OCR
RECOGNISING ACHIEVEMENT

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B641/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
CHEMISTRY B
Unit 1 Modules C1 C2 C3 (Higher Tier)

FRIDAY 18 JANUARY 2008

Afternoon
Time: 1 hour

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T45574

Candidate Forename | Candidate Surname

Centre Number | Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 60.
- The Periodic Table is printed on the back page.

FOR EXAMINER'S USE		
Section	Max.	Mark
A	20	
B	20	
C	20	
TOTAL	60	

This document consists of **20** printed pages and **4** blank pages.

[Turn over

Answer **all** the questions.

Section A – Module C1

1 Some perfumes contain smelly chemicals called esters.

Esters can be made by reacting two types of chemical together.

(a) Complete this **word** equation about making esters.

alcohol + ... → ester + ... [2]

(b) Cosmetics are tested before they are used on humans.

In some countries cosmetics are still tested on animals before they are used on humans.

Write about the testing of cosmetics.

Your answer should include

- why cosmetics need to be tested
- one advantage of testing on animals
- one disadvantage of testing on animals.

.....

.....

.....

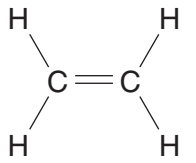
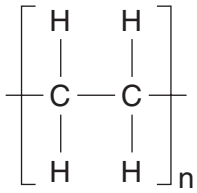
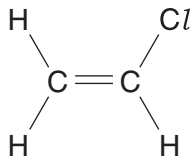
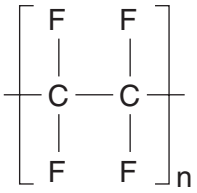
.....

..... [3]

[Total: 5]

2 Addition polymers are made by joining lots of monomer molecules together.

(a) Look at the table. It shows the structures of some monomers and polymers.

monomer	polymer
	
	
	

Complete the table. [2]

(b) Ethene, C_2H_4, contains only carbon and hydrogen atoms.

What is the name given to compounds that only contain hydrogen and carbon?

..... [1]

(c) Ethene, C_2H_4, is unsaturated because it contains a double bond.

Describe a test to show that a compound is unsaturated.

Write down what you would **see**.

name of chemical used .....

what you would see ..... [2]

(d) Plastics contain polymer molecules.

Disposal of waste plastics causes problems. One of these problems is litter.

Write about **other** problems of disposing of plastics.

.....

.....

..... [2]

[Total: 7]

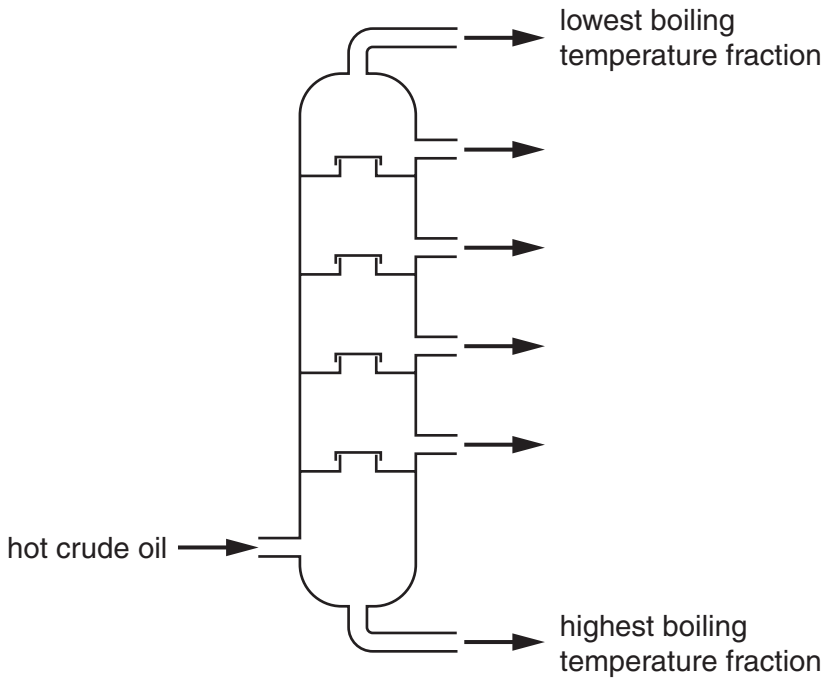
3 Fractional distillation separates crude oil, a mixture of hydrocarbons, into useful fractions.

Look at the diagram.

It shows a fractional distillation column.

During fractional distillation hydrocarbons with low boiling points 'exit' from the top of the column.

Hydrocarbons with high boiling points 'exit' from the bottom.



(a) The boiling point of a hydrocarbon is linked to its molecular size and to intermolecular forces.

(i) What is meant by intermolecular forces?

.....

