GCSE

WJEC CBAC

0236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. TUESDAY, 29 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	3	
2.	3	
3.	5	
4.	3	
5.	5	
6.	5	
7.	6	
8.	5	
9.	6	
10.	6	
11.	3	
Total	50	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

*Answer **all** questions.*

1. The atoms of carbon, hydrogen and oxygen can be represented by the following diagrams.

represents carbon (symbol C)

represents hydrogen (symbol H)

represents oxygen (symbol O)
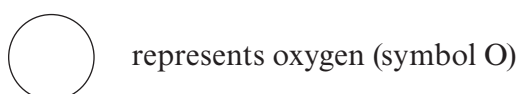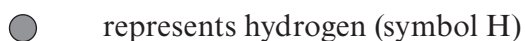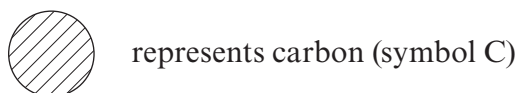
(a) Methane, CH_4, is represented as follows.
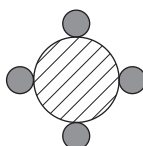
Using the information given above, draw a diagram to represent water, H_2O. [1]

(b) Give the formula **and** name of the molecule represented by the following diagram.

Formula .... [2]

Name ....

3
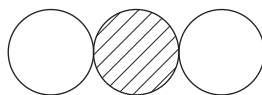
2. The diagram below shows the carbon cycle.
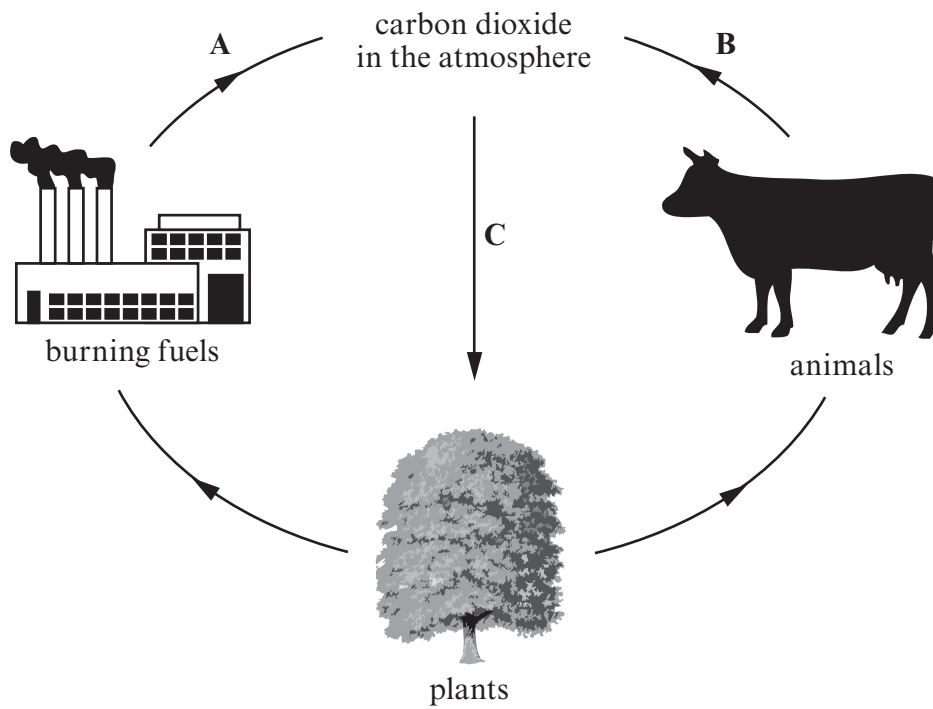
A, **B** and **C** are processes by which carbon dioxide is removed from or added to the atmosphere.

(a) Name the processes labelled **A**, **B** and **C** using the words from the box below. [2]

combustion	photosynthesis	respiration

A ....

B ....

C ....

(b) If very large quantities of trees were cut down, state what would happen to the amount of carbon dioxide in the atmosphere. [1]

....

3. *(a)* Crude oil is separated into fractions in a fractionating column.

