MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
General Certificate of Education Ordinary Level

SCIENCE (CHEMISTRY, BIOLOGY) 5118/01

Paper 1 Multiple Choice

October/November 2010

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Data Sheet is printed on page **19**.
A copy of the Periodic Table is printed on page **20**.

This document consists of **18** printed pages and **2** blank pages.

Singapore Examinations and Assessment Board

UNIVERSITY of CAMBRIDGE International Examinations

1 A liquid boils at a temperature of 100 °C.

Which other property of the liquid proves that it is pure water?

A It does not leave a residue when boiled.

B It freezes at 0 °C.

C It is neither acidic nor alkaline.

D It turns white anhydrous copper(II) sulfate blue.

2 An aqueous solution of compound X reacts with aqueous sodium hydroxide to form a green precipitate and then aluminium powder is added. The mixture is heated and a gas that turns damp red litmus paper blue is given off.

What is X?

A ammonium nitrate

B copper(II) chloride

C iron(III) chloride

D iron(II) nitrate

3 An element Y has two isotopes, ^{238}Y and ^{235}Y.

How does ^{238}Y differ from ^{235}Y?

A It has 3 more neutrons and 3 more electrons.

B It has 3 more neutrons.

C It has 3 more protons and 3 more electrons.

D It has 3 more protons.

4 Which could be an ionic compound?

	melting point / °C	boiling point / °C	electrical conductivity of		
			solid	liquid	solution in water
A	1610	2230	poor	poor	insoluble
B	660	2470	good	good	insoluble
C	–112	–83.7	poor	poor	good
D	801	1413	poor	good	good

5 Which ions are present in an aqueous solution of sodium sulfate, Na_2SO_4?

A Na_2^+, SO_4^-, H_2^+ and OH^-

B Na_2^+, SO_4^{2-}, H^+ and OH^-

C Na^+, SO_4^{2-}, H^+ and OH^-

D Na^-, SO_4^{2-}, H^+ and OH^{2-}

6 When 20 cm^3 of a gaseous alkene burns in an excess of oxygen, 60 cm^3 of carbon dioxide are formed.

Both volumes are measured at r.t.p.

What is the formula of the alkene?

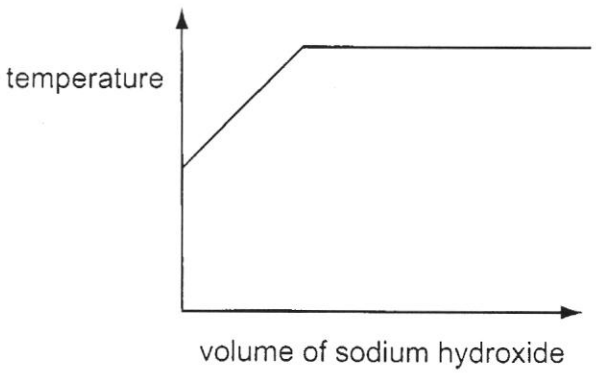
A C_3H_6 **B** C_3H_8 **C** C_6H_{12} **D** C_6H_{14}

7 The reaction between aqueous sodium hydroxide and hydrochloric acid is exothermic.

Both the sodium hydroxide and the hydrochloric acid were initially at room temperature.

Which graph shows the change in temperature when aqueous sodium hydroxide is added to hydrochloric acid until the alkali is present in excess?

A



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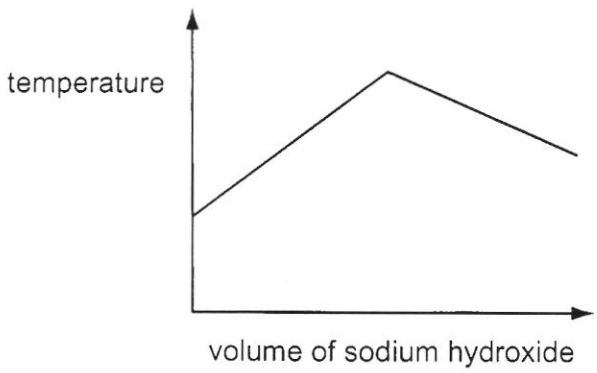

