



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

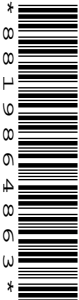
CANDIDATE
NAME

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SCIENCE

5124/03
5126/03

Paper 3 Chemistry

October/November 2007

1 hour 15 minutes

Candidates answer Section A on the Question Paper.

Additional Materials: Answer Booklet/Paper

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the booklet. 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 soft 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 pages provided and, if necessary, continue on separate answer paper.

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 **12** printed pages and **4** lined pages.



Section A

Answer **all** the questions.

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

For
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Use

- 1 (a) Rain water is collected in reservoirs. The water needs to be purified before drinking.

Table 1.1 describes three stages in this process.

Complete the table.

Table 1.1

stages in the purification process	purpose of each stage
flocculation	to lump together small, insoluble particles
	to remove the lumps of insoluble particles
chlorination	

[2]

- (b) (i) Tap water is not pure. It contains dissolved substances. A process can be used to separate these dissolved substances and the water. What is the name of this process?

.....

- (ii) Water is an oxide. Write its chemical formula.

.....

[2]

- 2 (a) Table 2.1 describes the properties of an acid, an alkali and a salt solution.

Complete the table.

Table 2.1

solution	colour with Universal Indicator solution	approximate pH	ions present
sodium hydroxide	blue		Na^+ , OH^-
hydrochloric acid	red		
sodium sulphate		7	

[5]

- (b) Name two solutions which, when mixed together, form a solution of sodium sulphate.

.....

.....

[1]

- 3 (a) Fig. 3.1 and Fig. 3.2 show the structures of two allotropes of carbon. In both structures the carbon atoms are shown as black dots.

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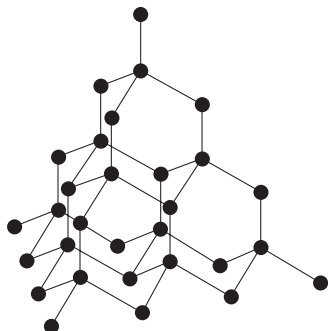


Fig. 3.1

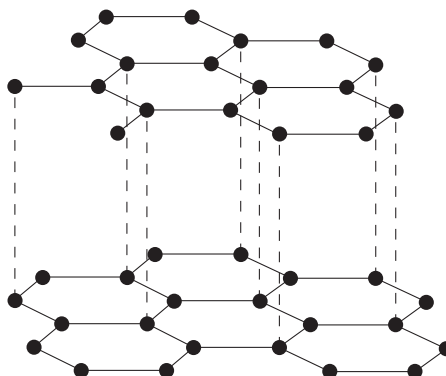


Fig. 3.2

- (i) Name the two allotropes.

Fig. 3.1

Fig. 3.2

- (ii) The allotrope in Fig. 3.1 is so hard that it can be used for making the tips of drills. The other allotrope is used as a lubricant as it is very slippery. Use the structures to explain these uses.

used for tipping drills

.....
.....

used as a lubricant

.....
..... [4]

- (b) Carbon atoms are also found in calcium carbonate.

- (i) Calcium carbonate is used to make calcium hydroxide.

Explain why farmers sometimes spread calcium hydroxide on their fields.

.....
.....

- (ii) Give **two** other uses of calcium carbonate.

.....
..... [4]

- 4 In an experiment indigestion tablets are used to investigate rate of reaction. When these tablets react with an acid, carbon dioxide gas is given off.

For
Examiner's
Use

Ten tablets are added to an excess solution of sulphuric acid at temperature **A**, and the total volume of gas given off is measured at regular intervals.

The procedure is repeated using sulphuric acid at two different temperatures, **B** and **C**.

In each experiment an excess of the same sulphuric acid solution is used.

Fig. 4.1 shows the results of these investigations.

