The Haberdashers' Aske's Boys' School
Elstree, Herts

13+ Entrance Examination 2015

CHEMISTRY

Please follow these instructions

- The Science paper is divided into three sections (Biology, Chemistry and Physics). The time for the Science paper is 1 hour. You should spend no more than 20 minutes on each section.
- Answer the questions in the spaces provided. Long answers are not expected.
- You may use your calculator in any of the numerical questions.
- Rough work should be done on the paper but do not write in the margins.
- Write your name and school in the box below.

Name	
School	
Exam number	

For the examiner's use only

Question	1	2	3	4	5	6	Total
Max	5	6	7	3	4	8	33
Mark							

Leave blank

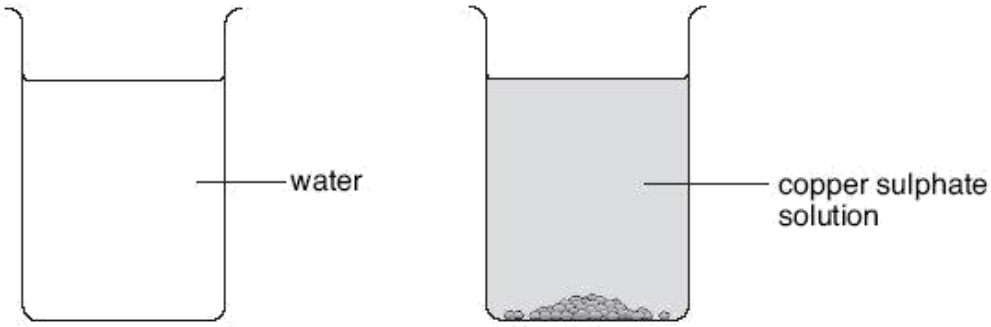
1. Owen used litmus paper to find out if six different liquids were **acidic**, **alkaline** or **neutral**. He dipped pieces of litmus paper into each liquid.

He wrote some of his results in the table below. Complete the table of results.

liquid	What happened to blue litmus paper?	What happened to red litmus paper?	Is the liquid acidic, alkaline or neutral?
lemon juice	went red	stayed red	acidic
water	stayed blue	stayed red	
sodium hydroxide solution	stayed blue	went blue	
alcohol			neutral
ammonia solution		went blue	
sour milk	went red		

Total 5 marks

2. (a) Ruth added some blue copper sulphate crystals to a beaker of water.



(i) How could Ruth **see** that some of the copper sulphate crystals had dissolved in the water?

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1 mark

Leave blank

(ii) How could Ruth make the copper sulphate crystals dissolve more quickly?

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1 mark

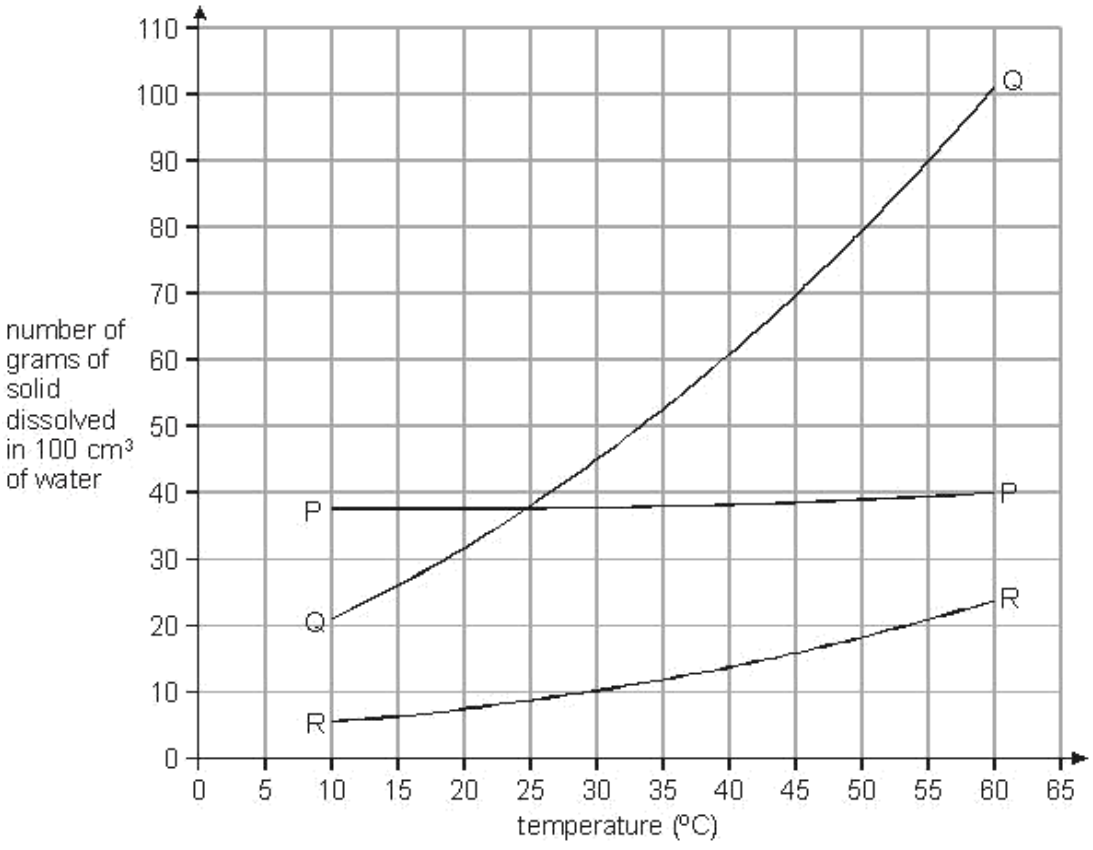
(b) Ruth poured some of the copper sulphate solution into a dish. She left it in a warm room for five days.