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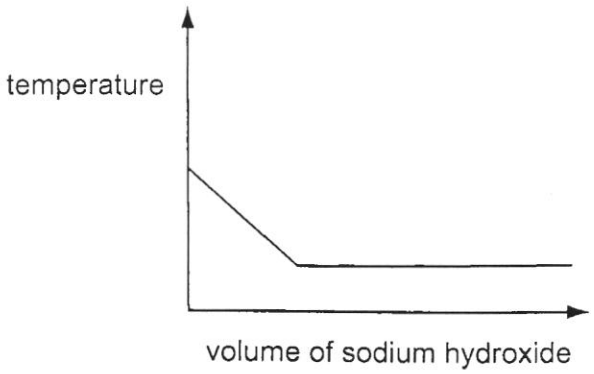
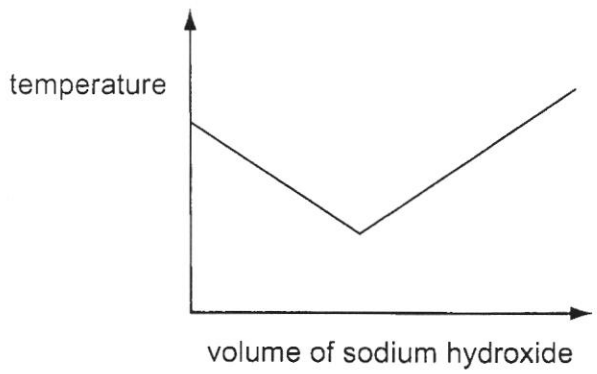
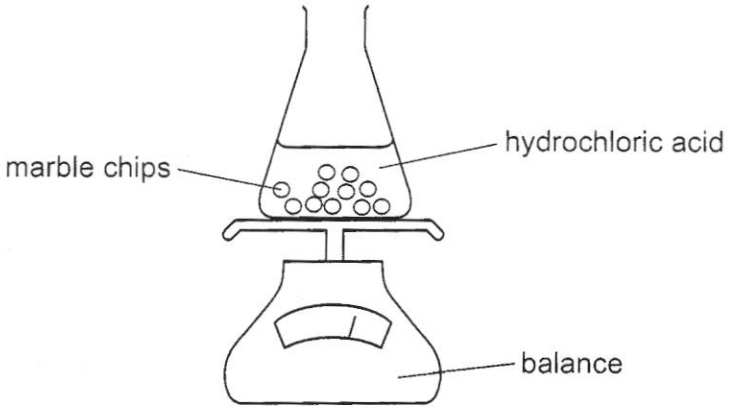


D

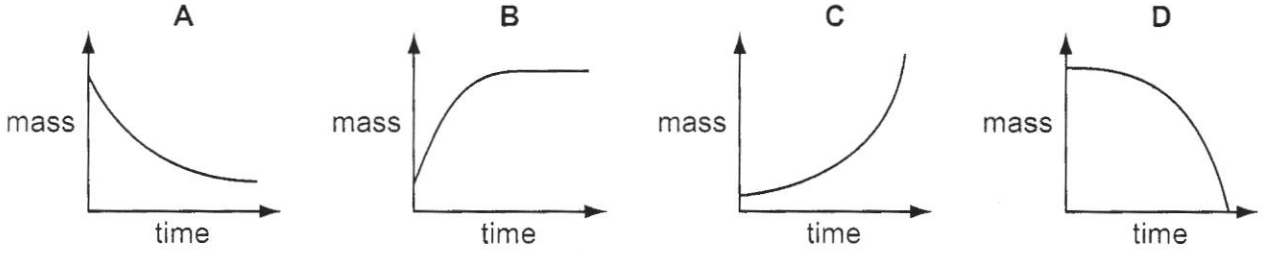


8 A student adds marble chips to hydrochloric acid.



The mass of flask and contents is measured at regular time intervals.

Which graph shows the result?



9 Small portions of aqueous potassium iodide and of acidified, aqueous potassium chromate(VI) were separately added to four solutions.

