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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

CHEMISTRY

Tuesday 8 June 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 number of chemical elements is about

1 **10** **100** **1000**

(b) When calcium carbonate is heated strongly, carbon dioxide gas is produced.
This is an example of

decomposition **displacement** **neutralisation** **reduction**

(c) When an iron nail is put into a solution of copper sulphate, the nail turns pinkish-brown.
This is because it forms

copper **iron sulphate** **rust** **sulphur dioxide**

(d) When magnesium is added to dilute acid, the gas given off is

air **hydrogen** **nitrogen** **oxygen**

(e) The amount of air entering a Bunsen burner is adjusted by turning the

base **chimney** **collar** **jet**

(5)

2. (a) Look at the list of eight substances below:

brass	**carbon dioxide**	**hydrogen**	**lead**
nitrogen	**oxygen**	**sea water**	**sugar**

Put each of these substances into the table below, classifying them as elements, compounds or mixtures:

elements	compounds	mixtures

(4)

3. Paul was given four different colourless liquids and was told to carry out two tests on each liquid.

The results of his tests are shown below.

liquid	addition of anhydrous copper sulphate	was there a solid residue when the liquid was evaporated?
A	turned blue	yes
B	stayed white	no
C	stayed white	yes
D	turned blue	no

(a) Which liquid, **A**, **B**, **C** or **D**, could have been

(i) pure water? ☐ (1)

(ii) sea water? ☐ (1)

(iii) pure alcohol? ☐ (1)

(iv) a solution of sugar in alcohol? ☐ (1)

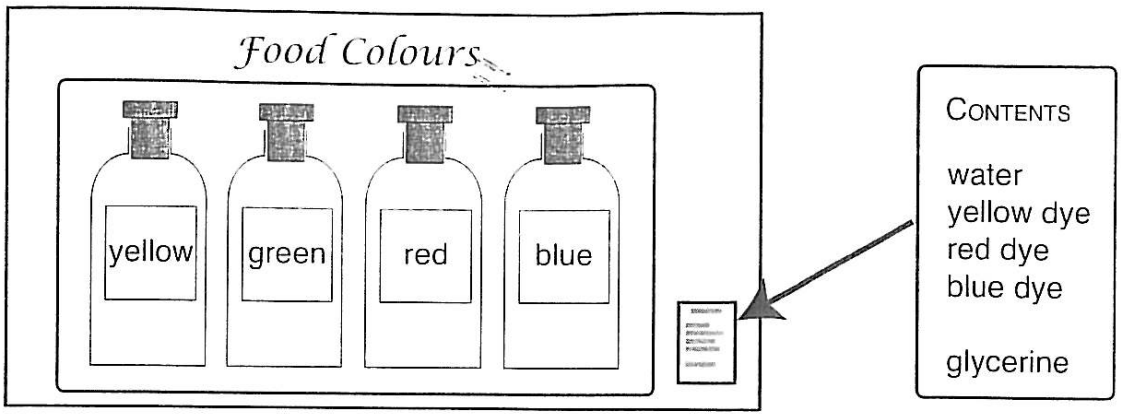
(b) Pure alcohol boils at 78 °C and burns very readily.

Suggest a safe method which Paul could have used to heat the solution of sugar in alcohol in order to evaporate the alcohol.

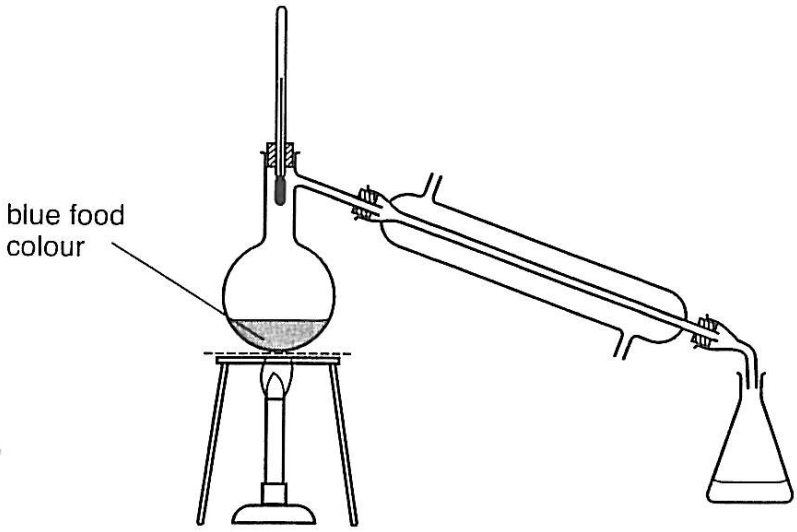
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..... (1)

