SURNAME ..... FIRST NAME .....

JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

LEVEL 2

CHEMISTRY

Tuesday 5 November 2013

Please read this information before the examination starts.

- This examination is 40 minutes long.
- Answers should be written on the question paper.
- Answer **all** the questions.
- Calculators may be required.

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1. Underline the option which best completes each of the following:

(a) The gas which turns lime water cloudy is

carbon dioxide **hydrogen** **nitrogen** **oxygen**

(b) A gas which can cause acid rain is

hydrogen **methane** **nitrogen** **sulphur dioxide**

(c) A non-metal which can conduct electricity is

carbon **copper** **iodine** **sulphur**

(d) When a solid turns directly to a gas on heating, it is said to

condense **distil** **melt** **sublime**

(e) The volume of nitrogen in 1000 cm^3 of air is about

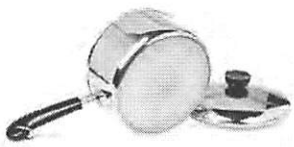
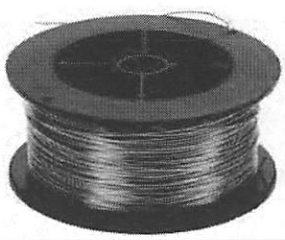
20 cm^3 **80 cm^3** **200 cm^3** **800 cm^3**

(5)

2. Copper has several useful properties.

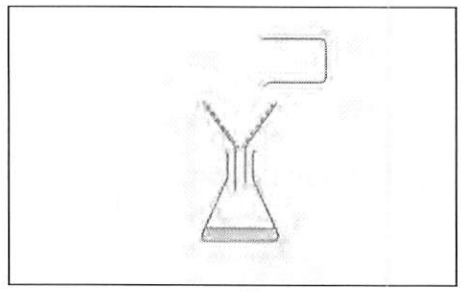
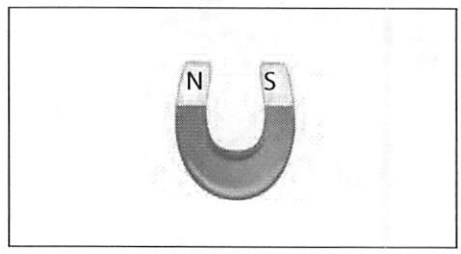
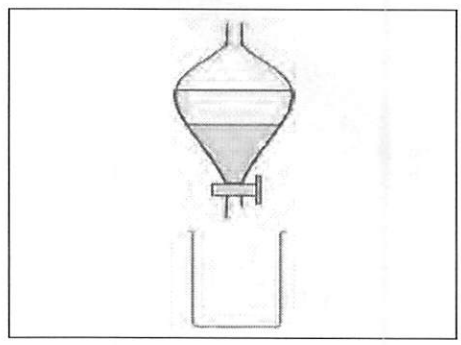
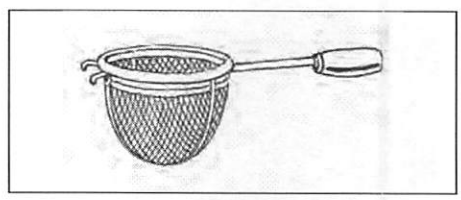
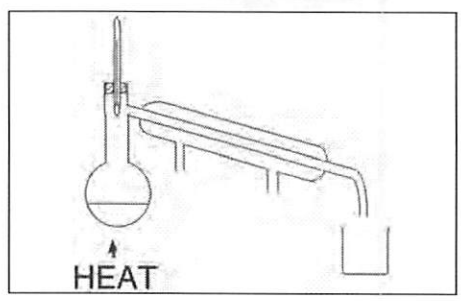
Use a ruler to draw straight lines to match the following uses of copper with the appropriate property.

You should draw THREE lines.

use	property
saucepan bottom 	shiny
water pipes 	good conductor of heat
wire 	good conductor of electricity
	unreactive

(3)

3. Match up the best method of separation needed to purify each mixture.
You should draw FIVE straight lines, using a ruler.

mixture	method of separation
iron from a mixture of iron filings and sugar	
oil from a mixture of oil and water	
sand from a mixture of sand and stones	
chalk from chalky water	
pure water from ink	

(4)

4. There are over 100 known elements.

(a) (i) What do you understand by the word *element*?