..... [1]

(ii) What is the relationship between molecular size of a hydrocarbon and the strength of its intermolecular forces?

.....

..... [1]

(iii) What is the relationship between the strength of intermolecular forces and boiling point?

.....

..... [1]

(b) One of the hydrocarbons in camping gas is propane, C_3H_8.

Propane burns in a plentiful supply of oxygen, O_2.

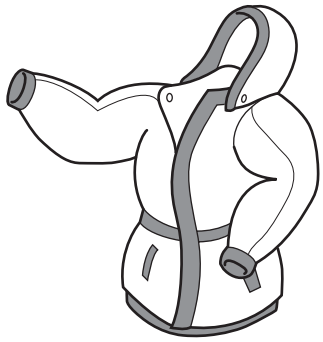
Carbon dioxide and water are formed.

Write a balanced **symbol** equation for this reaction.

..... [2]

[Total: 5]

4 Waterproof coats can be made using nylon or Gore-Tex®.



Nylon and Gore-Tex® are polymers.

One property that makes nylon suitable for making coats is that it is lightweight.

(a) Write down **two** other properties that make nylon suitable for making coats.

1 .....

2 ..... [2]

(b) What advantage does Gore-Tex® have over nylon?

.....

..... [1]

[Total: 3]

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Section B starts on page 8.
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Section B – Module C2

5 Stowmarket Synthetics make an oil paint.

This paint contains an oil, a pigment and a solvent.

(a) Explain how an oil paint dries.

.....

..... [1]

(b) A thermochromic pigment changes colour when it is heated or cooled.

Describe one use of a thermochromic paint.

.....

..... [1]

(c) A phosphorescent pigment glows in the dark.

Describe how a phosphorescent pigment is able to glow in the dark.

.....

..... [1]

[Total: 3]

6 Clean air is a mixture of many gases including oxygen, nitrogen and carbon dioxide.

Carbon monoxide, sulfur dioxide and oxides of nitrogen are pollutants sometimes found in air.

Increased energy consumption can change the composition of air.

The air may then contain more atmospheric pollutants.

(a) Deforestation could change the composition of air. Explain how.

.....

.....

..... [2]

(b) Nitrogen monoxide is made in a car engine.

It can be removed from the exhaust gases of a car by a catalytic converter.

In a catalytic converter nitrogen monoxide reacts with carbon monoxide.

Carbon dioxide and nitrogen are made.

(i) Write down the **word** equation for the reaction in the catalytic converter.

..... [1]

(ii) The catalyst in a catalytic converter has a large surface area.

The reaction between nitrogen monoxide and carbon monoxide is very fast.

Explain why.

Use ideas about particles.

.....

..... [1]

[Total: 4]

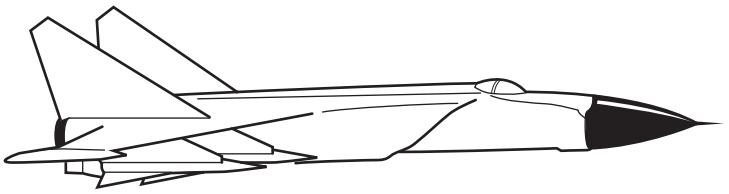
7 Metals are a very useful type of material.

Look at the table.

It shows some information about four metals.

metal	melting point in °C	density in g/cm^3	relative strength (1 is very weak)	relative hardness (1 is very soft)
aluminium	660	2.7	11	2.8
copper	1085	8.9	33	3.0
iron	1538	7.9	20	4.5
titanium	1668	4.5	40	6.0

(a) Look at this aeroplane.



Titanium is used to make this aeroplane.

Use information from the table to explain why.

.....

.....

..... [2]

(b) Iron corrodes quickly in moist air.

This is called rusting.

Aluminium does not corrode in moist air.

Explain why.

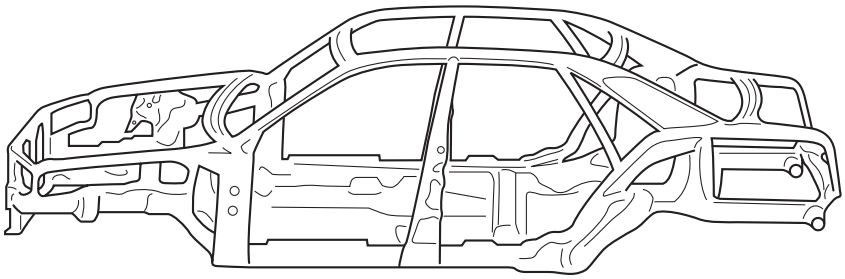
.....

.....

..... [2]

(c) Steel is an alloy that contains mostly iron.

Look at the diagram. It shows a car body.



Aluminium or steel can be used to make a car body.

