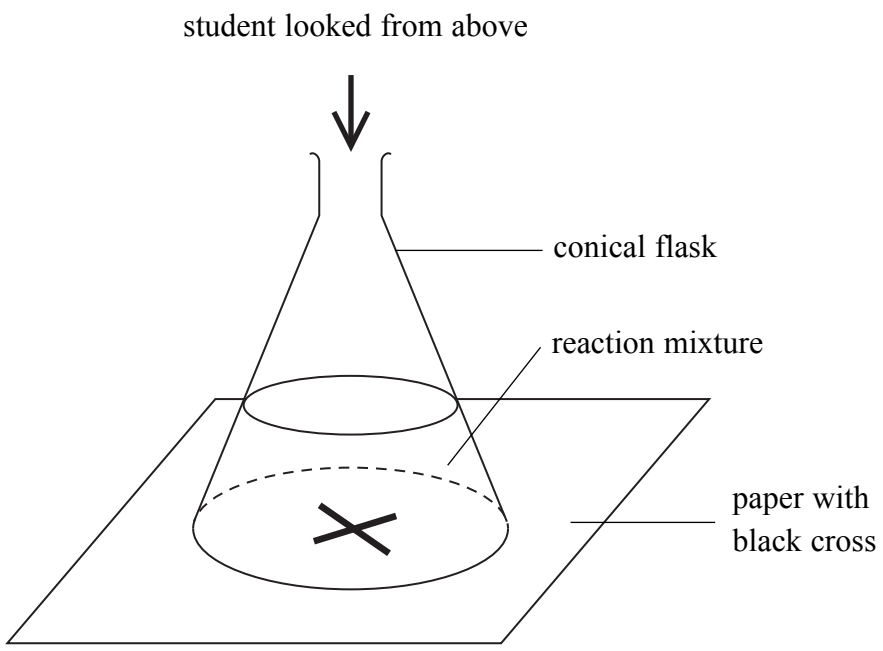
(a) Identify this precipitate.

.....

(1)

(b) A student carried out an experiment using this method.

- She poured 25 cm^3 of sodium thiosulphate solution into a conical flask.
- She added 10 cm^3 of dilute hydrochloric acid and started a stop clock.
- She swirled the flask and placed it on a piece of paper marked with a black cross.
- She stopped the clock when she could no longer see the black cross through the reaction mixture in the conical flask.



She repeated the experiment several times using the same volume of dilute hydrochloric acid, but using different mixtures of sodium thiosulphate solution and water.

The table on the next page shows her results.

Leave blank

Expt	Volume of $Na_2S_2O_3(aq)$ (cm^3)	Volume of $H_2O(l)$ (cm^3)	Concentration of sodium thiosulphate solution (%)	Time for cross to disappear (s)
1	25	0	100	6
2	20	5	80	8
3	15		60	9
4	10	15	40	15
5	5	20	20	32

(i) The results of Experiment 3 are incomplete.
What volume of water should she have used for the experiment to be a fair test?

.....

(1)

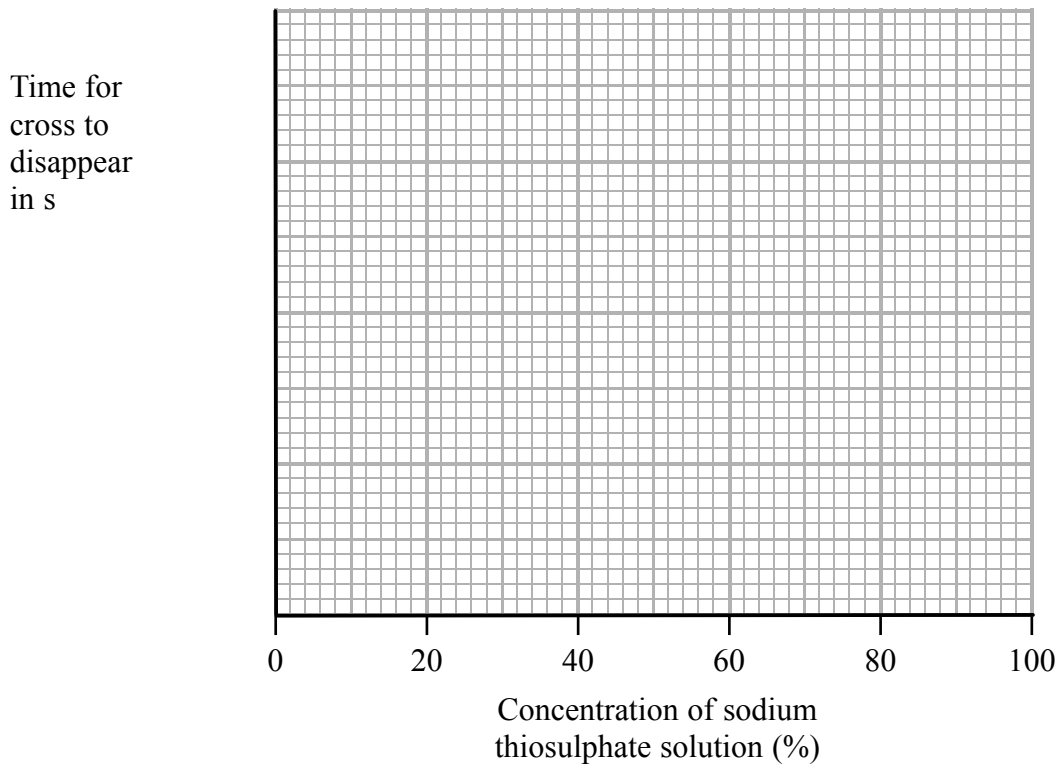
(ii) The volume of dilute hydrochloric acid and the volume of the mixture of sodium thiosulphate and water were kept constant in each experiment.
State **one** other variable that she should have kept constant.

