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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

SCIENCE

CHEMISTRY

Tuesday 2 November 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.

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

(a) An example of a non-metal is

aluminium **carbon** **magnesium** **zinc**

(b) An example of a solid at room temperature is

alcohol **mercury** **salt** **water**

(c) In the reaction

copper oxide + carbon → copper + carbon dioxide

the copper oxide has been

decomposed **neutralised** **oxidised** **reduced**

(d) A gas relit a glowing splint.

The gas could have been

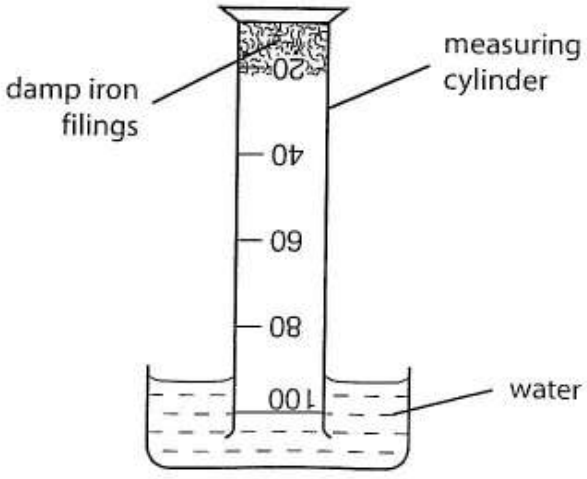
hydrogen **nitrogen** **oxygen** **sulphur dioxide**

(e) An oxide which has a pH value above 7 is

carbon dioxide **magnesium oxide**

sulphur dioxide **water** (5)

2. Samantha set up the following apparatus to find out how much of the air was needed for rusting.



After a week, the reaction was complete.

The iron reacted with a gas in the air to form rust.

(a) (i) Name the colour which iron filings would turn after a week had passed.

..... (1)

(ii) Give the chemical name for rust.

..... (1)

(b) Samantha started with 100 cm^3 of air in the measuring cylinder.

(i) What volume of gas would be in the cylinder after a week?

..... (1)

(ii) Explain your answer.

.....

..... (1)

(iii) Name the main gas left in the cylinder after a week.

..... (1)

(c) (i) Describe how the result of the experiment would differ if copper were used in place of iron.

.....

..... (2)

(ii) Give a reason for your answer.

.....

..... (1)

(d) Give two ways in which an iron object can be protected from rusting.

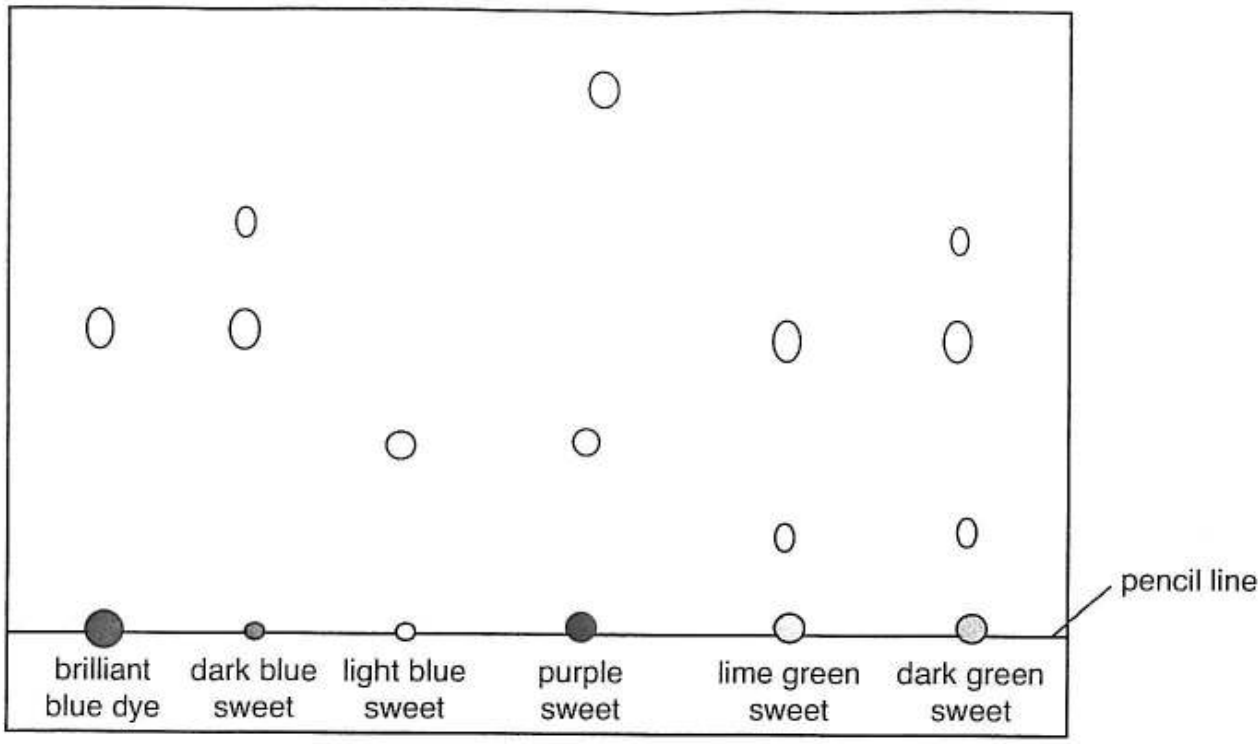
1: .....

