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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

CHEMISTRY

Tuesday 7 June 2011

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 majority of the elements are

gases **liquids** **metals** **non-metals**

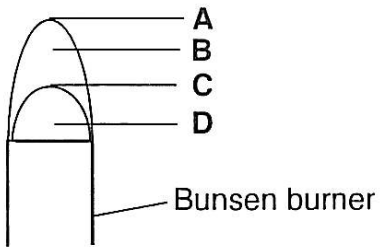
(b) Sea water is best described as

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

(c) A gas not usually found in air is

carbon dioxide **hydrogen** **oxygen** **water vapour**

(d) In the Bunsen burner flame shown below,



the highest temperature will be at the position marked

A **B** **C** **D**

(e) The word used to describe the change from gas to liquid is

condensing **evaporating** **freezing** **subliming**

(5)

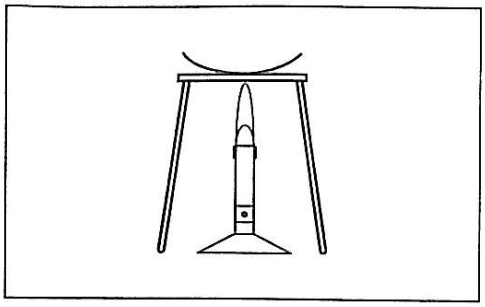
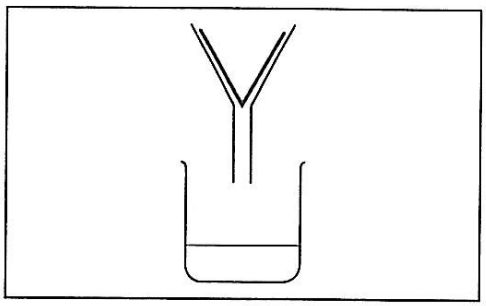
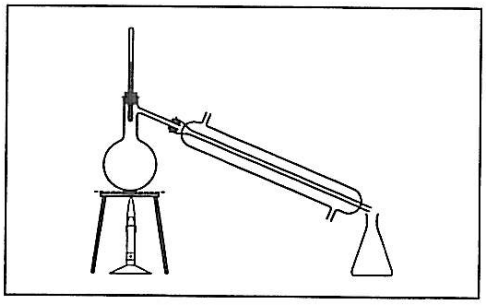
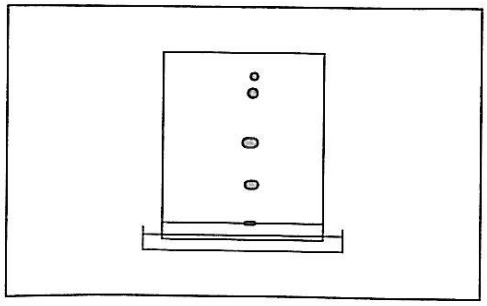
2. Fill in the blanks in the following word equations:

(a) magnesium + oxygen → ..... (1)

(b) copper oxide + carbon → ..... + carbon dioxide (1)

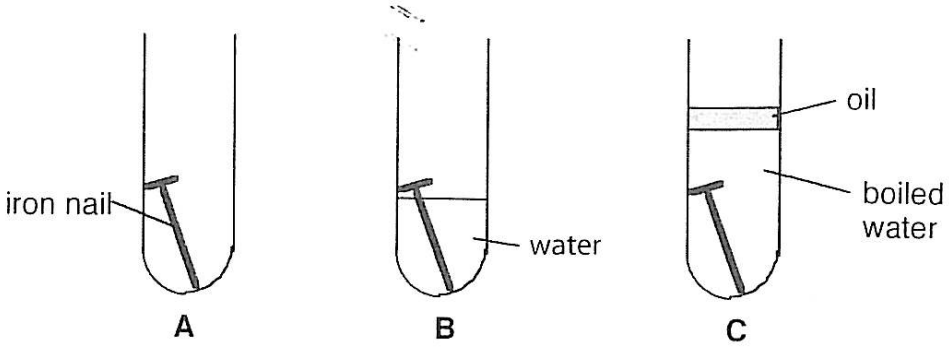
(c) magnesium + hydrochloric acid → ..... + hydrogen (1)

3. Use four lines to link the four separations with the apparatus which would best be used for that purpose.

separation	apparatus
obtaining pure water from sea water	
separating the dyes in Universal Indicator	
obtaining salt from sea water	
separating salt and sand after mixing with water	

(3)

4. Toby carried out an experiment to see which conditions caused rusting of iron to occur.
He placed three nails in test tubes, labelled **A**, **B** and **C**.
He left them for two weeks as shown in the diagram below.