4. Amanda bought a packet of four food colours in the supermarket.
When she brought it home, she looked at the label of contents on the packet.



She decided she would carry out some experiments to see if the label was correct.
She first took some of the blue food colour and heated it in the apparatus below.



She found that when the thermometer read 100 °C, a colourless liquid was collected in the flask and the blue food colour became darker.

(a) (i) What name is given to this type of experiment?

..... (1)

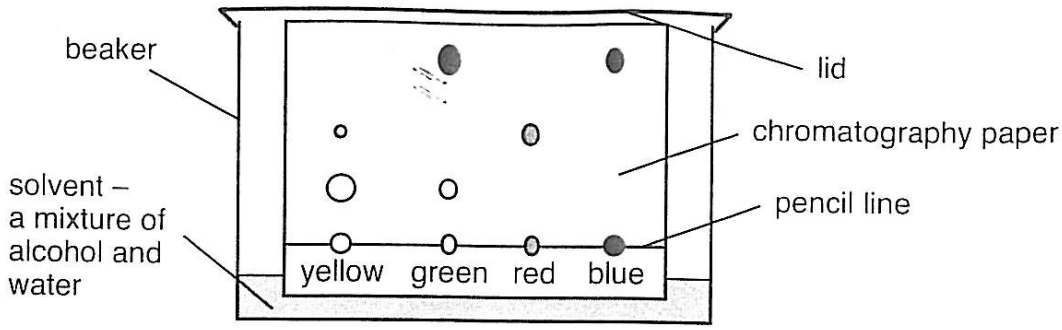
(ii) What conclusion could she make from the thermometer reading?

..... (1)

(iii) Why did the food colour become darker?

..... (1)

(b) She then set up a chromatography experiment using the four food colours; her results are shown below.



(i) Which food colours contain only one dye?

..... (1)

(ii) Which dyes were present in the green food colour?

..... (1)

(iii) Which dye is the most soluble in the solvent?

..... (1)

(c) (i) Why did she put a lid on her beaker in this experiment?

..... (1)

(ii) Why did she draw the line in pencil?

..... (1)

(d) Amanda was surprised to find the yellow food colour split into two spots.
Suggest why there are two spots.

..... (1)

(e) Suggest a reason why Amanda's experiments were not able to show that glycerine was present in the food colours.

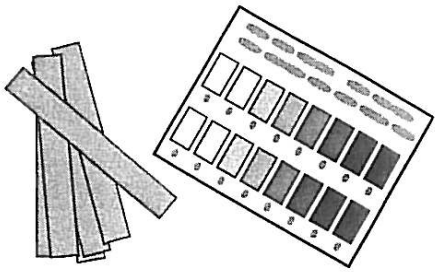
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..... (1)

5. It is very important for farmers to control the pH of their soil if they are to grow crops successfully.

To measure the pH of their soil, they take a sample of soil and mix it with water.

They then test the pH with a kit, like the one below.



(a) (i) What type of substance do these kits contain?

..... (1)

(ii) How does the farmer obtain a value for the pH from the kit?

..... (1)

(iii) State two things the farmer must do when sampling his soil from a large field to make sure that his results are reliable.

1: .....

2: ..... (2)

Farmers often use agricultural lime to help them control the pH of their soil, so that it does not become too acidic.