The colour changes are shown in the table.

solution number	potassium iodide	potassium chromate(VI)
1	colourless to brown	orange to green
2	colourless to brown	no change
3	no change	orange to green
4	no change	no change

Which solutions contained an oxidising agent?

A 1 only **B** 1 and 2 **C** 1 and 3 **D** 2 and 4

10 Which ionic equation represents the neutralisation of aqueous sodium hydroxide with dilute nitric acid?

A $H^+ + OH^- \rightarrow H_2O$

B $Na^+ + NO_3^- \rightarrow NaNO_3$

C $Na^+ + HNO_3 \rightarrow NaNO_3 + H^+$

D $NaOH + H^+ \rightarrow Na^+ + H_2O$

11 Which method of preparation of a pure salt solution requires the use of a pipette and a burette?

A $BaCl_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2HCl(aq)$

B $CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$

C $KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(l)$

D $MgCO_3(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2O(l) + CO_2(g)$

12 Sodium, aluminium and sulfur are in the same period of the Periodic Table.

Which trend in types of oxide occurs across this period?

	left	⟶	right
A	acidic	amphoteric	basic
B	amphoteric	basic	acidic
C	basic	acidic	amphoteric
D	basic	amphoteric	acidic

13 Fluorine is the first element in Group VII of the Periodic Table.

Which statement about fluorine is **not** correct?

A Fluorine exists as diatomic molecules.

B Fluorine forms negative ions.

C Fluorine is less reactive than chlorine.

D Fluorine is pale yellow.

14 Metals W, X, Y and Z are placed in salt solutions as shown in the table.

metal	result of placing metal in solution of			
	salt of W	salt of X	salt of Y	salt of Z
W	no reaction	X displaced	Y displaced	no reaction
X	no reaction	no reaction	no reaction	no reaction
Y	no reaction	X displaced	no reaction	no reaction
Z	W displaced	X displaced	Y displaced	no reaction

What is the order of reactivity of the metals from most reactive to least reactive?

A $Y \rightarrow X \rightarrow W \rightarrow Z$

B $Y \rightarrow W \rightarrow Z \rightarrow X$

C $Z \rightarrow W \rightarrow Y \rightarrow X$

D $Z \rightarrow Y \rightarrow X \rightarrow W$

15 Which metal oxide can be reduced to the metal using carbon?

A calcium oxide

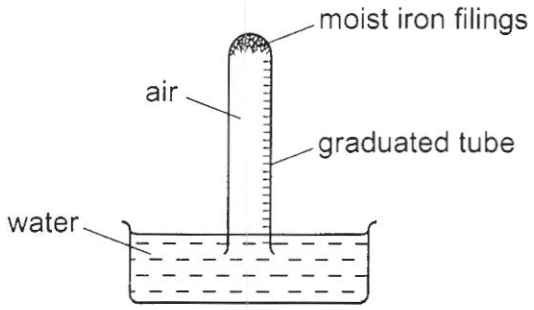
B magnesium oxide

C sodium oxide

D zinc oxide

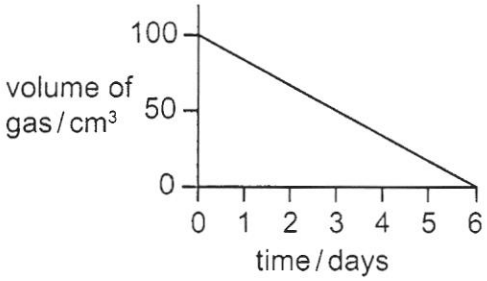
16 The apparatus shown was set up with 100 cm^3 of air in the tube.

The volume of gas in the tube was measured at intervals for six days.



Which graph best represents how the volume of gas changes with time?