One advantage of aluminium is that it will not corrode in moist air.

Describe **another** advantage and a disadvantage of using aluminium instead of steel to make a car body.

Information in the table may help you answer this question.

advantage of using aluminium .....

.....

disadvantage of using aluminium .....

..... [2]

[Total: 6]

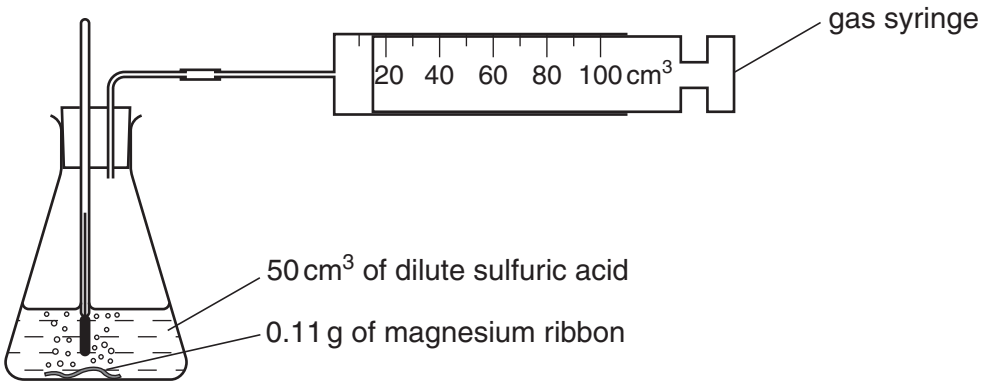
8 Blessy and Anu investigate the reaction between magnesium, Mg, and dilute sulfuric acid, H_2SO_4.

This reaction makes hydrogen, H_2, and magnesium sulfate, $MgSO_4$.

(a) Write the balanced **symbol** equation for this reaction.

..... [1]

(b) Look at the apparatus they use.



Blessy and Anu do four experiments.

They do each experiment using acid at a different temperature.

Each time they use

- 50 cm^3 of dilute sulfuric acid
- 0.11 g of magnesium.

They measure the time it takes to collect 100 cm^3 of hydrogen.

Look at their results.

temperature of acid in °C	**time to collect 100 cm^3 of hydrogen in seconds**
20	36
30	18
40	9
50	5

(i) Describe and explain what happens to the rate of reaction as the temperature increases.

Use ideas about collisions between particles.

.....

.....

..... [2]

(ii) Another way to change the rate of reaction is to increase the concentration of the sulfuric acid.

Describe and explain what happens to the rate of reaction.

Use ideas about collisions between particles.

.....

.....

..... [2]

[Total: 5]

9 The lithosphere is the cold rigid outer part of the Earth.

It is made up of large tectonic plates which float on the mantle.

These plates move very slowly.

Describe how the tectonic plates are able to move.

Use a labelled diagram to help you answer.

.....

.....

.....

..... [2]

[Total: 2]

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Section C starts on page 16.
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Section C – Module C3

10 This question is about the halogens and their reactions.

(a) Chlorine water, Cl_2(aq), is added to a solution of sodium iodide.

A brown solution is made.

Similar experiments can be done with

- chlorine water and sodium bromide solution
- bromine water and sodium iodide solution
- iodine solution and sodium bromide solution.

Look at the table. It shows the results from these and other experiments.

	chlorine water	**bromine water**	**iodine solution**
sodium chloride solution		no reaction	no reaction
sodium bromide solution	orange solution		no reaction
sodium iodide solution	brown solution	.....	

Complete the table to show the missing result. [1]

(b) Chlorine, Cl_2, reacts with sodium iodide solution.

Sodium chloride and iodine solution are made.

Write a balanced **symbol** equation for this reaction.

..... [2]

(c) Chlorine, bromine and iodine are all in Group 7 of the Periodic Table.

They all react in a similar way.

Explain why.

Use ideas about electronic structure.

.....

..... [1]

(d) Chlorine is a green gas.

Bromine is an orange liquid.

Iodine is a solid.

What colour is solid iodine?

..... [1]

[Total: 5]

11 This question is about the transition metals and their compounds.

(a) Compounds of transition elements are often coloured.

Iron(II) compounds are usually green.

Look at the list. It gives the colours of some transition metal compounds.

blue

grey

orange

pink

purple

(i) What colour are most copper compounds?

Choose from the list.

answer ..... [1]

(ii) What colour are most iron(III) compounds?

Choose from the list.

answer ..... [1]

(b) Julie heats some copper carbonate, $CuCO_3$, in a test tube.

Describe what happens to the copper carbonate.

.....

.....

..... [2]

(c) Iron(II) ions, Fe^{2+}, react with hydroxide ions, OH^-.

