EXETER SCHOOL

13+ Entrance Examination

CHEMISTRY

30 minutes

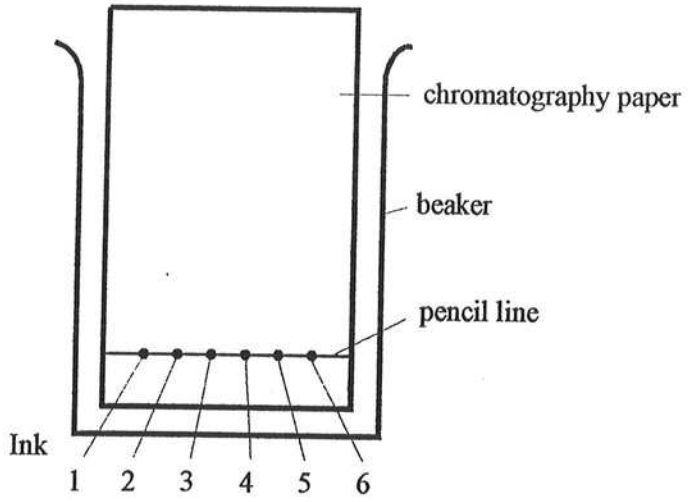
Name .....

Answer all questions on the question paper

1. A pupil used chromatography to investigate the dyes used to make the ink in six different pens. A pencil line was drawn near the bottom of the chromatography paper and a spot of each of the inks was then put on this line. The paper was then dipped into some solvent in a beaker.

(a) The apparatus is shown in the diagram below except that the solvent is not shown.

Complete the diagram by showing the height of the solvent in the beaker at the start of the experiment.



[1]

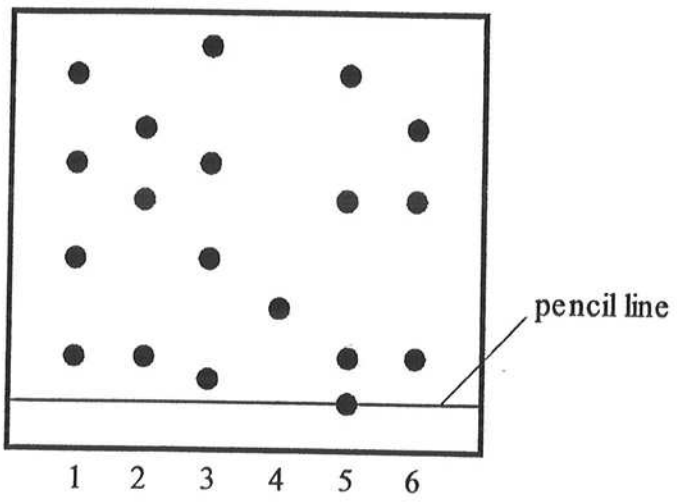
(b) Explain why the line drawn across the paper was in pencil and not in ink.

.....

.....

[1]

The diagram below shows the chromatogram obtained at the end of the experiment.



(c) How many dyes were used to make ink 3?

.....

[1]

(d) Which **two** inks were probably made from the same mixture of dyes?

.....

[1]

(e) Which ink may have been a pure substance?

.....

[1]

(f) Which ink contained a dye which did not dissolve in the solvent?

.....

[1]

Explain how you know.

.....

.....

[1]

2. A student did two experiments to test some river water.

(a) The first experiment was to measure the amount of solid particles in the water.

The method used is given below.

STEP 1	A piece of dried filter paper was weighed.
STEP 2	1000 cm^3 of the river water was poured through the filter paper.
STEP 3	The filter paper plus solid particles was then dried and weighed.

The results are shown below.

The mass of the dried filter paper plus solid particles	= 3.150 g
The mass of the dried filter paper	= 3.120 g

(i) What was the mass of solid particles in the sample of water?

..... g

[1]

(ii) The table below gives information about water quality.

WATER QUALITY	AMOUNT OF SOLIDS (g per 1000 cm^3 of water)
clean water	less than 0.005 g
recovering river	between 0.005 and 0.020 g
polluted river	between 0.020 and 0.050 g
crude sewage	greater than 0.350 g

Use the table to state the water quality of the sample of river water tested.