.....

(1)

(c) Choose a suitable scale for the time taken for the cross to disappear.

Plot a graph of her results on the grid below and draw a straight line or curve of best fit.



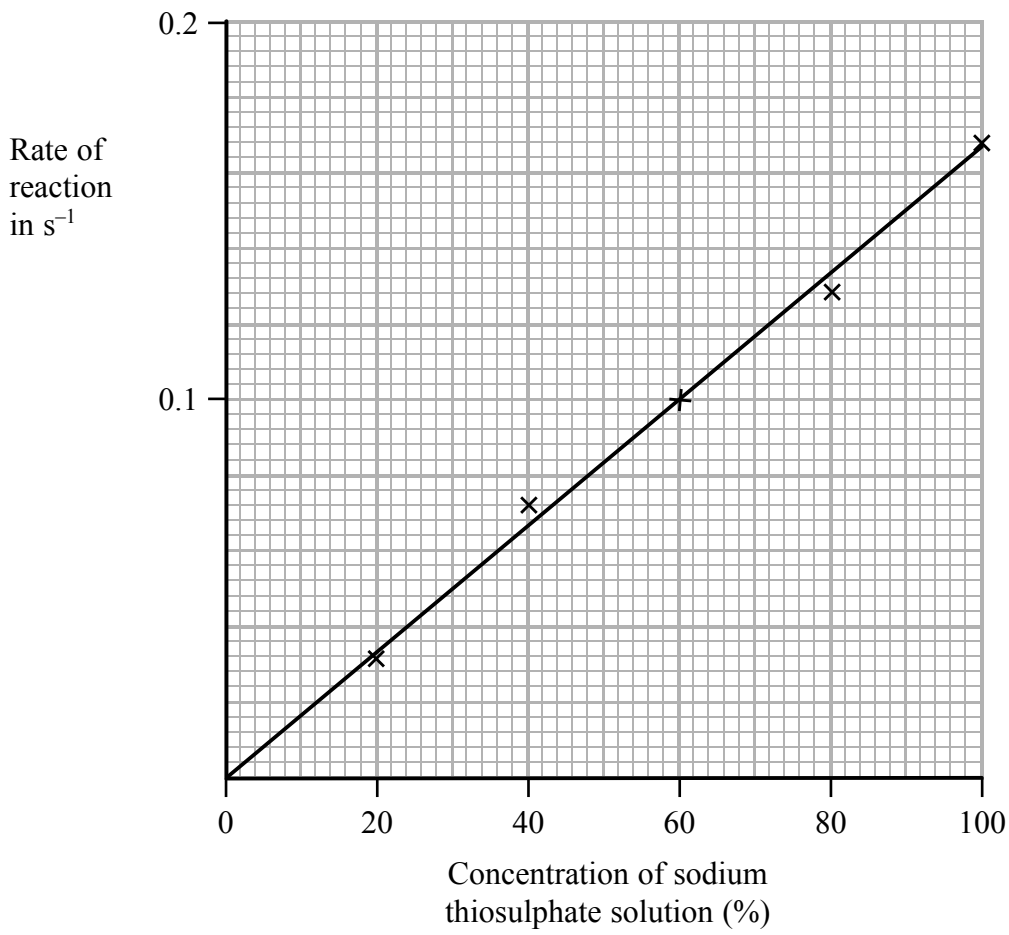
(4)

(d) The student used her results to calculate the rate of the reaction at different concentrations of sodium thiosulphate solution.