..... (1)

(ii) Complete the following table by identifying the elements.
(One has been done for you.)

symbol	C	Cl	H	He	O
name of element				helium	

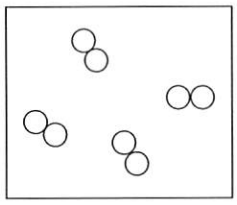
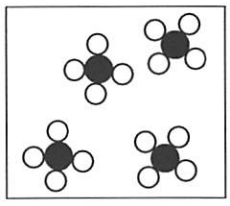
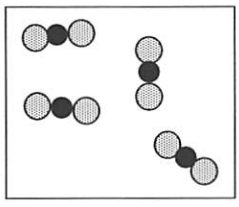
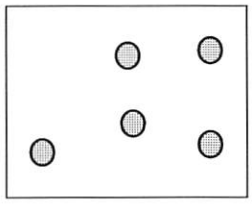
(2)

Some of these elements can form molecules.

(b) (i) What do you understand by the word *molecule*?

..... (1)

(ii) Match up the chemical formula of each gas to its particle diagram.
You should draw FOUR straight lines, using a ruler.

CO_2	Cl_2	He	CH_4
			

(3)

When CO_2 is cooled down to $-80\,°C$ it becomes a solid.

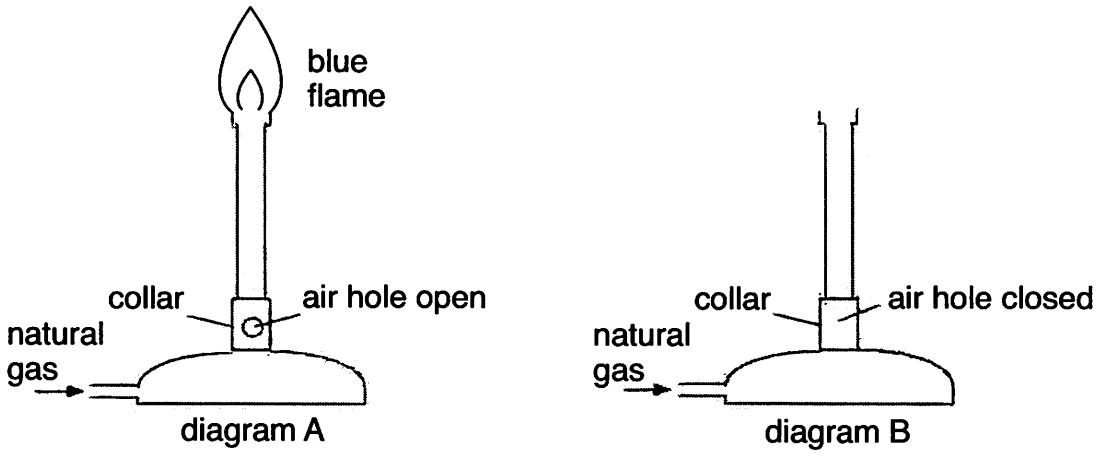
(c) Describe the differences between the movement and arrangement of the molecules of CO_2 in a solid and a gas.

.....

.....

..... (2)

5. The flame of a Bunsen burner changes when the air hole is closed.



(a) (i) Complete diagram B to show what the flame looks like when the air hole is closed. (1)

(ii) What colour will this flame be? ..... (1)

(b) Give a reason why it is safer to leave an unattended lit Bunsen burner with the air hole closed.

..... (1)

(c) When a beaker of water is heated by a Bunsen burner with the air hole closed, a deposit of black soot is soon formed on the beaker.

Explain why this soot is formed.

.....

.....

..... (2)

(d) A Bunsen burner, burning natural gas in air, can reach a maximum temperature of about 800 °C.

(i) On diagram A, label with an **X** the part of the flame where this maximum temperature will occur. (1)

(ii) Suggest a way in which a higher temperature than 800 °C could be achieved by burning natural gas.

.....

..... (1)

6. Part of the reactivity series is shown below:

magnesium	*most reactive*
zinc	
iron	
lead	
copper	*least reactive*

Use this to help in answering the following questions.

(a) Predict the products of the following reactions.
If you think there will be no reaction, write 'no reaction'.

(i) lead oxide + magnesium → ..... (1)

(ii) zinc oxide + iron → ..... (1)

When a piece of copper is added to silver nitrate solution, crystals of silver are formed.

(b) Where would you place silver in the reactivity series above?

..... (1)

A piece of iron is added to a solution of copper sulphate.

(c) Describe two things you could see happening during this reaction.

1: .....

.....

2: .....

..... (2)

7. Toby was investigating the reaction between vinegar and sodium hydrogen carbonate.

He added different amounts of sodium hydrogen carbonate to fresh samples of vinegar, waited for the reaction to finish and then measured the pH.