Boiling point range	**Fraction**
up to 25°C	gases
40-100°C	petrol
100-150°C	naphtha
150-250°C	kerosene
250-350°C	diesel oil
over 350°C	lubricating oil
over 400°C	bitumen

fractionating column
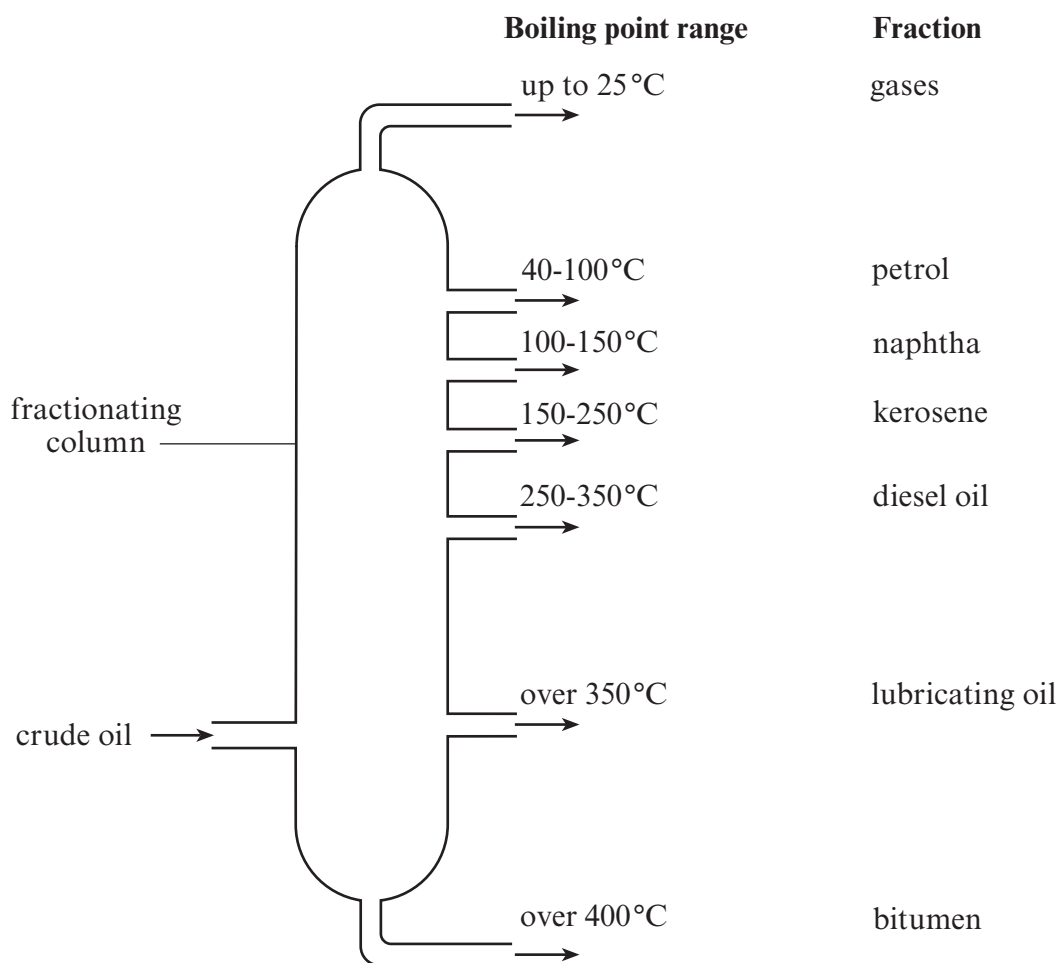
crude oil

(i) Name the fraction with the boiling point range of 100-150°C. [1]

....

(ii) State what must be done to the crude oil before it enters the fractionating column. [1]

....

(iii) Although the crude oil enters the fractionating column as a vapour or a gas, many of the fractions are collected as liquids. Name the process taking place when a gas changes to a liquid. [1]

....