The equation she used was

$$\text{rate of reaction} = \frac{1}{\text{time (in s) for cross to disappear}}$$

She then plotted a graph of rate of reaction against concentration of sodium thiosulphate solution and drew a straight line of best fit.



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(i) The point for 60% is incorrect.

Use the time shown in the table of results to calculate the correct rate of reaction for this concentration. Give your answer to two decimal places.

.....

.....

(2)

(ii) The student thought the results would be least accurate at high concentrations of sodium thiosulphate solution.

Suggest why this might be.

.....

.....

.....

(2)

(e) (i) Describe the relationship shown by the graph in part (d).

.....

.....

.....

(2)

(ii) Explain this relationship in terms of the movement of particles.

.....

.....

.....

.....

.....

.....

.....

(2)

Q3

(Total 15 marks)

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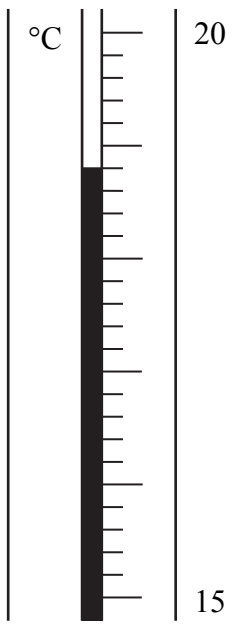
4. Some students were investigating salts.
One of them suggested measuring the temperature change that occurred when different salts were dissolved in water.

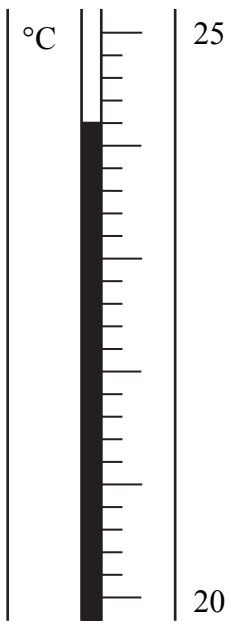
This is the method they used.

- Add 50 cm^3 of water to a beaker.
- Record the temperature of the water.
- Weigh 5 g of salt and add it to the water in the beaker.
- Stir the mixture with the glass rod until all the solid has dissolved.
- Record the temperature of the solution.

(a) The diagrams show the readings on the thermometer before and after a student dissolved a salt in water.



Before adding salt



After dissolving salt in water

Write down the thermometer readings and calculate the temperature change.

Temperature before.....°C

Temperature after.....°C

Temperature change.....°C

(3)

Leave blank

(b) How can the student check that the temperature change is reliable?

.....

.....

(1)

(c) Four students did the experiment and wrote down these results.

Student 1 When I used 5 grams of zinc nitrate the temperature increased from 19.2 to 27.4 °C

Student 2 With 5 g of ammonium nitrate the temperature went down from 20.2 to 14.4 °C

Student 3 The temperature started at 18.6 °C and finished at 13.8 °C when 5 grams of sodium nitrate was dissolved

Student 4 I used five grams of lithium chloride and the temperature changed by 8.1 °C

(i) Which student wrote down results that cannot be compared with the other three? Explain your choice.

Student .....

Explanation .....

.....

(2)

(ii) Construct a suitable table including column headings, with units, to show what was recorded.
Enter the three sets of results that can be used.

(4)

Leave blank

(d) The teacher discussed the method with the students.

(i) Student 1 said that the biggest error in the method was the loss of heat.

Suggest **one** way in which this error can be minimised.

.....

.....

(1)

(ii) Suggest why it is not possible to plot a graph of these results.

.....

.....

(1)

(iii) Student 3 dissolved 5 g of salt in 50 g of water.

