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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

LEVEL 2

CHEMISTRY

Tuesday 28 January 2014

Please read this information before the examination starts.

- This examination is 40 minutes long.
- The 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 sentences.

(a) The most common gas in the atmosphere is

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

(b) The gas which relights a glowing splint is

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

(c) When copper is heated strongly in an open dish, its mass will

decrease **increase**

increase and then decrease **stay the same**

(d) Water is best described as

an atom **a compound** **an element** **a mixture**

(e) The name given to the liquid which passes through filter paper is

filtrate **residue** **solute** **solvent**

(f) When heated, copper carbonate turns into copper oxide and carbon dioxide. This is an example of

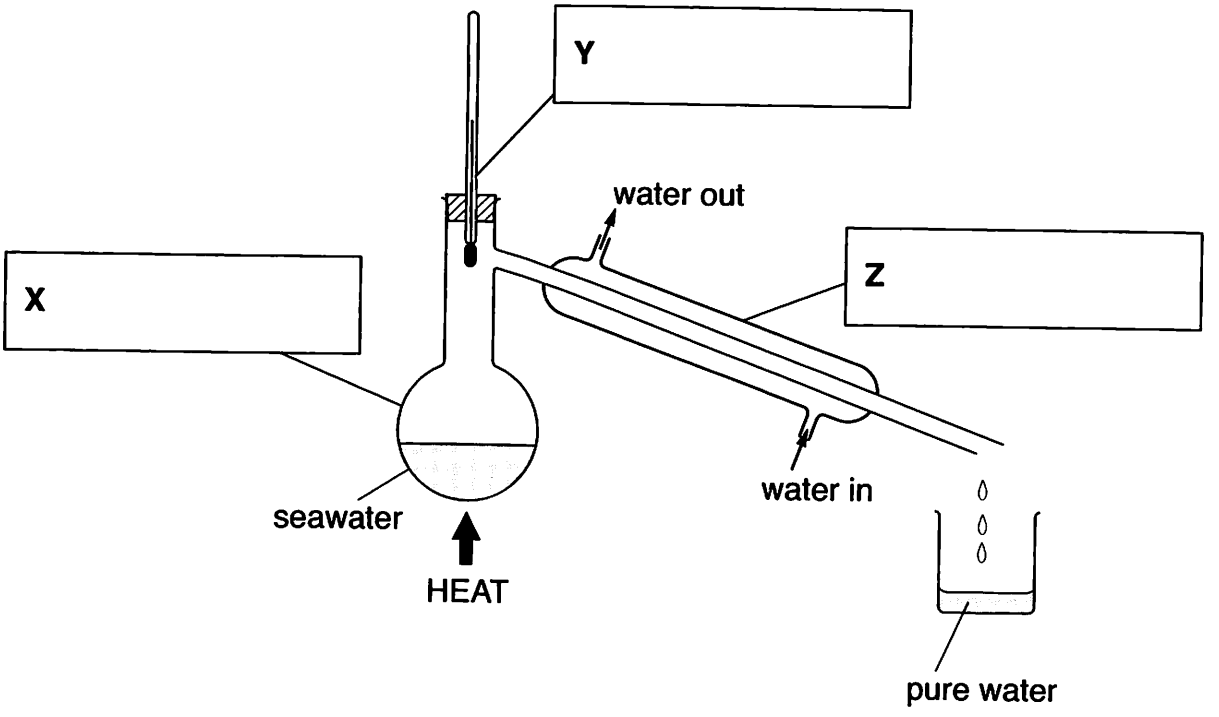
decomposition **displacement** **oxidation** **reduction**

(g) The chemical symbol for sodium is

K **Na** **S** **So**

(7)

2. The apparatus below can be used to obtain pure water from seawater.



(a) Label the pieces of apparatus **X**, **Y** and **Z** on the diagram. (3)

(b) Name this type of experiment. ..... (1)

(c) State the maximum reading (with its unit) on apparatus **Y** during the experiment.