(b) The pie chart below shows the composition of North Sea Oil.
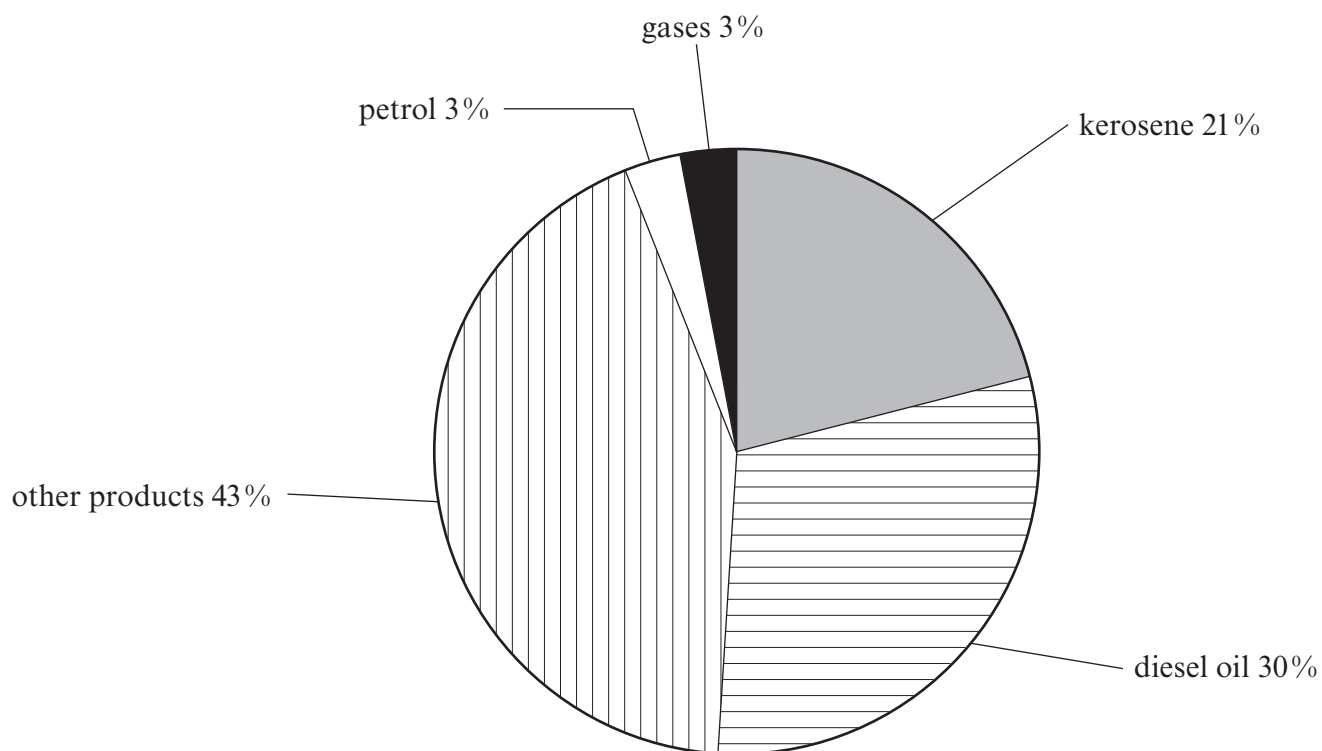
Percentage (%) of fraction in North Sea Oil

Use the pie chart to complete the following sentences.

(i) The percentage of kerosene in North Sea Oil is .... %. [1]

(ii) The fraction which makes up 30% of North Sea Oil is

.... [1]

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Turn over.

5

4. Nanoscience involves the study of very small particles.

(a) (i) Which of the following is considered to be a size in the nanoscale range?

Tick (✓) only **one** box. [1]

length of a bacterium 5000 nm ☐

length of a protein molecule 40 nm ☐

diameter of a red blood cell 500 nm ☐

width of a human hair 50000 nm ☐

(ii) From the box below, choose the correct number to complete the following sentence. [1]

hundred	million	thousand

1 nm is one .... times smaller than 1 mm.

(b) From the box below, choose the reason why nano-sized silver particles are used to clean hospital operating theatres. [1]

cheap	give a shiny surface
kill germs	pleasant smell

Reason ....

5. The table below shows some physical properties of four non-metals and the metal iron.

Element	Melting point/°C	Boiling point/°C	Density/g cm^{-3}
bromine	–7	59	3.1
chlorine	–101	–35	0.003
iron	1540	2750	7.9
iodine	114	184	4.9
sulphur	115	444	2

(a) Name the **non-metal** with the highest boiling point. [1]

....

(b) State how the information in the table shows that iron is a metal. [1]

....

(c) State which of the above elements would be a **gas** at room temperature (20 °C). Explain your answer. [2]

....

....

(d) Give **one** general physical property of non-metals, other than those relating to melting point, boiling point and density. [1]

....