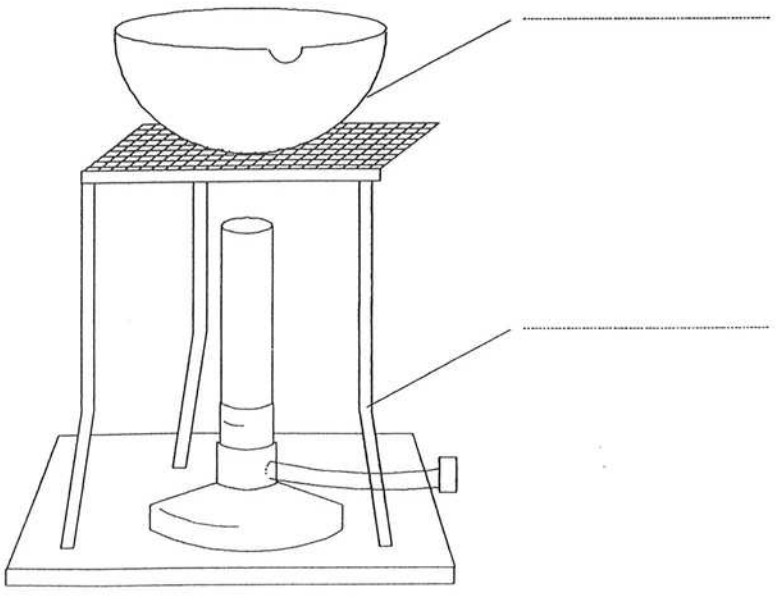
Water quality .....

[1]

(b) The student then did a second experiment. The student boiled some of the filtered water from the first experiment.
The diagram below shows the apparatus the student used.

(i) Label the two pieces of apparatus indicated, using words from this list.

evaporating basin	tripod
beaker	mat
conical flask	gauze



[2]

(ii) At the end of the experiment only a dry solid was left. The report below was taken from the student's book. There are some words missing.

Complete the report using words from this list.

condensed	impure
dissolved	pure
evaporated	solution

Some of the clear filtered water was heated until the water

had ..... and some solid was obtained from the water.

This shows that the water could not have been ..... .

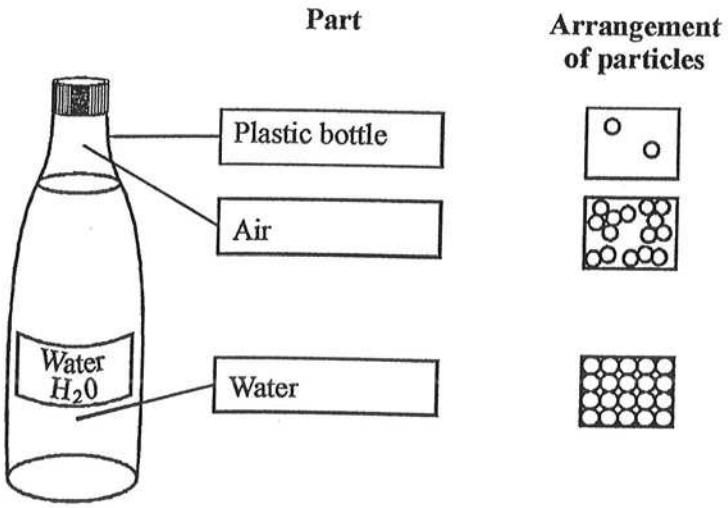
It must have been a ..... of the

solid ..... in the water.

[4]

3. Bottled water is sold throughout the world.

(a) Draw a line to join each labelled part to the arrangement of its particles.



[2]

(b) Use **one** of the words in the box to complete the sentence.

ice	liquid	steam	vapour

The bottle of water was put into a freezer to cool it down. It was left too long, so the water changed to ..... .

[1]

(c) Write **two** things that the chemical formula H_2O tells you about water.

1. .....