When lime is shaken with water in a test tube, the liquid goes very cloudy.

When this is left for a while, the liquid goes clear and a white layer of solid is formed at the bottom of the tube.

(b) (i) What does this tell you about the solubility of lime?

..... (1)

(ii) Why is this important when spreading lime on fields?

..... (1)

(iii) How could you separate the white layer of solid in the test tube?

..... (1)

When the liquid from the test tube is tested with Universal Indicator, it turns purple.

(c) (i) What does this tell you about the lime?

..... (1)

(ii) What type of chemical reaction occurs between the lime and the soil?

..... (1)

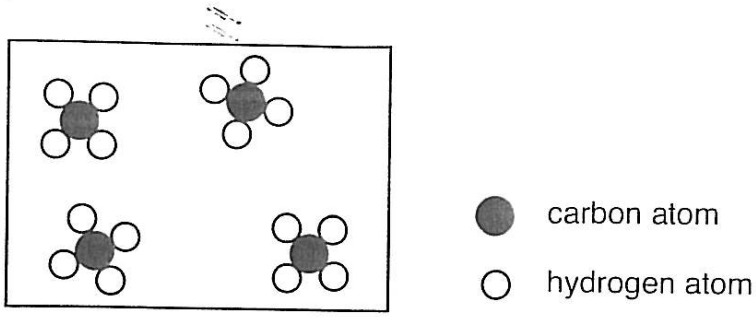
(iii) What will happen to the pH value of the soil when the lime is added?

..... (1)

6. Natural gas is a fossil fuel and is a very important source of energy in the world.

Natural gas consists mainly of the hydrocarbon **methane**.

The diagram below shows the arrangement of methane molecules in a sample of methane at room temperature.



(a) What do you understand by the words

(i) hydrocarbon? .....

..... (1)

(ii) molecule? .....

..... (1)

(b) When methane is cooled down to –162 °C, it turns into a liquid.

(i) What name is given to the temperature at which a gas turns into a liquid?

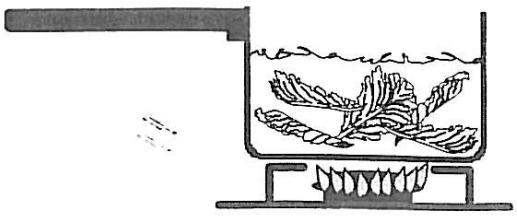
..... (1)

(ii) Describe how the arrangement of molecules changes when methane gas changes into a liquid.

.....

..... (2)

Many people use natural gas for cooking at home.



When a saucepan of cold water is placed on a gas stove and the gas is lit, a mist of water droplets is seen on the outside of the saucepan.

After a short while the mist disappears.

(c) (i) Which gas in the air is essential to allow the methane to burn?

..... (1)

(ii) Explain why droplets form on the **outside** of the cold saucepan.

.....

..... (2)

(iii) Explain why the droplets soon disappear.

..... (1)

(d) The burning of natural gas produces carbon dioxide.

(i) Give a test which proves that a sample of burnt natural gas contains carbon dioxide.

test: .....

result: ..... (2)

(ii) Describe an environmental problem associated with the formation of carbon dioxide from burning natural gas.

.....

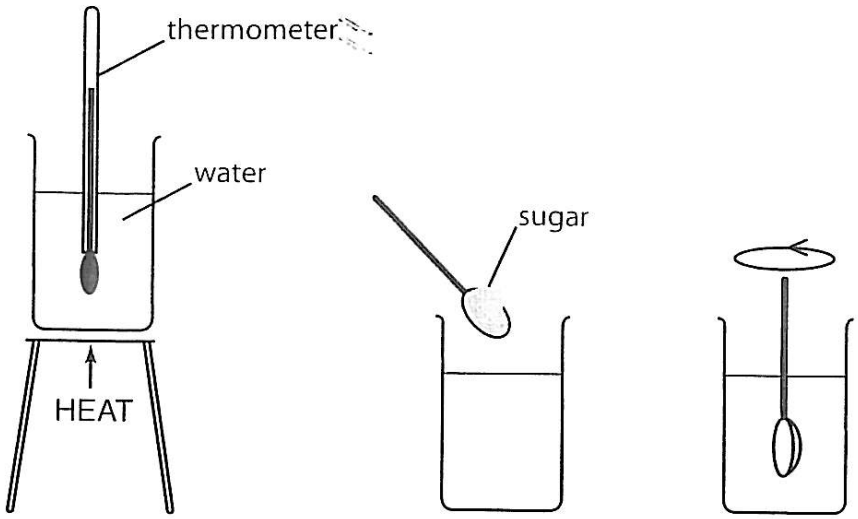
..... (2)