(a) (i) Suggest in which tube the iron nail would rust the most. ..... (1)

(ii) Explain your reasoning.

.....

..... (2)

(b) (i) State one way in which Toby's experiment was a fair test.

..... (1)

(ii) Give one other way in which Toby could ensure his experiment was a fair test.

..... (1)

(c) Galvanised nails are often sold for outdoor use.
These nails are coated in zinc which protects the iron from rusting.
Give two reasons why coating the nails in zinc protects them from rusting.

1: .....

2: ..... (2)

5. Coal and natural gas are both fossil fuels.

Both can be used to heat our homes.

Fifty years ago, coal was used much more commonly, but nowadays natural gas is used much more than coal for this purpose.

(a) Explain the term *fossil fuel*.

.....

..... (2)

(b) Give two advantages of natural gas over coal as a fuel.

1: .....

2: ..... (2)

(c) Natural gas consists mainly of the hydrocarbon, methane.

When it burns completely in air, two compounds are formed.

Name the two compounds formed.

1: .....

2: ..... (2)

(d) Describe the environmental consequences of one named gas formed by burning fossil fuels, such as coal and natural gas.

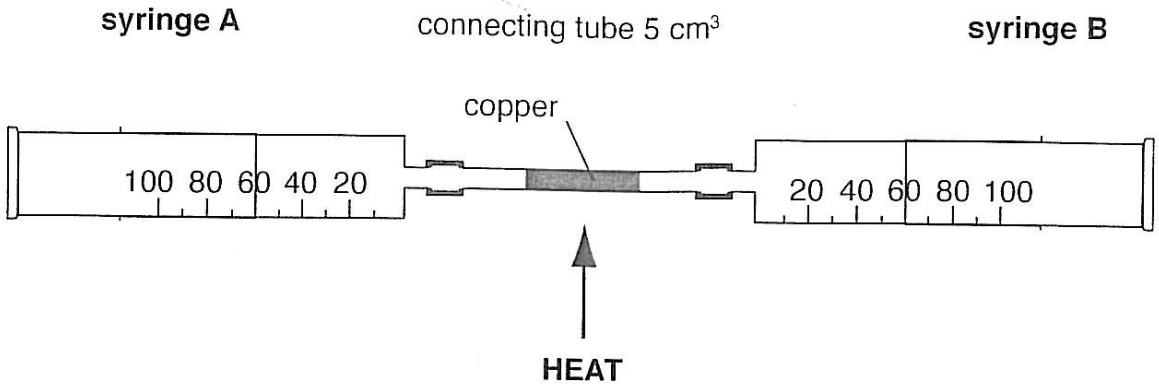
.....

.....

..... (3)

6. Tom's teacher was showing his class an experiment to find out the percentage of oxygen in the air.

He set up the apparatus below, which consisted of two gas syringes connected by a tube containing copper powder.



The teacher told the class that the volume of air in the connecting tube was 5 cm^3.

He also told them that the copper would react with the oxygen in the air.

(a) (i) Calculate the total volume of air in the whole apparatus at the start of the experiment.

..... (1)

(ii) Suggest a way in which the teacher could have worked out that the volume of the connecting tube was 5 cm^3.

.....

..... (1)

The teacher then started to heat the copper and repeatedly passed the air over it from one side to the other for a few minutes.

He then allowed the apparatus to cool down.

When it had cooled down, he found that:

- the pink-brown copper powder had turned black
- the volume of air had reduced to leave a total volume of 100 cm^3

(b) (i) Suggest why he used copper *powder* in this experiment.

..... (1)

(ii) Name the black powder formed on the copper powder.

..... (1)

(iii) Suggest why he let the apparatus cool down before measuring the volume of gas left.

..... (1)

(iv) Use these results to work out the volume of oxygen used in the reaction.