A



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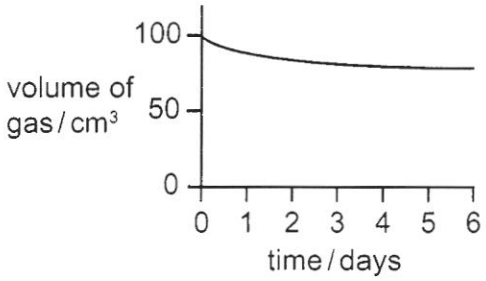
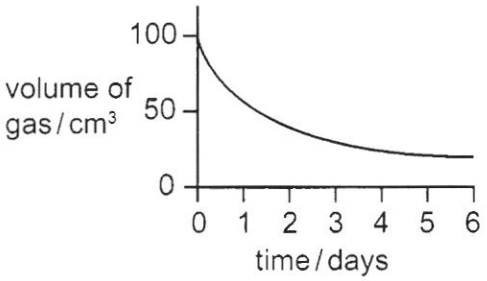


C



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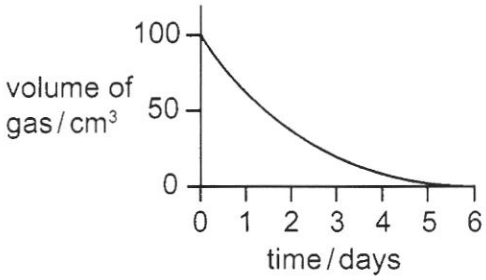

17 The table gives the relative concentrations of polluting gases in the air in four different industrialised cities.

In which city are limestone buildings most threatened by pollution?

	sulfur dioxide	nitrogen dioxide	ozone
A	17	46	23
B	32	33	30
C	38	40	11
D	45	14	21

18 Which statement about a homologous series is **not** correct?

All the members of the series have the same

A chemical reactions.

B functional group.

C general formula.

D physical properties.

19 A student investigated the reaction of vegetable oils with hydrogen.

100 cm^3 of hydrogen was bubbled through 1 g samples of four different vegetable oils containing a suitable catalyst.

The volume of hydrogen remaining after each experiment was recorded.

vegetable oil	volume of hydrogen remaining / cm^3
P	100
Q	87
R	63
S	0

Which vegetable oils are unsaturated?

A P, Q and R

B Q and R only

C Q, R and S

D S only

20 Which type of reaction occurs when ethanol is converted to ethanoic acid?

A hydration

B dehydration

C oxidation

D reduction

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General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | S | | | | |

INDEX NUMBER | | | | |

SCIENCE

5118/03

Paper 3 Chemistry

October/November 2010

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE ON ANY BARCODES.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions.
Write your answers on the lined paper provided and, if necessary, continue on separate answer paper.

A copy of the Data Sheet is printed on page 15.
A copy of the Periodic Table is printed on page 16.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	
Section B	
Total	

This document consists of **13** printed pages and **3** lined pages.

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[Turn over

Section A

For Examiner's Use

Answer **all** the questions.

Write your answers in the spaces provided on the question paper.

1 Give three reasons why it is important to recycle metals.

(i) .....

(ii) .....

(iii) .....

[3]

2 Table 2.1 describes two different solutions. Complete the table.

Table 2.1

solution	chemical formula	one product of the reaction with ammonium carbonate
sulfuric acid		
sodium hydroxide		

[4]

3 Forensic scientists use paper chromatography to compare the inks from five different bank notes (dollar notes) with the ink used to make genuine bank notes.

For Examiner's Use

Their results are shown as a chromatogram in Fig. 3.1.

