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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

CHEMISTRY

Tuesday 26 January 2010

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:

(a) The most common gas in the atmosphere is

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

(b) A substance which forms a solution in water with a pH of 7 is

carbon dioxide **salt** **sodium oxide** **sulphur dioxide**

(c) An example of an element is

air **brass** **copper** **sugar**

(d) The process which takes place when potassium permanganate is heated is

burning **decomposition** **dissolving** **neutralisation**

(e) To test for oxygen you should use

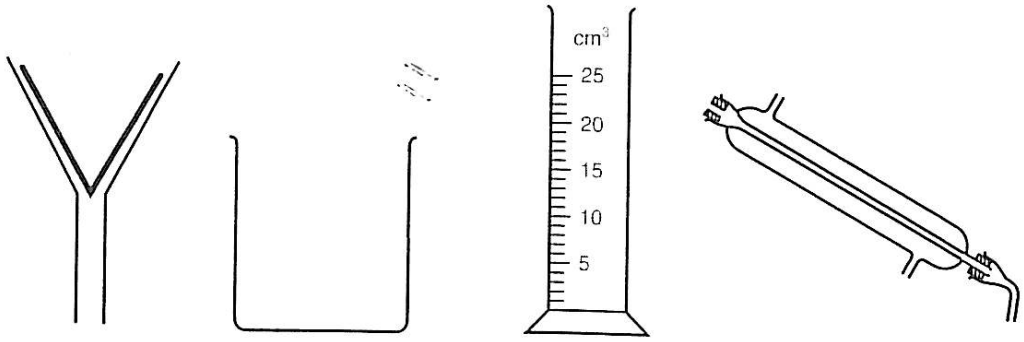
a glowing splint **anhydrous copper sulphate** **lime water** **a lit splint**

(f) Magnesium is a

compound **metal** **mixture** **non-metal**

(6)

2. The drawings below show various pieces of apparatus which you would find in a chemistry laboratory.



A B C D

Choose the apparatus **A**, **B**, **C** or **D** which you would use when

(a) mixing two liquids together ☐

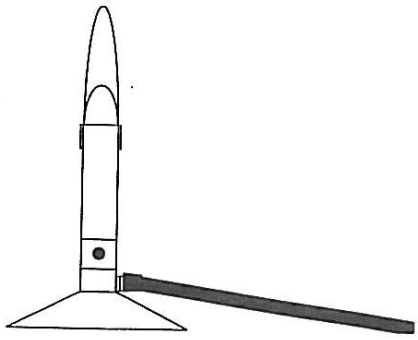
(b) separating an insoluble solid from a liquid ☐

(c) measuring a particular volume of liquid ☐

(d) obtaining pure water from sea water ☐

(4)

3. Below is a diagram of a Bunsen burner.



(a) Label the diagram with a cross (✗) to show the hottest part of the flame. (1)

(b) Which colour should the flame be when used for heating?

..... (1)

(c) Which colour should the flame be when it is not being used?

..... (1)

4. Jennifer carried out a chromatography experiment to find out how many coloured dyes were present in some boiled sweets.

(a) Rearrange the following sentences to show the order in which she should have carried out her experiment.

A Put the chromatography paper in water.

B Crush the sweets.

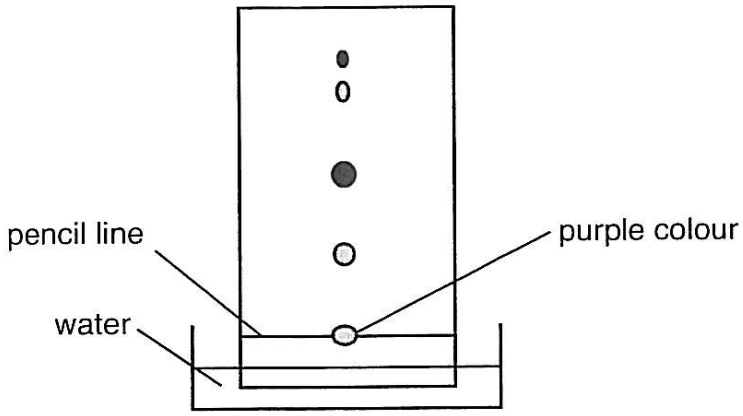
C Put some of the sweet mixture onto the chromatography paper.