(a) In his investigation, name

(i) the independent variable

..... (1)

(ii) the dependent variable

..... (1)

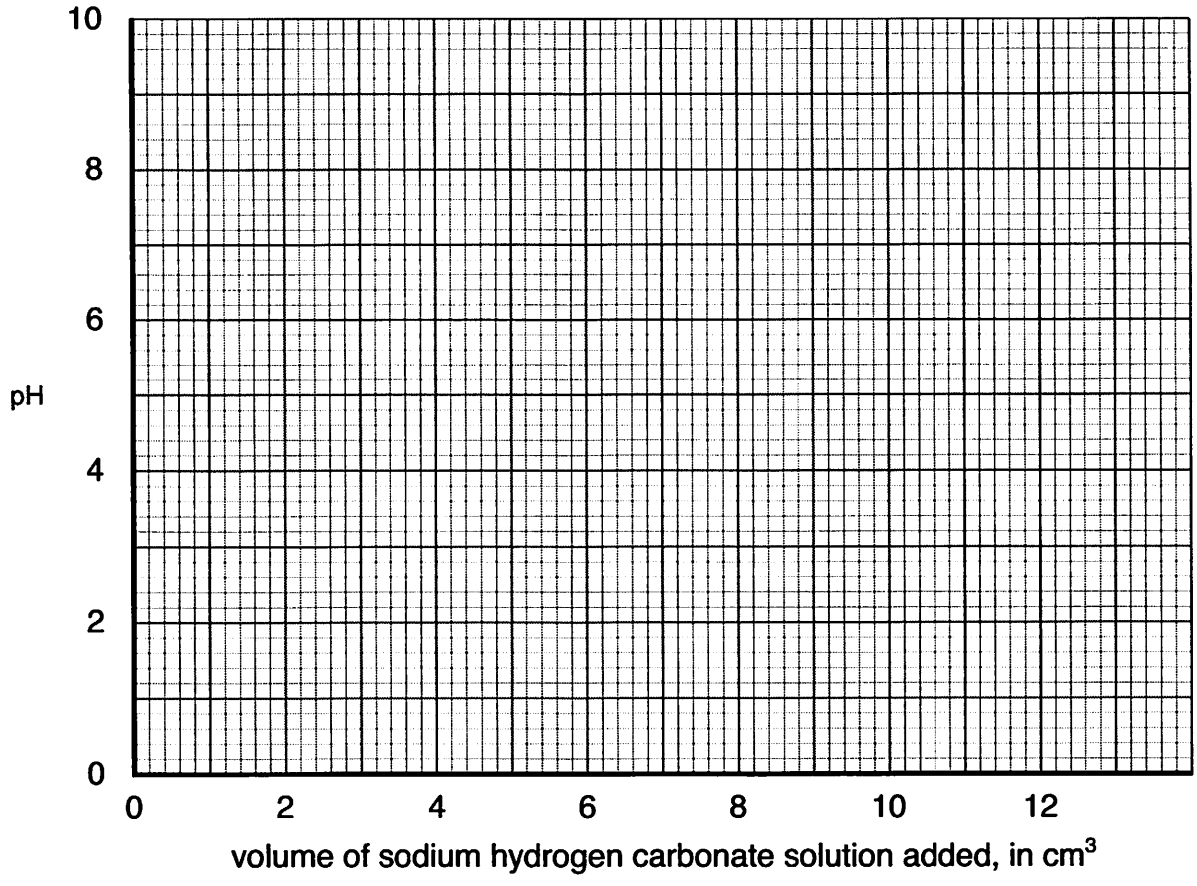
(iii) a variable which needed to be controlled

..... (1)

Toby carried out a fair test and his results were as follows:

volume of sodium hydrogen carbonate solution added, in cm^3	pH of solution after reaction
0	3
2	5
4	7
6	8
8	8
10	8

(b) (i) Plot his results on the graph below. (2)



(ii) Draw a line or curve of best fit through the points. (1)

(c) (i) What is the pH of the vinegar used?..... (1)

(ii) How much sodium hydrogen carbonate was needed to produce a neutral solution?

..... (1)

(iii) What would be the pH of the resulting solution if 12 cm^3 of sodium hydrogen carbonate were added?

..... (1)

(d) (i) From the results of this experiment, what type of chemical is sodium hydrogen carbonate?