5

6. An experiment was carried out to investigate the temperature change which occurs when sodium hydroxide and hydrochloric acid react. The apparatus was set up as shown below. It recorded the temperature of the acid for three minutes. Sodium hydroxide was added at this point and the temperature was recorded for a further four minutes.
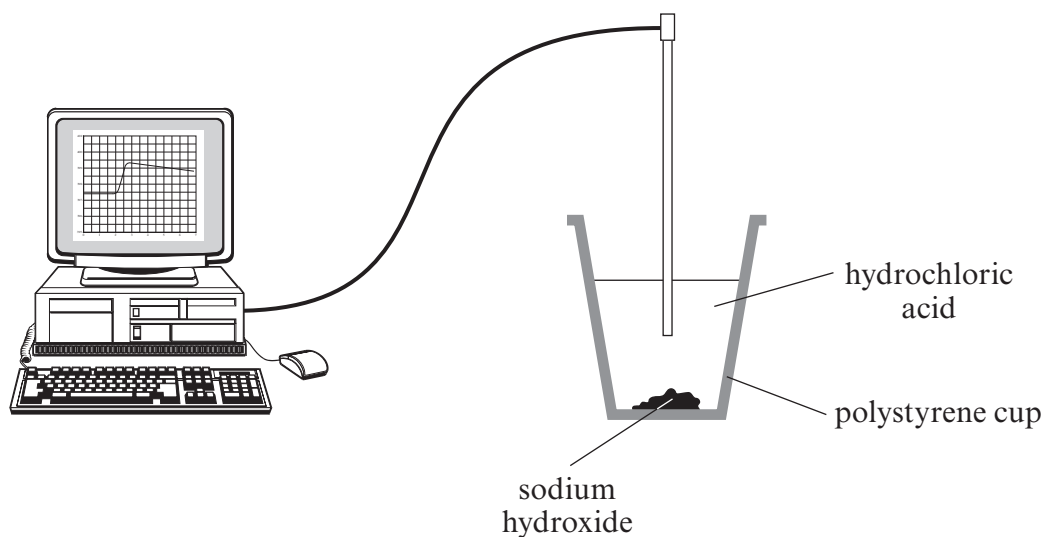
The graph produced by the computer is shown below.
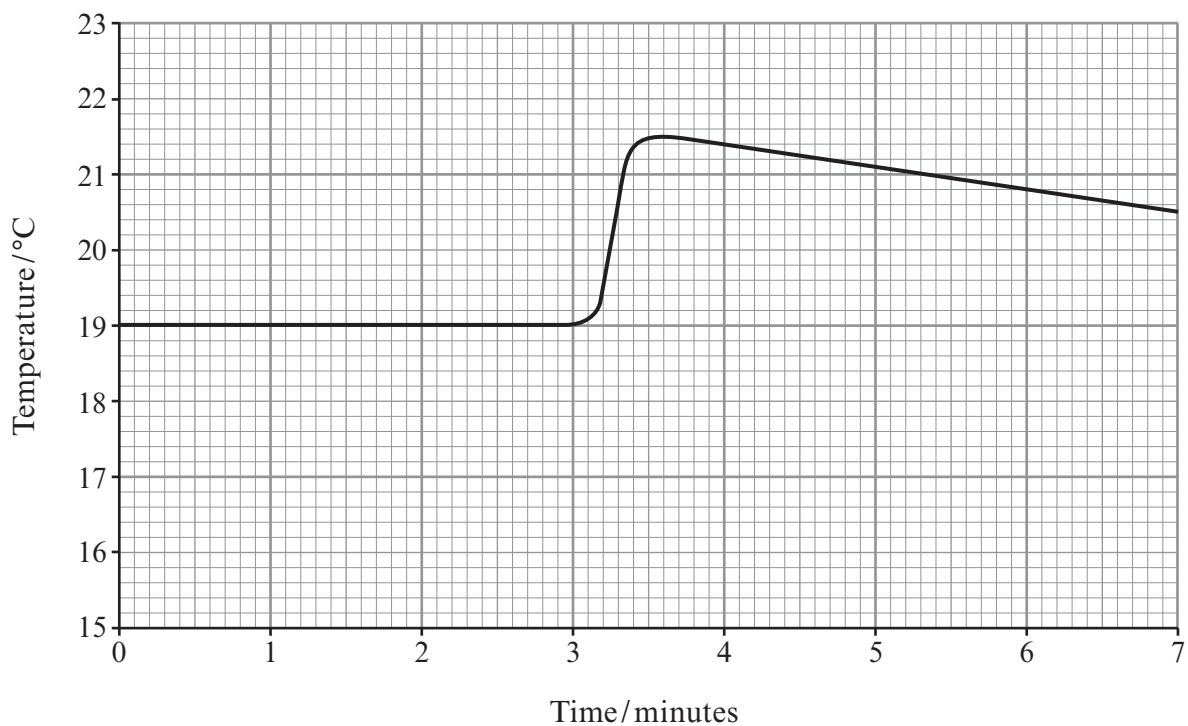
(a) Use the graph to give the