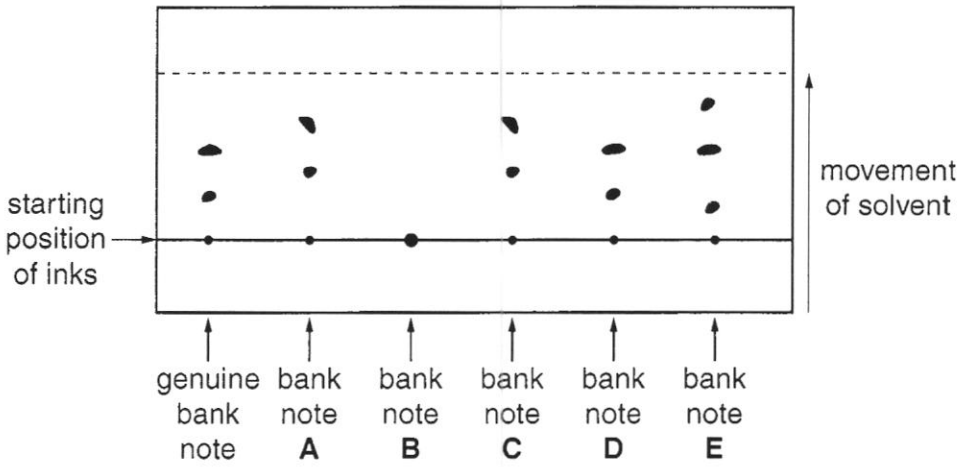

Fig. 3.1

(a) Which of the bank notes, **A**, **B**, **C**, **D** or **E**

(i) is **not** a fake,

.....

(ii) are printed with identical inks,

.....

(iii) is printed with ink containing three soluble dyes?

.....

[3]

(b) Draw the apparatus that could be used to produce this chromatogram.

For Examiner's Use

[2]

(c) Use your knowledge of bank notes to suggest why water would probably **not** be a suitable solvent to use for this chromatography.

.....

[1]

4 Fig. 4.1 shows the nuclei of five different atoms. The nuclei are labelled **F**, **G**, **H**, **I** and **J**. These are not symbols of elements.

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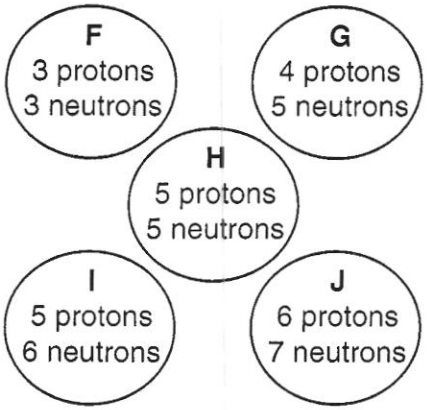

Fig. 4.1

Which letter or letters from **F**, **G**, **H**, **I** and **J** represent

(a) the nucleus of an atom with an atomic number of six,

..... [1]

(b) the nucleus of an atom with a relative atomic mass of six,

..... [1]

(c) two nuclei from different isotopes of the same element,

..... [1]

(d) the nucleus of an atom with only one electron in its outer shell,

..... [1]

(e) the nucleus of an atom which could form an ion with a double positive charge?

..... [1]

5 The boxes in Fig. 5.1 contain descriptions of five different substances, **K**, **L**, **M**, **N** and **O**.

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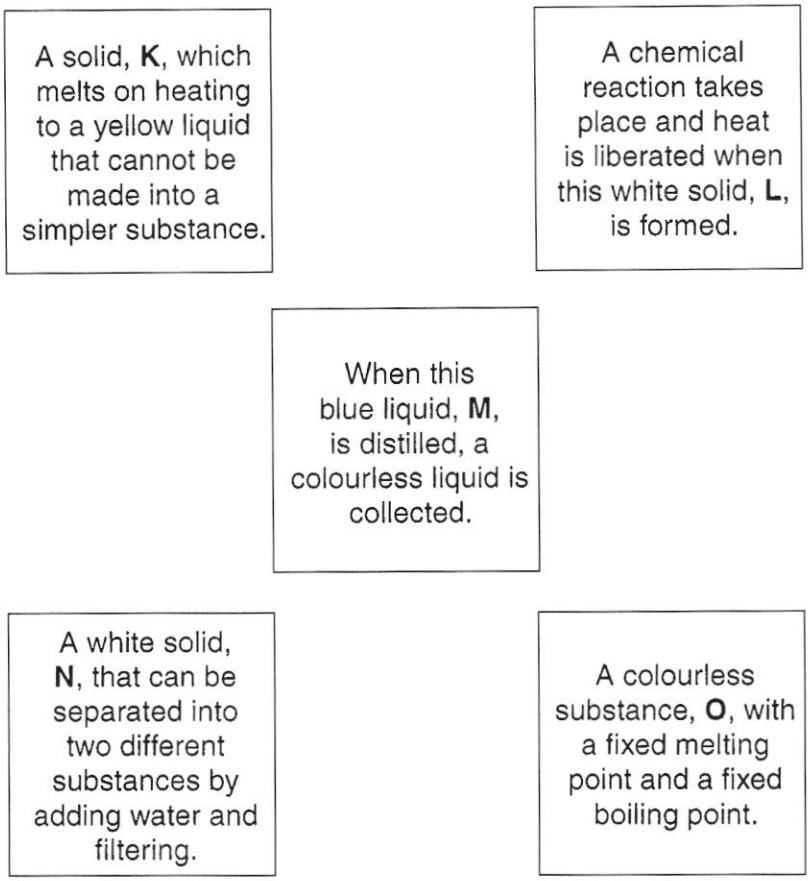