..... (1)

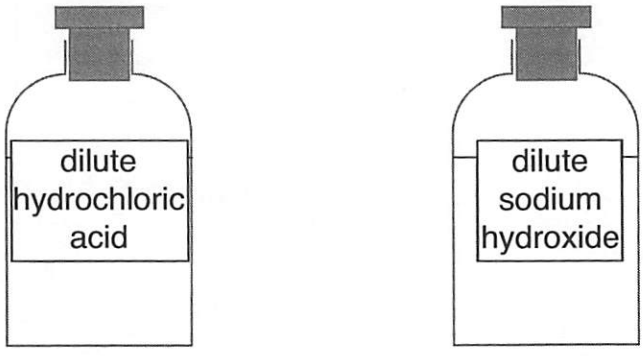
(d) When this apparatus is used to separate a mixture of alcohol and water, it does not separate the mixture as effectively.

Suggest a reason for this.

.....

..... (1)

3. Myles and Chloe were learning about acids and alkalis in school.



They were given some hydrochloric acid and some sodium hydroxide solution.

Their teacher told them that the chemicals had been diluted with water for safety reasons.

(a) (i) What is the approximate pH of hydrochloric acid? ..... (1)

(ii) What is the approximate pH of sodium hydroxide? ..... (1)

They carried out an investigation to establish how much the two chemicals had been diluted.

They added different volumes of the two chemicals together and measured the pH of the solutions formed.

(b) (i) What type of reaction occurs between these two chemicals?

..... (1)

(ii) Write the word equation for the reaction.

..... (3)

Their results are shown below.

(One result is missing.)

volume of hydrochloric acid, in cm^3	volume of sodium hydroxide, in cm^3	pH
10	10	3
10	20	7
10	30	

(c) Suggest how the pH could have been measured.

.....

..... (2)

(d) (i) Which is the independent variable in this investigation?

..... (1)

(ii) Predict the pH value of the missing result. ..... (1)

(e) (i) Using the results, state which chemical is the most dilute.

..... (1)

(ii) Explain your answer.

.....

..... (1)

4. Butane is a hydrocarbon gas which is used for portable heaters.
It is stored under pressure in canisters like the one shown below.



(a) Which elements are present in any hydrocarbon?

..... (1)

(b) Name the two compounds formed when butane burns in a good supply of air.

1: ..... (1)

2: ..... (1)

(c) Explain why it is very dangerous to burn butane in a heater which does not have a good supply of air.

.....

..... (2)

(d) Suggest a way in which you could measure how much butane had been burnt during a day's use of a portable heater.

.....

.....

..... (2)

In the pressurised canister, the butane is present as a liquid.

When the valve is opened, the butane changes to a gas and is pushed out of the canister.

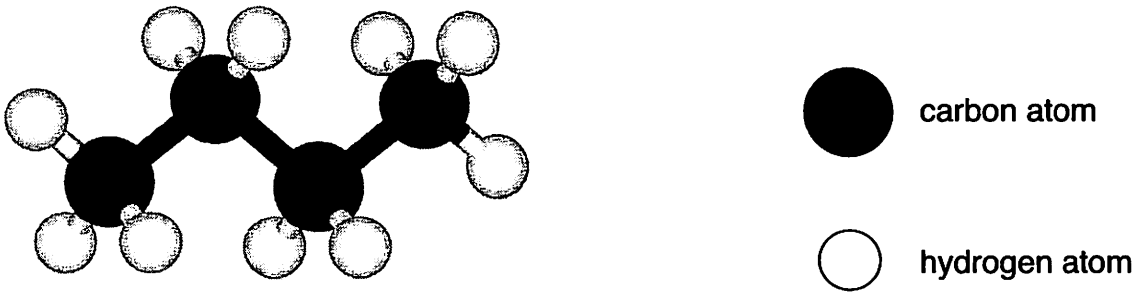
(e) Describe, in terms of particles, what happens to the butane as it changes from a liquid into a gas.

.....

.....