D Add water to the sweets.

order: ☐ ☐ ☐ ☐ (2)

step 1 step 2 step 3 step 4

The result of her experiment is shown below:



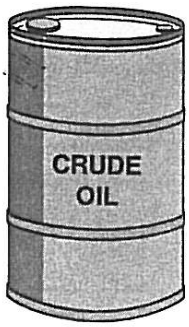
(b) Why is the line at the bottom of the paper drawn in pencil rather than with a pen?

..... (1)

(c) How many coloured dyes were used to make the purple sweet? ..... (1)

(d) Circle the spot on the diagram which is the **least soluble** dye. (1)

5. Crude oil is a fossil fuel.
It is used to make petrol for cars and many other useful products.



(a) Name one other type of fossil fuel.

..... (1)

(b) Which two products are released when petrol is burned in plenty of air?

product 1: .....

product 2: ..... (2)

(c) Some cars now use hydrogen as a fuel, as it is better for the environment.

(i) Why is burning petrol harmful to the environment?

..... (1)

(ii) Why is burning hydrogen less harmful to the environment?

.....

..... (2)

(iii) Give a possible disadvantage of hydrogen as a fuel.

..... (1)

6. Limestone is made of calcium carbonate.

(a) Underline the word which best completes the following sentence:

Calcium carbonate is

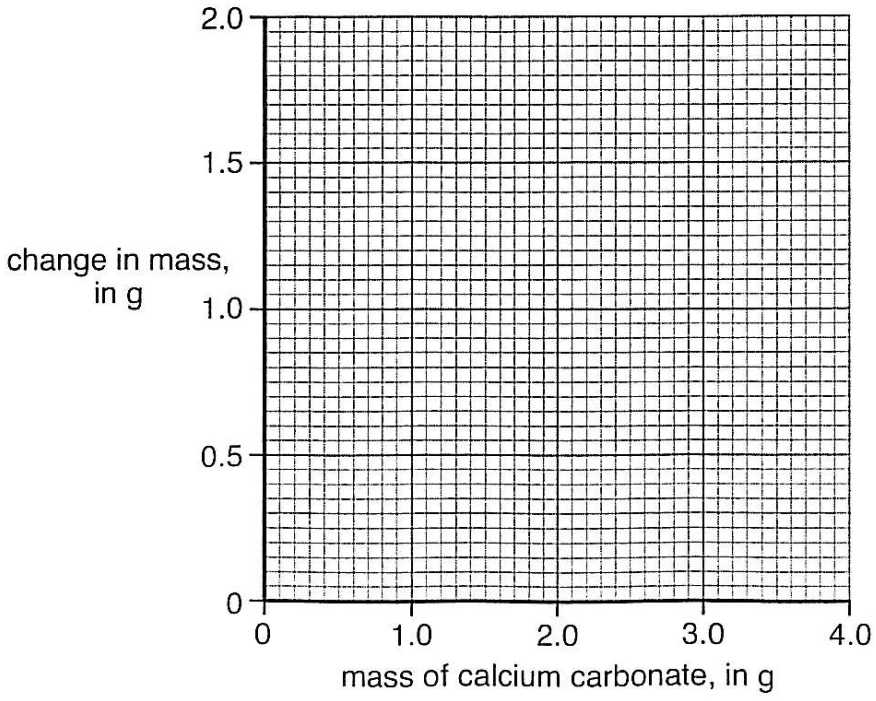
an atom **a compound** **an element** **a mixture** (1)

A class was asked to heat some samples of pure calcium carbonate.
They discovered that each sample lost mass during the experiment.
The results for the class are recorded in the table below.

mass of calcium carbonate, in g	mass at the end of the experiment, in g	change in mass, in g
1.00	0.55	0.45
1.80	1.00	0.80
2.80	1.55	1.25
3.50	2.10	1.40
4.00	2.25	

(b) (i) The change in mass for the last experiment has been left blank.
Work it out and put your answer in the space in the results table above. (1)

(ii) Plot these results onto the graph below. (2)



(iii) One of the results does not fit the pattern of the others.