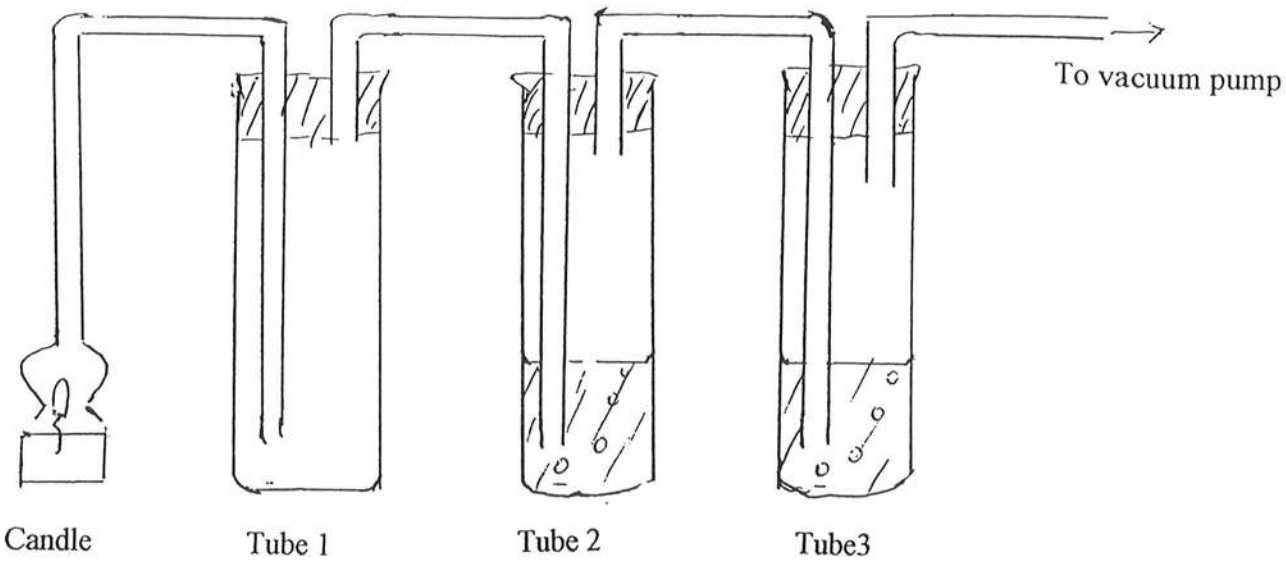
.....

2. .....

.....

[2]

4 The apparatus below was used to investigate what substances are produced when a candle burns in air.



TUBE	CONTENTS	BEFORE	AFTER	CONCLUSION
1	Anhydrous Copper sulfate		BLUE	
2	Universal indicator solution	GREEN		ACID
3	Lime water		TURNS MILKY	

(a) Fill in the 5 blank spaces in the table. (5)

(b) What element from the air is essential for the burning of the candle wax?

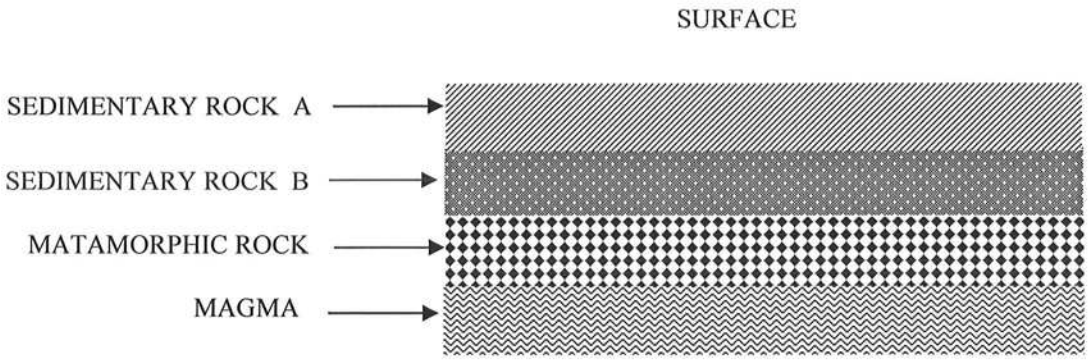
_____ (1)

(c) In view of your answers to part (a) and (b),suggest what two elements are present in candle wax?

element 1_____ element 2_____ (2)

5

a) The diagram below shows a cross section through a part of the Earth's crust.



i) Which rock in the diagram is the oldest sedimentary rock?