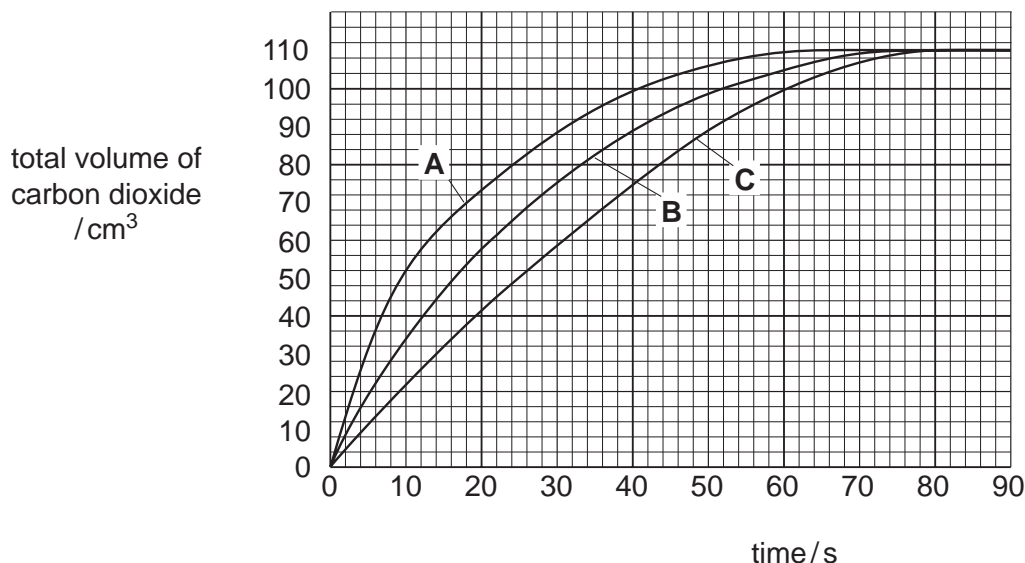
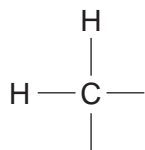


Fig. 4.1

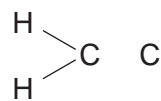
- (a) Which of the temperatures **A**, **B** and **C** is the highest?
..... [1]
- (b) How are the reactions at temperature **A** and at temperature **C** different after about seventy seconds?
..... [1]
- (c) Draw on Fig. 4.1 the curve that you would expect if the experiment were repeated at temperature **C** but with **five** tablets. [2]
- (d) Use your knowledge of kinetic particle theory to explain why rates of reaction vary with change in temperature.
.....
..... [2]

- 5 (a) Fig. 5.1 shows the partly drawn structural formula of ethane and of ethene.

Complete the drawings.



ethane



ethene

Fig. 5.1

[2]

- (b) (i) Fig. 5.2 shows part of a molecule of the polymer, PVC.

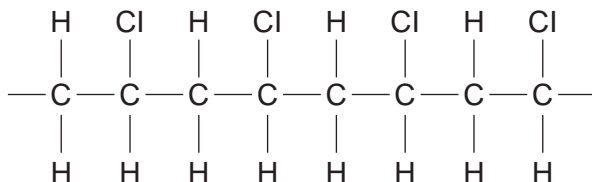


Fig. 5.2

Deduce and draw the structural formula of the monomer from which PVC is made.

- (ii) Polymers such as PVC can cause long-term pollution problems. Explain why.

..... [3]

6 (a) Calcium, copper and zinc are three metals.

- (i) Table 6.1 describes the reaction of these metals with cold water and steam. Put a tick (✓) if a reaction will take place and a cross (✗) if a reaction will not take place. The first has been done for you as an example.

Table 6.1

metal	reaction of metal with cold water	reaction of metal with steam
calcium	✓	✓
copper		
zinc		

- (ii) Place these three metals in order of chemical reactivity, with the most reactive first.

most reactive metal

.....

least reactive metal

- (iii) Before experimenting with aluminium to place it in the above series, the surface of the aluminium must first be scraped. Why is this necessary?

..... [4]

(b) Give **two** reasons why it is important to recycle metals.

.....

..... [2]

7 Fig. 7.1 contains information about substances **D**, **E**, **F** and **G**.

For
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solid D	gas E
<p>D is white. It is formed by burning zinc in oxygen. The product is yellow when hot and white when cold.</p>	<p>E is colourless. It has a constant composition. When magnesium is burnt in the gas, two solids are formed, one white and one black.</p>
solid F	solid G
<p>F has a constant composition. It burns in oxygen to form only one product.</p>	<p>G is blue. It dissolves in water and its solution can be separated into three dyes by chromatography.</p>

Fig. 7.1

Classify the substances as either an element or a compound or a mixture. Now complete Table 7.2 by placing a tick (✓) in one box in each row.