All the water evaporated from the solution in the dish.
What was left in the dish?

.....

1 mark

(c) Ruth did an experiment to see how much of three solids, P, Q and R, will dissolve in water at different temperatures.
She plotted her results on graph paper as shown below.



Use the graph above to answer the questions below.

(i) At 30°C how many grams of solid R dissolved in the water?

..... g

1 mark

Leave blank

(ii) At 60°C which solid dissolved the most in water? Give the letter.

.....

1 mark

(iii) Which **two** solids were equally soluble at 25°C? Give the letters.

(iv) ..... and .....

1 mark

Total 6 marks

3. (a) The table below shows the melting points and boiling points of four elements.

element	melting point (°C)	boiling point (°C)
aluminium	660	2520
iron	1540	2760
magnesium	650	1100
mercury	−39	357

When answering the questions below, you may give the name of an element more than once.

Which element in the table is:

(i) a liquid at 0°C?

.....

1 mark

(ii) a solid at 1500°C?

.....

1 mark

(iii) a gas at 500°C?

.....

1 mark

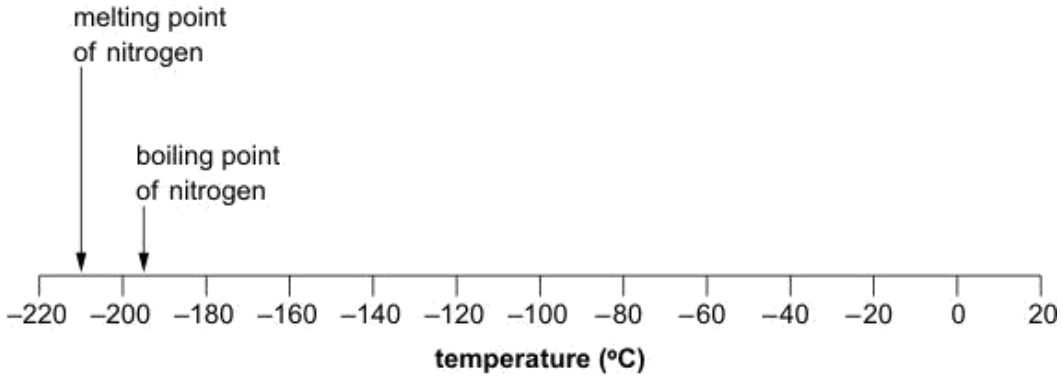
(iv) a liquid over the biggest temperature range?

.....

1 mark

Leave blank

(b) The melting point and boiling point of nitrogen are marked on the scale below.



(i) **Draw an arrow** on the scale above to show the temperature at which water freezes.

1 mark

(ii) When water is a liquid, what is the physical state of nitrogen? Tick the correct box.

solid ☐ liquid ☐ gas ☐

1 mark

(iii) What is the physical state of nitrogen at −200°C? Tick the correct box.

solid ☐ liquid ☐ gas ☐

1 mark

Total 7 marks

4. Copper can be obtained from its ore, copper sulphide, in two stages.

First stage *heating the ore in air*

Copper sulphide reacts with oxygen from the air to form copper oxide and sulphur dioxide gas.