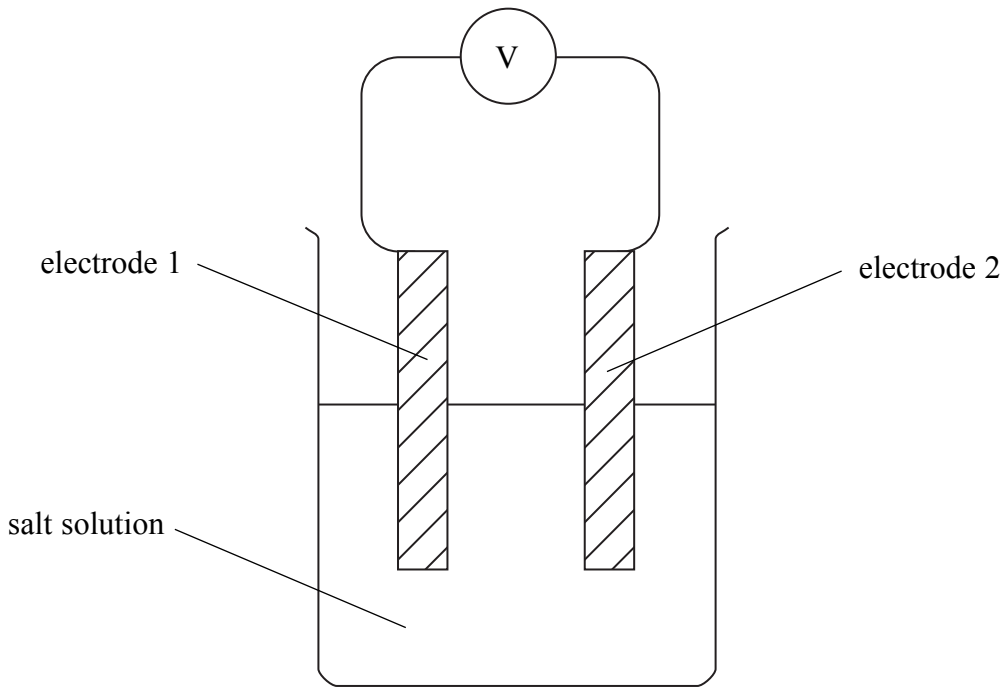
Calculate the concentration of the salt, in grams of salt per kilogram of water.

(1)

Q4

(Total 13 marks)

5. The reactivities of metals can be compared using this apparatus.



Electrode 1 and electrode 2 are made from two different metals.

The greater the value, ignoring the sign, of the voltmeter reading, the bigger the difference in reactivity between the two metals.

If the reading on the voltmeter is negative, the metal used for electrode 1 is more reactive than the metal used for electrode 2.

If the reading on the voltmeter is positive, the metal used for electrode 1 is less reactive than the metal used for electrode 2.

Metal used for electrode 1	**Metal used for electrode 2**	**Voltmeter reading (V)**
P	Q	+1.6
P	R	–1.1
P	S	–0.9
Q	R	–2.7
Q	S	–2.5
R	S	+0.2

Leave blank

(a) Which metal in the table is the **most** reactive?

.....

(1)

(b) Which metal in the table is the **least** reactive?

.....

(1)

(c) Which **two** metals in the table are most similar in reactivity?

.....

(1)

A student investigated four other metals **T**, **U**, **V** and **W**.
All these metals form ions with a 2+ charge.

The order of reactivity of these metals is

T
U
V
W

↑ increasing reactivity

(d) When metal **S** is used as electrode 1 and metal **T** as electrode 2, the voltmeter reading is –0.8 V.

Calculate the voltmeter reading when metals **P** and **T** are compared.

.....

(1)

(e) When metal **T** is added to a solution of the sulphate of metal **U**, a displacement reaction occurs.
Ionic half-equations for the reactions occurring are:

$$T \rightarrow T^{2+} + 2e^- \qquad \text{and} \qquad U^{2+} + 2e^- \rightarrow U$$

Suggest ionic half-equations for the reactions occurring when metal **V** is added to a solution of the sulphate of metal **W**.

Equation 1 .....

Equation 2 .....

(2)

Leave blank

(f) The overall ionic equation for the reaction that occurs when metal **T** is added to a solution of the sulphate of metal **U** is

$$T + U^{2+} \rightarrow T^{2+} + U$$

Suggest an overall ionic equation for the reaction that occurs when each of the following are mixed.

If no reaction occurs, write **no reaction**.

(i) Metal **V** is added to a solution of the sulphate of metal **U**.

.....

(1)

(ii) Metal **T** is added to a solution of the sulphate of metal **W**.

.....

(1)

Q5

(Total 8 marks)

TOTAL FOR PAPER: 50 MARKS

END