Table 7.2

substance	element	compound	mixture
D			
E			
F			
G			

[4]

- 8 The diagrams in Fig. 8.1 show the arrangement of particles in copper, sodium chloride and hydrogen chloride at room temperature.

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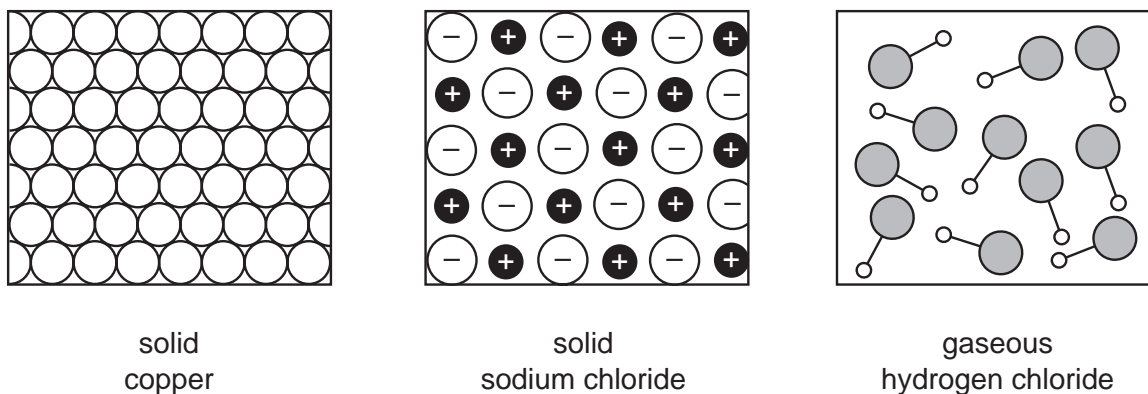


Fig. 8.1

- (a) (i) Which of these substances has the lowest melting point?

.....

- (ii) Explain why this substance has a low melting point.

.....

..... [2]

- (b) (i) At room temperature only **one** of the three substances conducts electricity.

Name this substance.

.....

- (ii) At very high temperatures a second of these substances will conduct electricity.

Name this substance and predict why it will conduct electricity at very high temperatures but **not** at room temperature.

.....

..... [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) (i)** In industry, petroleum (crude oil) is separated into several useful substances using a fractionating tower. Describe and explain this separation process.
- (ii)** Explain why all of the substances in petroleum (crude oil) do not reach the higher parts of the tower. [7]
- (b)** Methane is separated from natural gas. Methane burns in oxygen to form carbon dioxide and water.
- (i)** Write the chemical equation for this reaction of methane with oxygen.
- (ii)** 3 dm³ of methane are burned in an excess of oxygen. Calculate the volume of oxygen, measured at room temperature and pressure, which reacts with this methane. [3]
- 10** An element has an isotope with the nucleon number of 7. Each neutral atom of this isotope has three electrons and a nucleus containing two different types of particle.
- (a) (i)** Give the names of these particles and the number of each particle present in each nucleus. [4]
- (ii)** Compare the masses and compare the electrical charges of these particles. [3]
- (b)** The element has another isotope with atoms that have a nucleon number of six. Compare and contrast the nuclei of these **two** isotopes. [3]