Fig. 5.1

Decide whether each substance should be classified as an element, compound, mixture, or either an element or a compound. Show your decision by ticking (✓) the correct box for each substance in Table. 5.1.

Table 5.1

substance	element	compound	mixture	either an element or a compound
K				
L				
M				
N				
O				

[5]

6 Calcium carbonate and dilute hydrochloric acid react to produce a gas. Data to determine the speed of this reaction are collected using the apparatus shown in Fig. 6.1.

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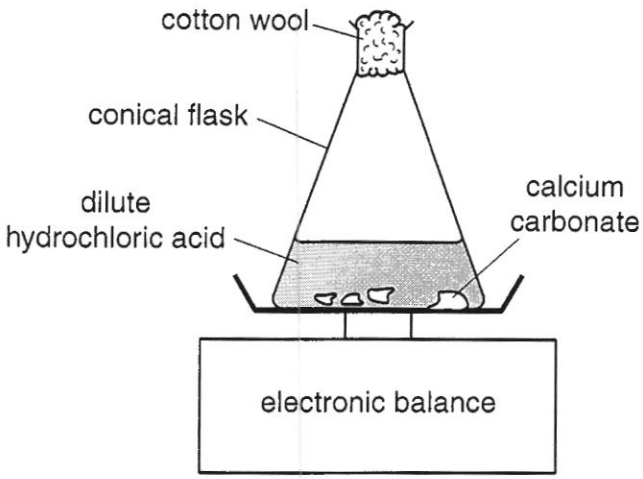

Fig. 6.1

(a) (i) Why does the reading on the electronic balance gradually decrease in value?

.....

(ii) Suggest a purpose for the cotton wool in the mouth of the conical flask.

.....

[2]

(b) The reading on the electronic balance is taken every 30 seconds and used to plot the graph shown in Fig. 6.2.