_____[1]

ii) Which rock in the diagram has been made from another rock which has changed its structure without melting?

_____[1]

iii) What name is given to magma when it reaches the surface?

_____[1]

iv) Basalt is an igneous rock formed nearer the surface than granite, another igneous rock. State and explain which rock will have the largest crystals?

_____

_____[2]

b) Cobalt is a metallic element that melts at 1492°C and boils at 2900°C.

i) Will cobalt be a liquid, solid or gas at 25°C? _____ [1]

ii) At 1500°C, what state will cobalt be? _____ [1]

iii) Would you expect cobalt to be an electrical insulator or conductor?

_____ [1]

c) Calcium burns in air to make a compound.

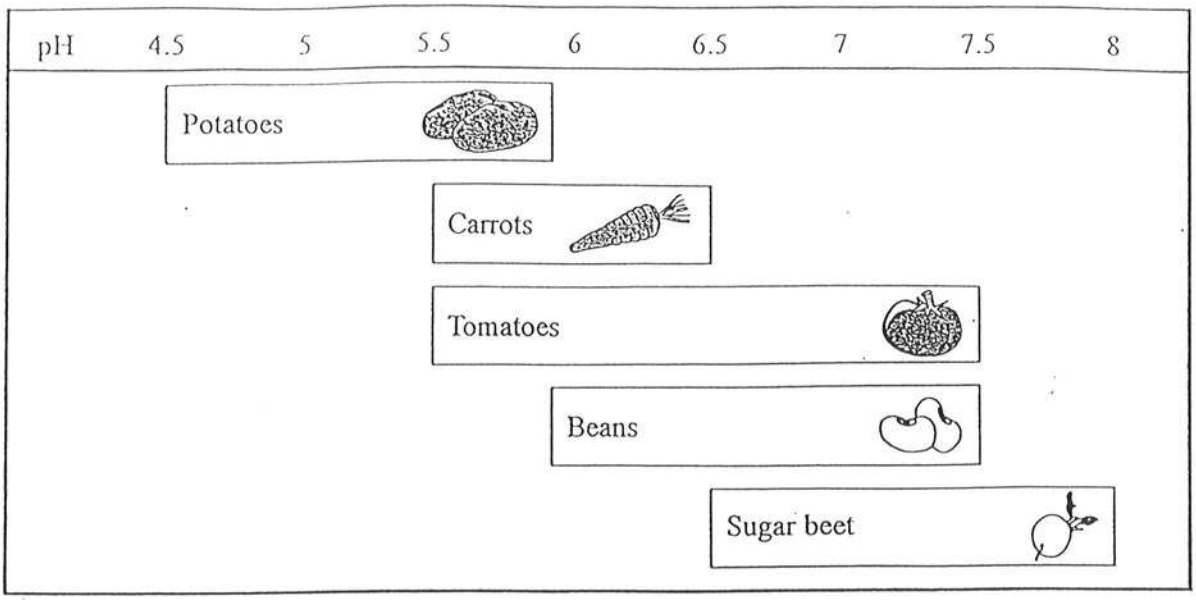
i) Give the name of the gas in air that reacts with calcium when it burns.

_____ [1]

ii) State the names of all the elements present in the compound calcium carbonate.

_____ [2]

6 (a) The chart shows the pH ranges at which some crops grow best.



(i) What does pH measure?

.....

(1 mark)

(ii) What is the pH of a neutral solution?

.....

(1 mark)

(iii) What colour is universal indicator in a neutral solution?

.....

(1 mark)

(iv) Which two crops grow best only in acidic soils?

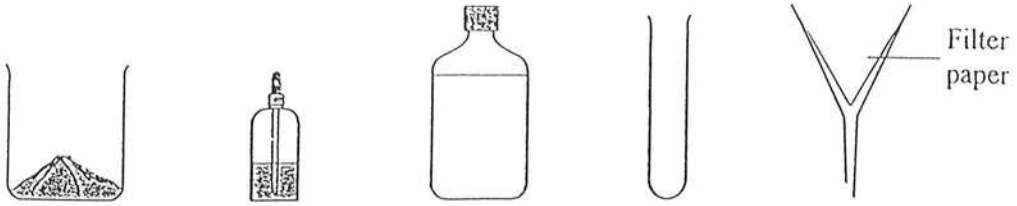
1. .....