..... (1)

(v) Show that the percentage of oxygen in the air is 20%.

.....

.....

..... (2)

(c) Name the main gas left behind in the syringes after the reaction had occurred.

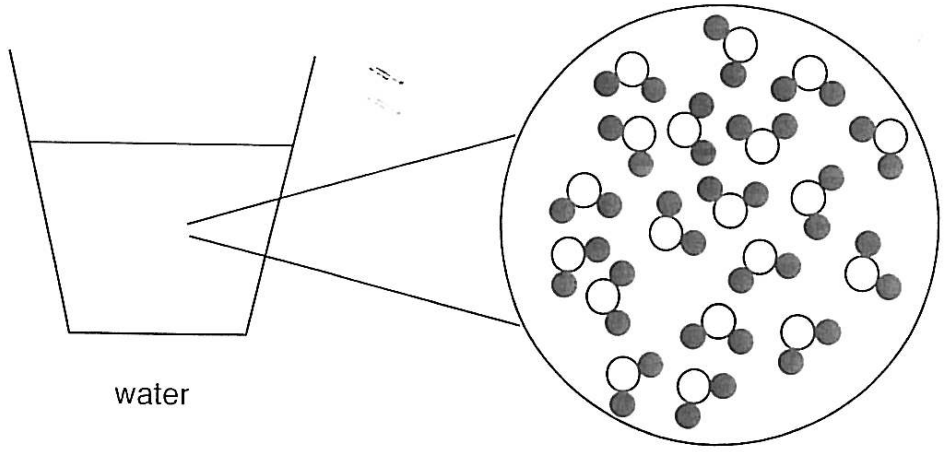
..... (1)

The teacher pointed out to the class that not all the copper had reacted.

(d) Explain why not all the copper had reacted.

..... (1)

7. The diagram below shows molecules of water present in a glass of water.



● hydrogen atom

○ oxygen atom

(a) Suggest how you can tell from the molecules in the diagram that

(i) water is a compound

.....

..... (2)

(ii) water is a liquid

.....

..... (2)

(iii) the water is pure

..... (1)

(b) Describe what happens to the water molecules when the water is cooled to 0 °C.

.....

.....

..... (2)

(c) When 1 cm^3 of water is boiled, the volume of steam produced is about 3000 cm^3.

(i) State the temperature, in °C, at which water boils.

..... (1)

(ii) Explain, in terms of the molecules, why there is such a large increase in volume when water turns into steam.

.....

..... (1)

Water and alcohol are both colourless liquids.

(d) If you were given two test tubes, one containing water and one containing alcohol, describe a chemical test which would tell you which tube contained water.

test: .....

result: ..... (2)

8. Rachel examined the labels of a number of items she found in her family's kitchen cupboards in order to find out their active ingredients.

She then measured the pH values of these items and her findings are shown below.

item	active ingredient	pH value
white vinegar	ethanoic acid	3
baking powder	sodium hydrogencarbonate	9
oven cleaner	sodium hydroxide	14
lemon juice	citric acid	4

(a) Describe how Rachel might have measured the pH values above.

.....

..... (2)

(b) Name the substance which is the most acidic. ..... (1)

The oven cleaner came with strict safety instructions for its use.

(c) (i) Suggest one of these safety instructions.

..... (1)

(ii) Explain why this safety instruction is necessary.

..... (1)

Rachel placed some lemon juice in a glass and added baking powder to it until the solution had a pH value of 7.

She noticed that the solution fizzed, giving off carbon dioxide gas.

(d) (i) Name the type of reaction which occurred.

..... (1)

(ii) Suggest how she could have proved the gas was carbon dioxide.

test: .....

result: ..... (2)

(iii) The remaining liquid was a solution of a salt called sodium citrate.
Suggest how Rachel could obtain some solid sodium citrate from this solution.

..... (1)

(e) Baking powder is added to flour in order to make cakes rise.



When baking powder is heated in an oven, the following reaction occurs:

sodium hydrogencarbonate → sodium carbonate + carbon dioxide + water

(i) Name the type of reaction which occurs.

..... (1)

(ii) Explain why this reaction makes cakes rise.

.....

..... (1)

(f) Name the four elements present in baking powder.

..... (1)

(Total marks: 60)