Circle this point on your graph and suggest a reason why it does not fit the pattern.

.....

..... (2)

(iv) Draw a best fit line through the points on your graph. (1)

(c) During this experiment, carbon dioxide gas was formed.

Describe the test which you would use to show that the gas was carbon dioxide.

test: .....

result: ..... (2)

A sample of natural limestone was found to consist of 75% calcium carbonate and 25% sand.

The sand is not affected by heating.

(d) What would be the change in mass when 2.00 g of this natural limestone was heated?

Show your working.

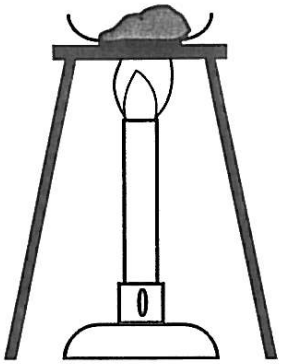
.....

..... (2)

7. Here is part of the reactivity series:

most reactive	**iron**
	lead
least reactive	**copper**

Lead oxide powder was mixed with iron filings and heated strongly.
Some silvery beads of metal appeared.



(a) (i) How could you show that the beads were a metal?

..... (1)

(ii) Which metal were they likely to be?

..... (1)

A similar experiment was carried out, using copper powder instead of iron filings.

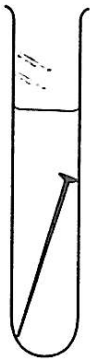
(b) Would you expect to see the shiny beads form now?
Give a reason for your answer.

.....

..... (2)

An iron nail was put in some copper sulphate solution.

It became covered in a pink-brown solid and the solution turned from blue to green.



(c) (i) What was the pink-brown solid?

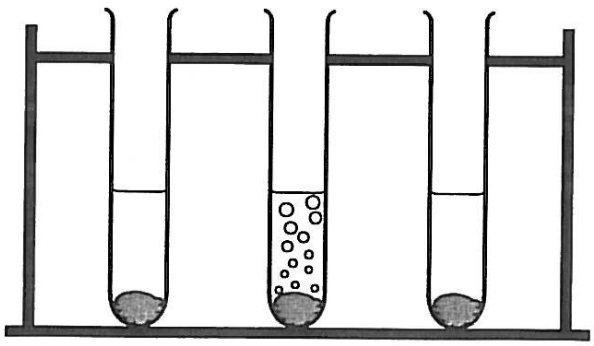
..... (1)

(ii) What was the name of the green solution?

..... (1)

In another investigation, powders of each of the three metals were put separately into sulphuric acid.

Only one of them reacted, giving off a gas.



(d) (i) Name the metal which reacted.

..... (1)

(ii) Name the gas produced when the reaction took place.

..... (1)

8. Simon was comparing the strength of three different acids, **A**, **B** and **C**.

In each case he dropped a 2-cm strip of magnesium ribbon into a beaker containing 20 cm^3 of the acid.

The time taken for the magnesium to react completely was measured.

acid	time taken, in seconds
A	30
B	15
C	76

(a) (i) State two ways in which Simon carried out a fair test.

1: .....

2: ..... (2)

(ii) Give two other ways in which he could have ensured that the experiment was a fair test.

1: .....

2: ..... (2)

(iii) Give two safety precautions which Simon should have used.

1: .....

2: ..... (2)

(b) (i) Simon believed that the stronger the acid, the less time it would take to react completely with the magnesium ribbon.

According to this idea, state which of **A**, **B** or **C** you think is

the strongest acid ☐

the weakest acid ☐

(2)

(ii) Explain carefully another test which Simon could carry out to identify the strongest acid.

Make sure that you describe any changes which he might see.

.....

.....

..... (2)

Citric acid is found in lemons.

It dissolves in water.

Simon tried to separate the citric acid from lemon juice using filtration.

(c) Explain, in terms of particles, why filtration would not work.

.....

..... (2)

(d) Simon thought that he might try simple distillation to obtain the citric acid.

(i) Draw a labelled diagram of the apparatus which he could use.

(3)

(ii) Simon found that his distillate was pure water instead of citric acid.

Suggest a possible reason for this.

..... (1)

(Total marks: 60)