2. .....

(2 marks)

Leave margin blank

(b) Describe how a farmer could test the pH of a sample of soil using the substances and apparatus shown.



Soil | Universal indicator | Water | Test tube | Filter funnel

.....

.....

.....

.....

.....

.....

.....

.....

(3 marks)

(c) The farmer tested the pH of the soil from a field in which sugar beet was to be grown. Explain why the farmer then wanted to spread lime on the field.

.....

.....

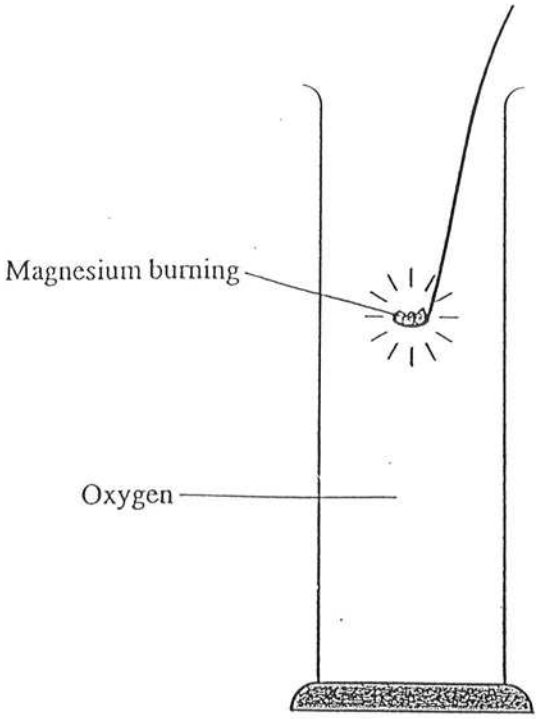
.....

.....

(2 marks)

10

7 Magnesium burns in oxygen.



(a) State **two** things that are seen as magnesium burns in oxygen.

1. .....

2. .....

(2 marks)

(b) Name the substance formed when magnesium burns in oxygen.

.....

(1 mark)

(c) The substance formed is mixed with water. What happens when Universal Indicator is added to the solution?

.....

(1 mark)

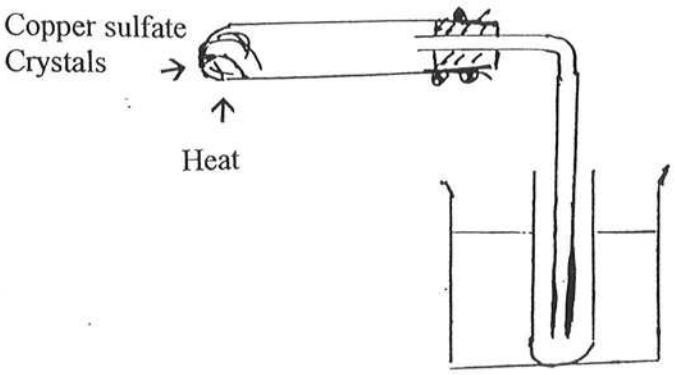
(d)

Write a word equation for the reaction between magnesium and oxygen

_____ (2)

6

8. The diagram below was used by a student to investigate the action of heat on copper sulfate crystals.



(a) what colour are the crystals at the beginning of the experiment?

_____ (1)

(b) What changes would you see in the heated test tube as the copper sulfate crystals were heated?

Change 1 _____

Change 2 _____ (2)

(c) What is the liquid in the beaker and explain what its function is?

_____

_____ (2)

(d) The student found that only a small amount of a colourless liquid was collected in the test tube in the beaker.

(i) what is the liquid collecting in the test tube?

_____ (1)

(ii) suggest a simple modification to the apparatus so that more liquid can be easily collected.

_____ (1)

(e) Write down two observations a student would make if he added water to the cool contents of the test tube containing the heating crystals.

Observation 1 _____ (1)

Observation 2 _____ (2)