11 Fig. 11.1 describes reactions involving a metallic salt.

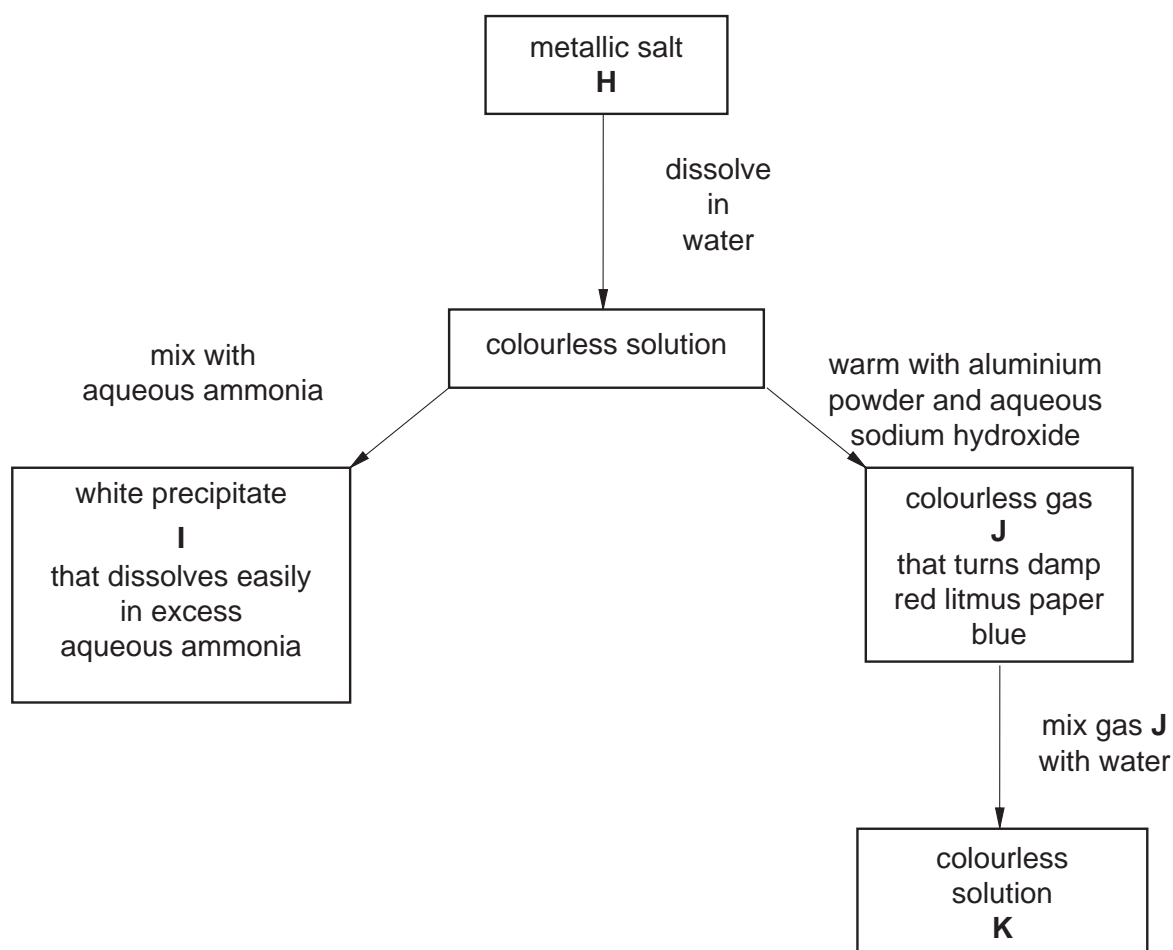


Fig. 11.1

- (a) Name substances **H**, **I**, **J** and **K**. [5]
- (b) Give the chemical formula for **one** of **H**, **I**, **J** or **K**. [1]
- (c) Write the equation for any **one** of the reactions shown in Fig. 11.1. [2]
- (d) Give **two** uses of the metal in the metallic salt **H**. [2]

DATA SHEET
The Periodic Table of the Elements

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Li Lithium	Be Beryllium	B Boron	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon	Na Sodium	Mg Magnesium	Al Aluminium	Si Silicon	P Phosphorus	S Sulphur	Cl Chlorine	Ar Argon	K Potassium	Ca Calcium	Sc Scandium	Ti Titanium	V Vanadium	Cr Chromium	Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton	Rb Rubidium	Sr Strontium	Y Yttrium	Zr Zirconium	Nb Niobium	Mo Molybdenum	Tc Technetium	Ru Ruthenium	Rh Rhodium	Pd Palladium	Ag Silver	Cd Cadmium	In Indium	Sn Tin	Sb Antimony	Te Tellurium	I Iodine	Xe Xenon	Cs Caesium	Ba Barium	La Lanthanum	Hf Hafnium	Ta Tantalum	W Tungsten	Re Rhenium	Os Osmium	Ir Iridium	Pt Platinum	Au Gold	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	At Astatine	Rn Radon																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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