..... (1)

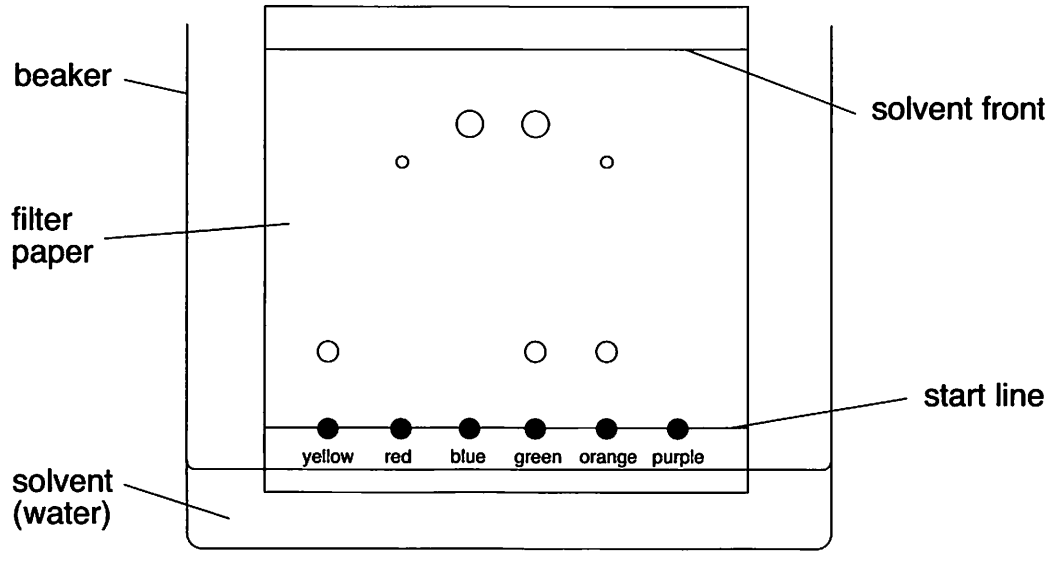
(ii) Name the type of reaction taking place.

..... (1)

8. Some pupils were investigating a set of felt-tip pens to see how the colours in them were made up.

They put a spot of each colour on a piece of filter paper and put this in a beaker of water.

Here are their results (purple is not shown):



(a) Name the method being used to study the colours.

..... (1)

(b) Which colours are made up of only one dye?

..... (1)

(c) How is the green felt-tip colour made up?

..... (1)

Each dye can be identified by its R_f value where

$$R_f = \frac{\text{distance the dye travelled (measured to the middle of the spot)}}{\text{distance the solvent has travelled (start line to solvent front)}}$$

(d) By taking measurements from the diagram, calculate the R_f value for the red dye.

.....

..... (2)

Purple is a mixture of two colours.
One is red, the other has a R_f value of 0.8.

(e) Identify the other colour and mark the two spots in the correct places on the diagram.

The other colour is ..... (2)

The R_f value for the yellow dye is 0.2.

(f) What you would expect to happen to this value if

(i) the solvent had not been given time to move so far up the paper?

..... (1)

(ii) a different solvent were used?

..... (1)

TURN OVER FOR QUESTION 9

9. Some pupils carried out two investigations mixing a solid with a liquid.
They recorded in the table below what they did and what happened.

experiment	
A	Some salt (sodium chloride) was added to water and stirred until it dissolved.
B	Some powdered zinc was added to some dilute sulphuric acid. It fizzed and disappeared.

(a) In experiment A, name the

(i) solvent ..... (1)

(ii) solute ..... (1)

(b) In experiment B,

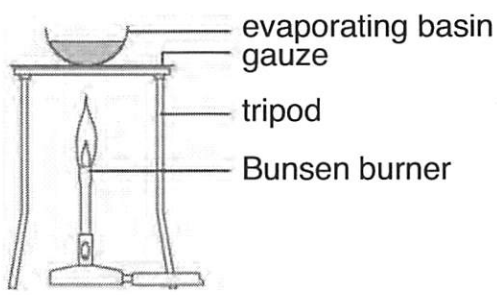
(i) name the gas produced ..... (1)

(ii) give a test for the gas

test: .....

result: ..... (2)

Both of the resulting solutions were heated gently to evaporate the water and, in both cases, white crystals were produced.



(c) In each case would the crystals weigh more, weigh the same or weigh less than the mass of the original solid added?
Underline the correct answer.

(i) experiment A: **more** **same** **less** (1)

(ii) experiment B: **more** **same** **less** (1)

(Total marks: 60)