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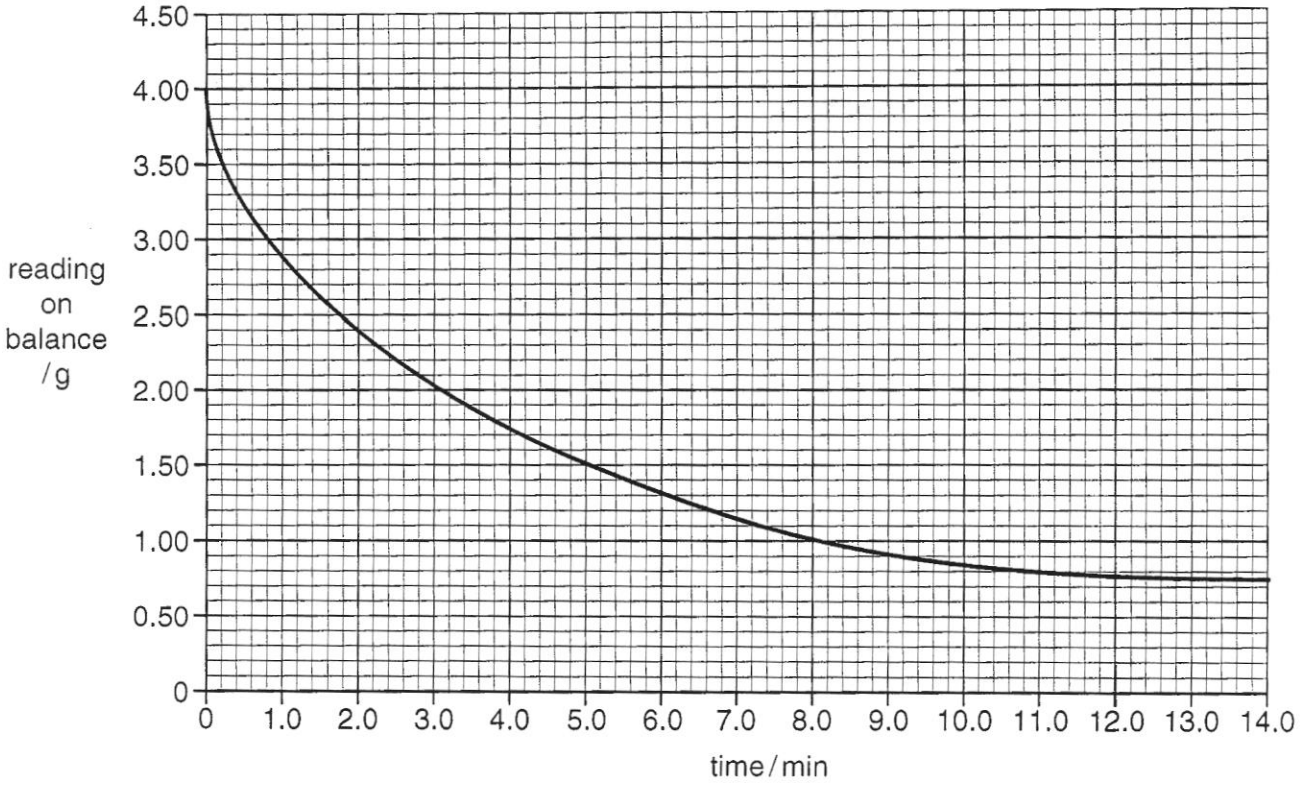

Fig. 6.2

(i) What can you tell from the graph about the speed of this reaction during its first 14 minutes?

.....

.....

(ii) Calculate the loss in mass over the first 8 minutes of the reaction.

.....

(iii) Calculate the average speed of reaction over the first 6 minutes in grams per minute.

.....

[4]

7 Fig. 7.1 describes some of the reactions of the hydrocarbon **P**.

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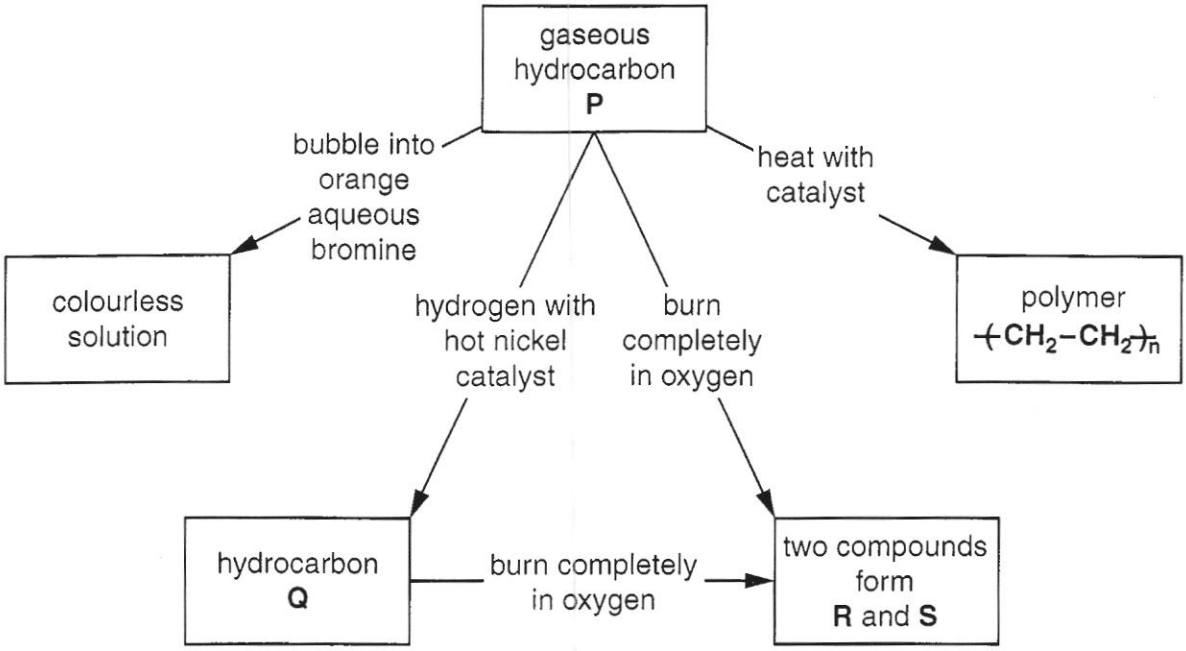