   (i) **highest** temperature recorded, ... °C [1]

   (ii) **increase** in temperature during the reaction. .... °C [1]

(b) Using the substances in the box below, write a **word** equation for the reaction that took place inside the polystyrene cup. [2]

hydrochloric acid	**sodium chloride**
sodium hydroxide	**water**

.... + ... ⟶ .... + ...
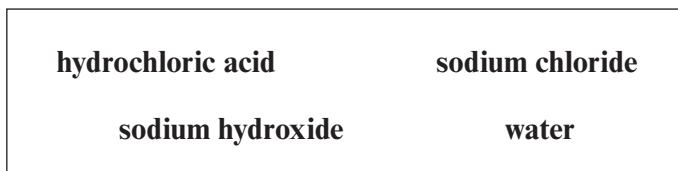
(c) State whether the reaction is exothermic or endothermic and give a reason for your answer. [1]

....

....

5

7. Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

Some calcium carbonate was placed in **excess** dilute hydrochloric acid. The total volume of carbon dioxide produced was recorded every minute. The experiment was carried out at room temperature. The results obtained are shown in the following table.

Time/minutes	0	1	2	3	4	5	6
Volume of carbon dioxide/cm^3	0	20	32	40	45	48	48

(a) Plot the results from the table on the grid below and draw a smooth curve through the points. [3]

Volume of carbon dioxide/cm^3

Time/minutes

(0236-01)
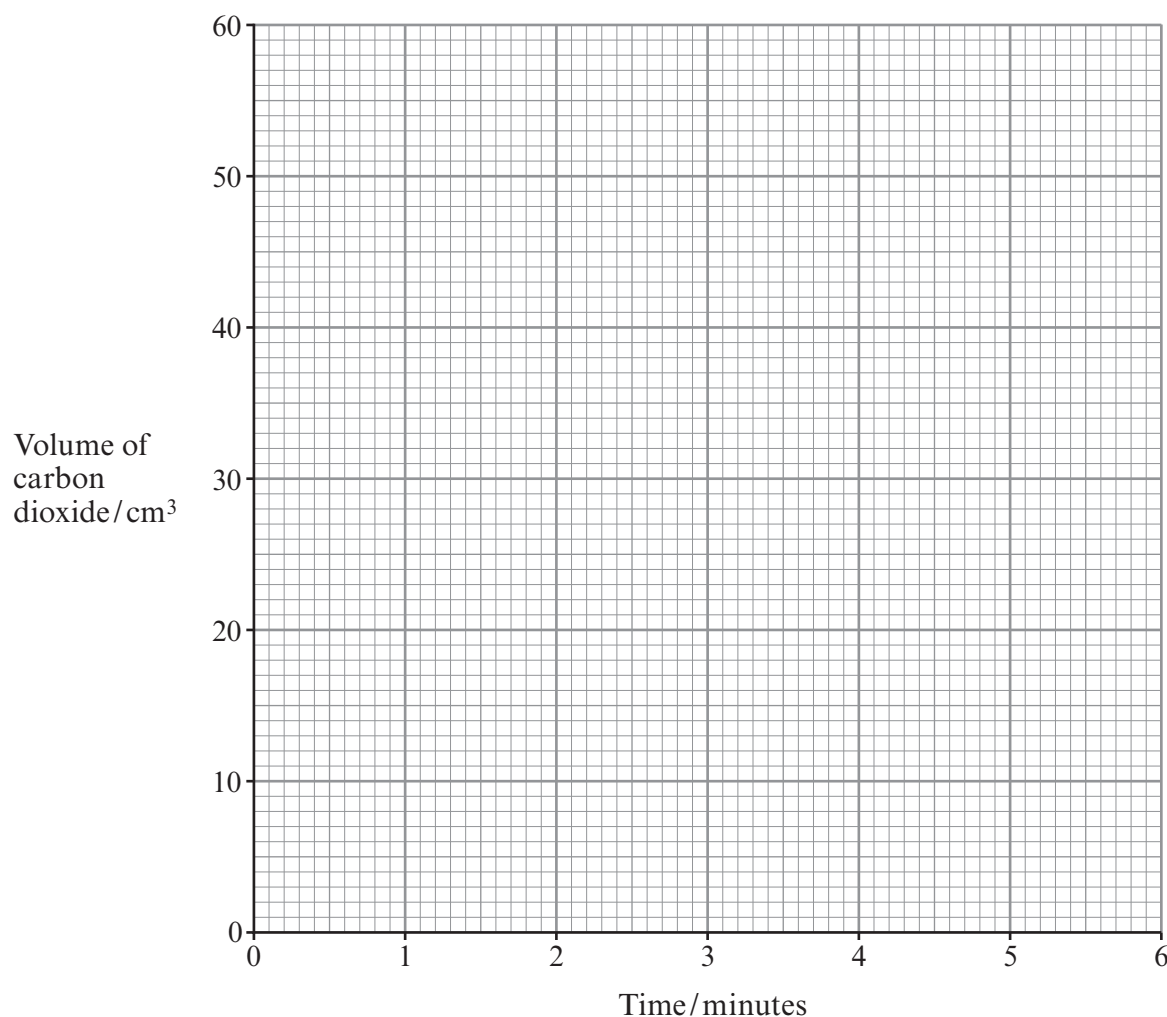
(b) Give the volume of carbon dioxide produced after 2½ minutes. [1]