Second stage *heating the copper oxide with carbon*

Copper oxide reacts with carbon to form copper and carbon dioxide gas.

(a) Give the names of **three** elements mentioned above.

1. .....

2. .....

3. .....

1 mark

Leave blank

(b) Give the name of **one** compound mentioned above.

.....

1 mark

(c) Give the name of the compound, mentioned above which causes 'acid rain'.

.....

1 mark

Total 3 marks

5. Kerry made some copper sulphate crystals. She wrote a description of what she did.

I heated some dilute sulphuric acid in a beaker and added some copper oxide to it. I stirred the mixture until it became a clear blue colour. I added more copper oxide until no more would react and then filtered the mixture into a dish. A black solid was left on the filter paper. I left the solution in the dish for a week and saw that the liquid had gone and blue crystals were left.

Use the information in Kerry's description to answer the questions below.

(a) What colour is:

(i) copper sulphate solution?

..... .

1 mark

(ii) copper oxide?

..... .

1 mark

(b) Write down a word equation for the reaction which took place in the beaker.

..... + ... → ..... + water

1 mark

(c) Why did Kerry have to filter the mixture?

.....

.....

1 mark

Total 4 marks

Leave blank

6. Six groups of pupils burned magnesium in air. The magnesium reacted with oxygen to form magnesium oxide.

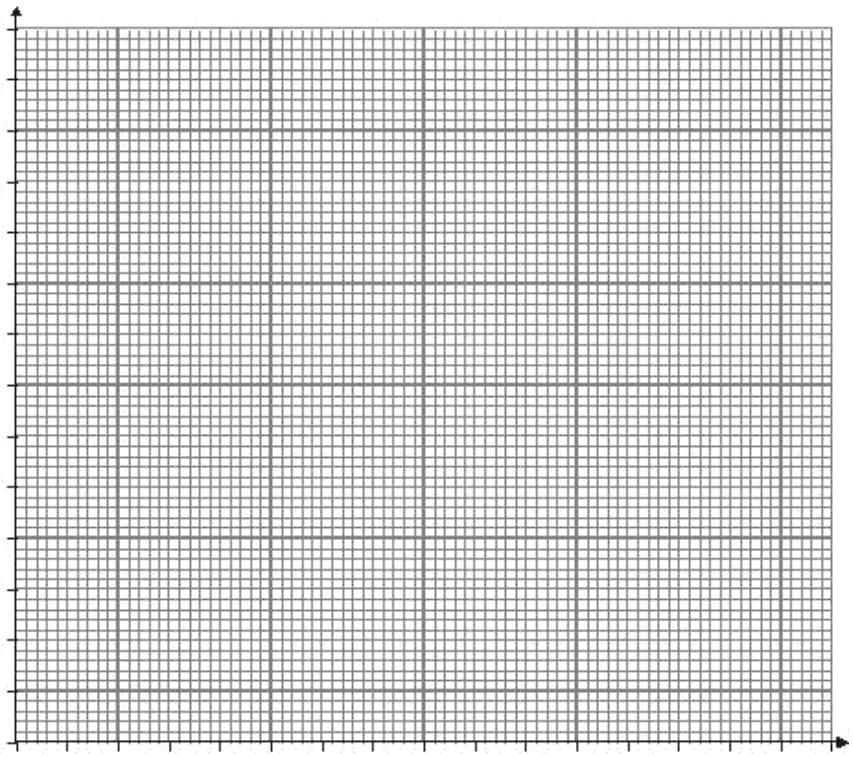
They recorded the mass of magnesium used and the mass of magnesium oxide formed. Their results are shown in the table.

group	mass of magnesium (g)	mass of magnesium oxide (g)
A	3.2	5.2
B	3.8	6.5
C	4.2	7.0
D	4.9	8.6
E	5.4	8.0
F	6.1	10.7

(a) Use their results to draw a graph below.

- Decide the scale for each axis.
- Label the axes.
- Plot the points.
- Draw a line of best fit

4 marks



Leave blank

(b) (i) Which group's results do **not** fit the general pattern?
Give the letter.

1 mark

(ii) How should the class deal with this 'odd' result?

.....

.....

1 mark

(c) Use the graph to predict the mass of magnesium oxide that will be formed by burning 7.0 g of magnesium.

..... 9

1 mark

(d) The results show the relationship between the mass of magnesium and the mass of magnesium oxide formed.

What conclusion could you draw about this relationship?

.....

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.....

1 mark

Total 8 marks

Maximum 33 marks

END OF PAPER

Go back and check your work carefully.