..... (2)

A butane molecule looks like this:



(f) Complete the formula of butane:

C_4H..... (1)

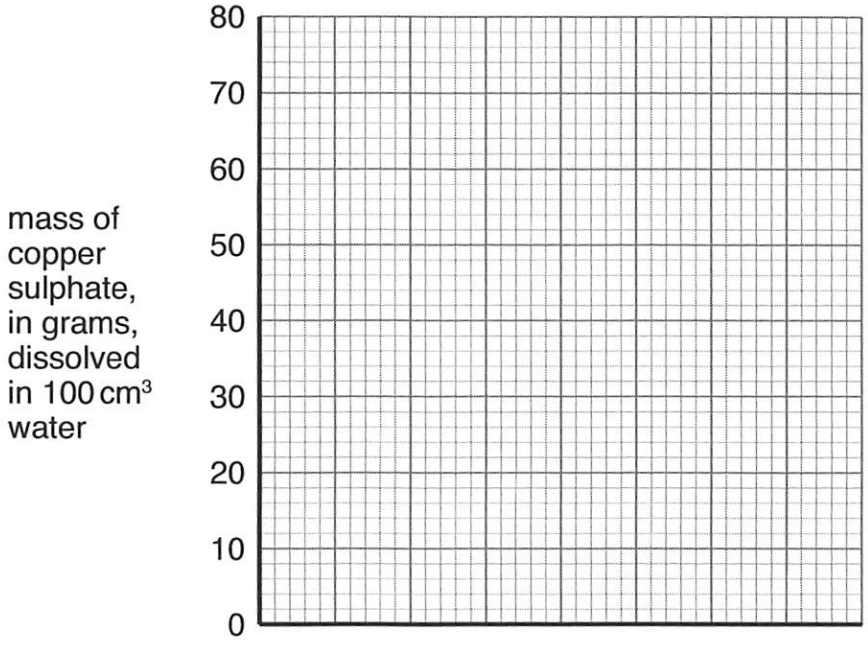
5. Ben measured how much copper sulphate dissolved in 100 cm^3 water at different temperatures.

He obtained the following results:

temperature, in °C	mass of copper sulphate dissolved, in grams per 100 cm^3 water
20	32
30	36
40	43
50	45
60	62
70	74

(a) (i) On the graph below, label and insert a suitable scale on the horizontal axis. (1)

(ii) Plot his results on the axes below. (2)



(iii) One result does not fit the pattern. Circle that point on the graph. (1)

(iv) Draw a line or curve of best fit. (1)

(b) Describe in words how the solubility of copper sulphate varies with temperature.

.....

.....

..... (2)

(c) (i) What mass of copper sulphate would dissolve in 100 cm^3 of water at 55 °C?

..... (1)

(ii) Ben added 80 grams of copper sulphate to 200 cm^3 of water.
At what temperature would all the copper sulphate dissolve?

Show your working.

.....

..... (2)

(d) Copper sulphate is a blue solid.

Describe what Ben would see if he added 50 grams of copper sulphate to 100 cm^3 water at room temperature (20 °C) and stirred the solution.

.....

..... (2)

6. Metals have many very important uses in the modern world.

In choosing a particular metal for a particular use we need to consider, amongst other things, its:

- strength
- density
- cost
- reactivity
- thermal and electrical conductivity

Choose TWO appropriate properties to explain why:

(a) plumbers use copper for water pipes

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.....

..... (2)

(b) engineers use iron for building bridges

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.....

..... (2)

(c) car manufacturers coat car bodies with zinc

.....

.....

..... (2)

(d) builders use lead for roofs

.....

.....

..... (2)

7. The police have been given a ransom note and have given it to their forensic scientists to find out who wrote it.



They have managed to extract a sample of the ink from the ransom note.

They also obtained ink from the pens of three suspects.

(a) Give the name of a procedure they could use to find out which pen might have been used to write the note.

..... (1)

(b) Explain how they would set about identifying which suspect is guilty.

You should include a labelled diagram in the space below.

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..... (4)

(You may continue over the page if required.)

(Total marks: 60)