A precipitate of iron(II)hydroxide is made.

Write down the formula of the iron(II)hydroxide.

..... [1]

(d) Transition elements can be used as catalysts.

A transition element is used as a catalyst in the manufacture of margarine.

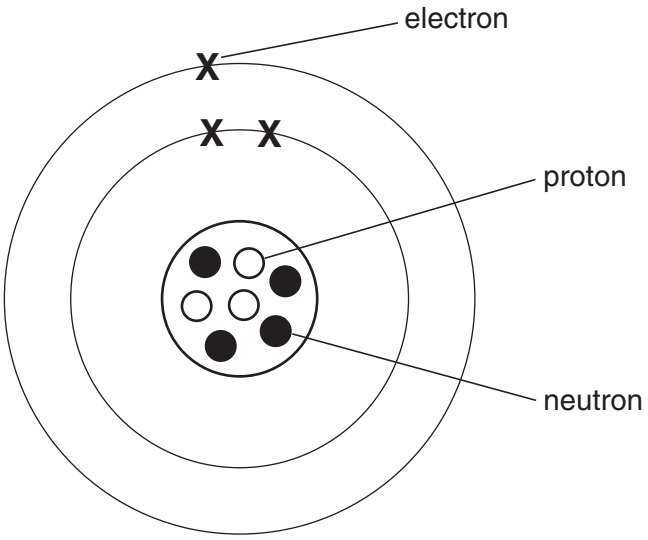
Which transition element?

..... [1]

[Total: 6]

12 This question is about atoms.

(a) Look at the diagram.



Which group of the Periodic Table is this element in?

Group ..... [1]

(b) An atom of sodium has the symbol $^{23}_{11}Na$.

Complete this table about $^{23}_{11}Na$.

particle	number in one atom
neutron	
electron	

[2]

(c) Look at the symbols for three different atoms of sodium.

$^{22}_{11}Na$ $^{23}_{11}Na$ $^{24}_{11}Na$

Complete the sentence.

These different atoms of sodium are called ..... . [1]

(d) Electrons are arranged around the nucleus in shells.

The electronic structure of calcium is 2.8.8.2.

What is the electronic structure of phosphorus?

Use the Periodic Table to help you.

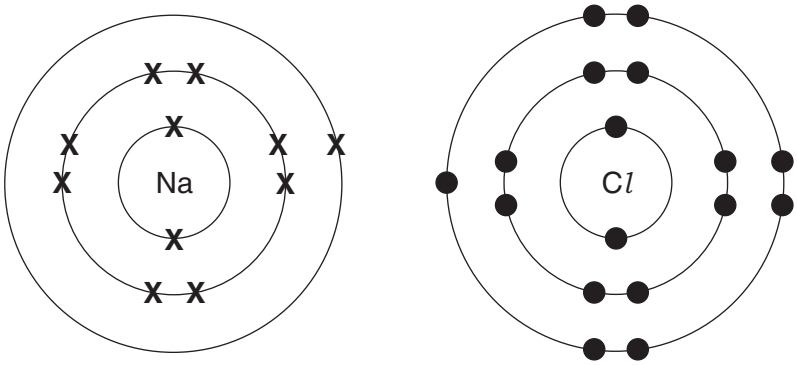
..... [1]

[Total: 5]

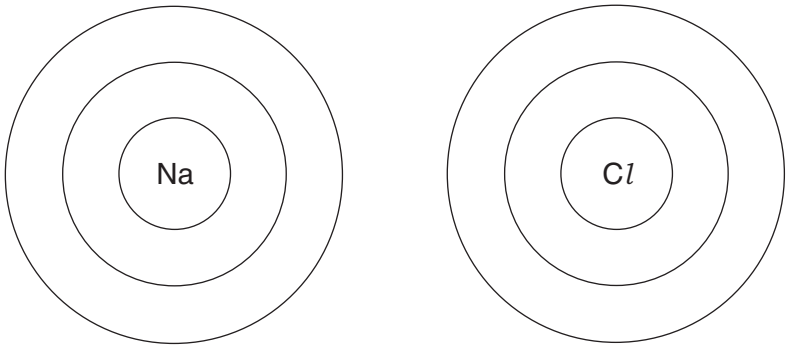
13 This question is about ionic bonding.

Look at the diagrams.

They show the electronic structure of a sodium **atom** and of a chlorine **atom**.



(a) Complete the diagrams below to show the electronic structure and charge on a sodium **ion** and a chloride **ion**.



[2]

(b) Solid sodium chloride contains ions.

Solid sodium chloride will not conduct electricity.

(i) Why does solid sodium chloride **not** conduct electricity?

..... [1]

(ii) How could you make sodium chloride conduct electricity?

..... [1]

[Total: 4]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.