(iii) Name another polluting gas which can be formed when natural gas is burnt.

..... (1)

7. John always puts a spoonful of sugar in his tea to make it taste sweeter.

He decided to investigate how changing the temperature of the tea affected how quickly the sugar dissolved.



He heated some water until it reached a particular temperature.

He then removed the beaker from the heat, added a spoonful of sugar and stirred the mixture.

He timed how long it took for the sugar to dissolve.

(a) Why was it reasonable for him to use water rather than tea for this experiment?

..... (1)

(b) In this experiment, name the substance which is

(i) the solvent: ..... (1)

(ii) the solute: ..... (1)

(c) Suggest a way in which John could make sure he added **exactly** the same amount of sugar each time.

..... (1)

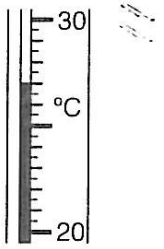
(d) State two other things which John could have done to make sure that his experiment was a fair test.

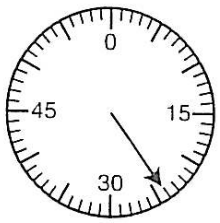
1: .....

2: ..... (2)

In one of his experiments, the thermometer reading and the stopclock reading are shown below.

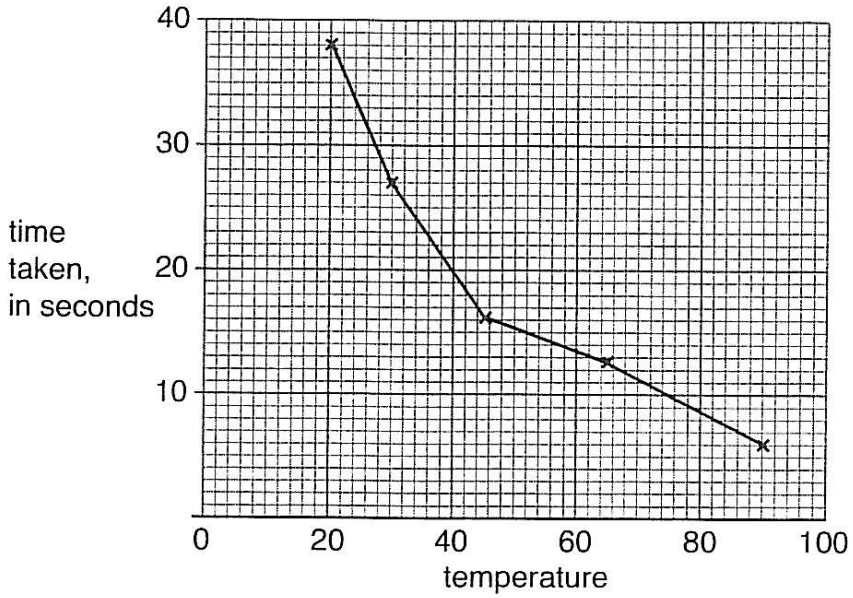
(e) Write in the values shown.





temperature = ... °C time = ... sec (2)

John collected his results and plotted the graph below.



(f) (i) State two mistakes which John made in drawing his graph.

1: .....

2: ..... (2)

(ii) Write a sentence to describe the conclusion you would make from John's experiment.

.....

.....

..... (2)

(Total marks: 60)