2: ..... (2)

3. Andrew loves sweets but he knows he is allergic to brilliant blue dye.

When he was given a packet of coloured sweets which he had never tried before, he decided to use paper chromatography to see which sweets he could eat and which would be harmful.

The chromatogram he produced is shown below.



(a) Describe how Andrew could have removed the dyes from the sweets to place them on the paper.

.....

..... (2)

(b) Draw a labelled diagram of the apparatus he could use to perform the chromatography experiment.

(4)

(c) (i) Name the sweets which Andrew can eat safely.

..... (1)

(ii) Explain your answer.

..... (1)

(d) Name the sweet which contains the largest number of colours.

..... (1)

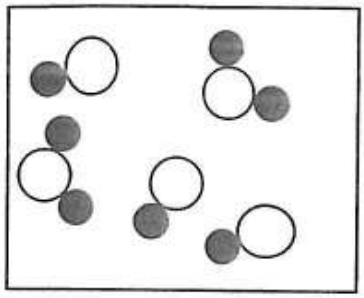
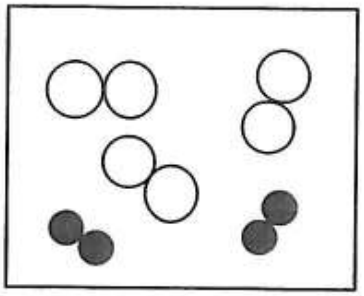
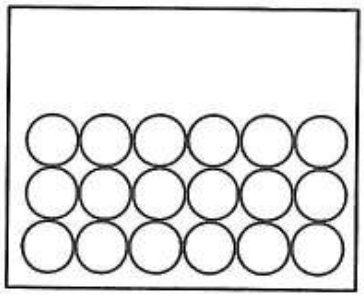
(e) Suggest how Andrew could identify the dye in the purple sweet which rose highest on the chromatography paper.

.....

.....

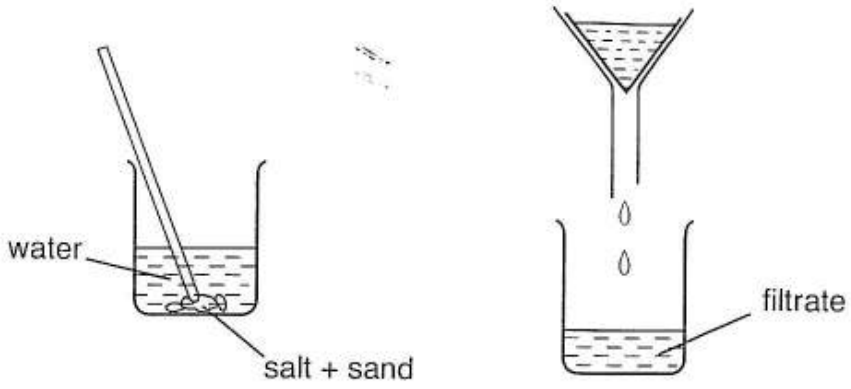
..... (2)

4. Draw a line from each of the descriptions below to the correct diagram.
You should draw **four** lines.

description	**diagram**
atoms of an element	
a mixture of elements	
a mixture of compounds	
a metal	

(4)

5. A mixture of salt and sand was added to some water.
The mixture was stirred and then filtered.



solute	solvent	solution	soluble	insoluble	dissolving

(a) Choose one word from the words in the box above which best describes the following:

(i) the water ..... (1)

(ii) the sand ..... (1)

(iii) the filtrate ..... (1)

(b) After the experiment, suggest how the following could be obtained:

(i) pure water

..... (1)

(ii) pure salt

..... (1)

(iii) pure sand

..... (1)

6. Petrol is a fossil fuel vital to modern life.

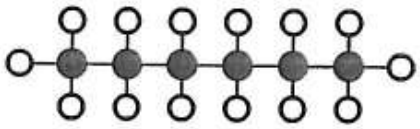
(a) Name the raw material from which petrol is obtained.