Fig. 7.1

(a) What does the reaction with orange aqueous bromine tell you about **P**?

.....

[1]

(b) Identify

(i) **P**,

.....

(ii) **Q**,

.....

(iii) **R** and **S**.

.....

[4]

(c) Write a full chemical equation, including state symbols, to represent any one of the changes in Fig. 7.1.

.....[3]

8 Students give their own special symbols to five **non-metallic** elements. All five non-metals are in the same group of the Periodic Table. The special symbols are shown in Fig. 8.1. The order of chemical reactivity of these non-metals is also shown.

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	decreasing order of chemical reactivity →				
special symbols given by students	**Aa**	**Bb**	**Cc**	**Dd**	**Ee**

Fig. 8.1

The students know

1. the group of the Periodic Table in which these non-metals are placed,
2. that sodium, Na, combines with the non-metal they had given the symbol **Aa**.

As a result they give the compound so formed the formula Na**Aa**.

(a) **(i)** In which group of the Periodic Table are these elements placed?

.....

(ii) Choose from Fig. 8.1 the special symbol of the element which is most likely to be a solid at room temperature and pressure.

.....

[2]

(b) The special symbol given to one of these elements by the students is **Cc**. Use this special symbol to write the formula of

(i) a molecule of this element,

.....

(ii) the compound formed between this element and aluminium.

.....

[2]

(c) **(i)** Suggest the name of the element given the *special symbol* **Bb** by the students.

.....

(ii) Write the *special symbol* of the element most likely to displace **Bb** from a solution containing ions of **Bb**.

.....

(iii) Use *special symbols* to write an ionic equation for this displacement. State symbols are not required.

.....

[4]

Section B

Answer any **two** questions.

Write your answers on the lined pages provided and, if necessary, continue on separate answer paper.

9 **(a)** Motor car engines powered by fossil fuels produce pollutant gases. Describe how **two** of these gases are produced and state their harmful effects. [4]

(b) A coal used in a power station contains 1% by mass of sulfur. When this coal is burned the pollutant gas sulfur dioxide is produced. Calculate the mass and volume of sulfur dioxide formed when 20 000 g of this coal are burned completely in air.

[Relative atomic masses: A_r: O, 16; S, 32]

[The volume of one mole of any gas is 24 dm^3 at room temperature and pressure.] [6]

10 Calcium chloride and sodium oxide have high melting points and form colourless solutions with water.

(a) **(i)** Draw a diagram to show the electronic structure of calcium chloride.

[Proton numbers: C*l*, 17; Ca, 20]

(ii) Describe how this structure differs from the electronic structure of sodium oxide.

[Proton numbers: O, 8; Na, 11]

[4]

(b) Explain why these two substances have high melting points. [3]

(c) Describe a chemical test to distinguish between solutions of these two substances. [3]

11 **(a)** Organic compounds form homologous series. Give the general characteristics of members of a named homologous series. [3]

(b) Alcohols form a homologous series.

(i) Draw the structure of an alcohol that has two carbon atoms in each molecule.

(ii) Define the term *relative molecular mass*. Calculate the relative molecular mass of the alcohol that you have drawn in **b(i)**.

[Relative atomic masses: A_r: H, 1; C, 12; O, 16]

(iii) What organic substance is formed when this alcohol reacts with atmospheric oxygen?

Write an equation for the reaction. State symbols are **not** required.

[7]

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