.....

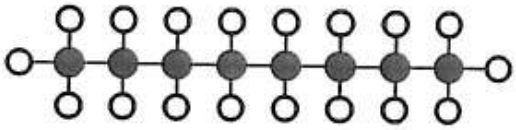
(1)

Petrol is a mixture of a number of different chemicals.

The molecules of two such chemicals, hexane and octane, are drawn below.



hexane



octane

● carbon atom

○ hydrogen atom

(b) (i) State one similarity between a hexane molecule and an octane molecule.

.....

(1)

(ii) State one difference between a hexane molecule and an octane molecule.

.....

(1)

The boiling points of hexane and octane are 69 °C and 125 °C.

(c) Suggest how a mixture of hexane and octane could be separated.

..... (1)

(d) (i) When petrol is used to power a car, name the type of chemical reaction which takes place in the engine.

..... (1)

(ii) Name two substances formed by this reaction in a good supply of air.

1: .....

2: ..... (2)

The exhaust gases from a car engine can have various harmful environmental effects.

(e) Name one of these harmful gases and describe the effects it has on the environment.

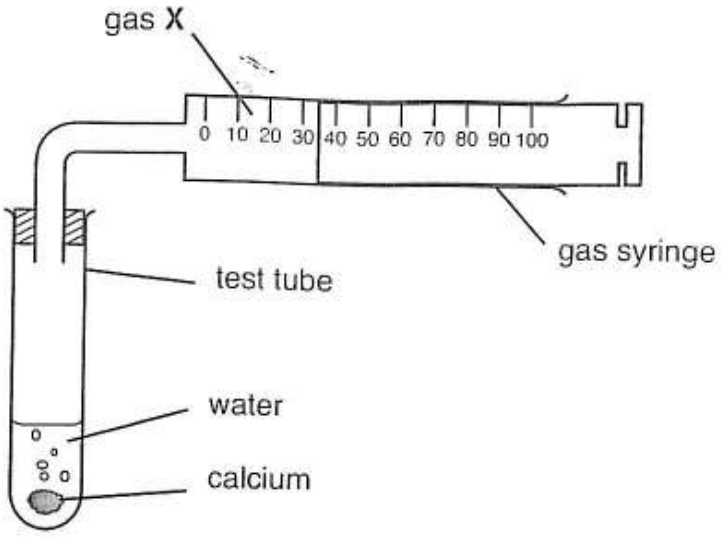
name: .....

effects: .....

.....

..... (3)

7. Peter added a small amount of the element calcium to some water in the apparatus shown below.



He recorded all his measurements and observations in his notebook.

Measurements

Mass of calcium used 0.16 grams
Volume of water used 10 cm^3
Volume of gas X formed 96 cm^3

Observations

1. Appearance of calcium: silvery, shiny metal.
2. When added to water, the calcium bubbled rapidly.
3. A white solid was formed in the tube.
4. The gas X burnt with a squeaky pop when a lighted splint was put in it.
5. The liquid remaining turned litmus blue.

(a) (i) Name gas **X**.

..... (1)

(ii) Explain your answer.

..... (1)

(b) The white solid formed in this reaction is calcium hydroxide.

(i) Suggest what observation number 3 tells you about the solubility of calcium hydroxide in water.

..... (1)

(ii) Suggest how Peter could obtain a pure, dry sample of the white solid from the tube.

.....

..... (2)

(iii) What does Peter's observation number 5 tell you about calcium hydroxide?

..... (1)

Peter found that the white solid appeared to dissolve easily in hydrochloric acid.

(iv) Explain this observation.

.....

..... (2)

(c) Write the word equation for the reaction between calcium and water.

..... (2)

Peter added 0.48 g of calcium to water.

(d) Calculate the volume of gas **X** which was produced.

.....

..... (2)

(e) Explain how Peter could show that calcium is a metal.

.....

..... (2)

(Total marks: 60)