.... cm^3

(c) If the reaction had been repeated using **half the amount** of calcium carbonate and the same amount of the original acid, give the expected final volume of carbon dioxide produced and explain your answer. [2]

Final volume of carbon dioxide .... cm^3

Explanation ....

....

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8. *(a)* The following table shows five compounds and their formulae.

Name of compound	Formula
ammonia	NH_3
hydrochloric acid	HCl
sodium chloride	NaCl
sulphuric acid	H_2SO_4
water	H_2O

Use the information in the table to answer parts (i)-(iii).

(i) Give the **name** of the compound that contains the elements hydrogen and oxygen **only**. [1]

....

(ii) Give the **names** of the elements present in hydrochloric acid. [1]

.... and ....

(iii) Give the **name** of the compound that contains **three** different elements. [1]

....

(b) Use the table of formulae for some common ions on the inside of the back cover of this examination paper to give the formula of

(i) ammonium chloride, ... [1]

(ii) sodium oxide. .... [1]

9. The electronic structures of five elements, **A**, **B**, **C**, **D** and **E**, are given in the following table.

These letters are **not** chemical symbols.

Element	Electronic structure
A	2
B	2,1
C	2,8,3
D	2,8,8
E	2,8,8,2

Choose letters from the table to answer parts *(a)* and *(b)*.

Each letter may be used once, more than once or not at all.

(a) Give the **letters** of the **two** elements which belong to the **same** period of the Periodic Table. Give a reason for your answer. [2]

Elements .... and ....

Reason ....

....

(b) Give the **letter** of the element which is found in Group 2 of the Periodic Table. Give a reason for your answer. [2]

Element ....

Reason ....

....

(c) The Periodic Table shown on the back cover of this examination paper may be of use in answering part (i).

(i) From the table above, give the **letter** of the element which represents argon. [1]

....

(ii) Give **one** use of argon. [1]

....

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10. The diagram below shows some reactions of a common acid.

```
                    ┌─────────────────────────┐
                    │ magnesium sulphate      │
                    │ solution and gas B      │
                    └─────────────────────────┘
                              ▲
                              │ magnesium
                              │ ribbon
  sodium hydroxide            │              black solid E
      solution                │
┌──────────────┐        ┌──────────────┐        ┌──────────────────┐
│ colourless   │ ◄───── │ dilute acid A│ ─────► │ blue solution F  │
│ solution D   │        └──────────────┘        └──────────────────┘
└──────────────┘              │
                              │ copper carbonate
                              ▼
                    ┌─────────────────────────┐
                    │ copper sulphate solution│
                    │ and gas C               │
                    └─────────────────────────┘
```
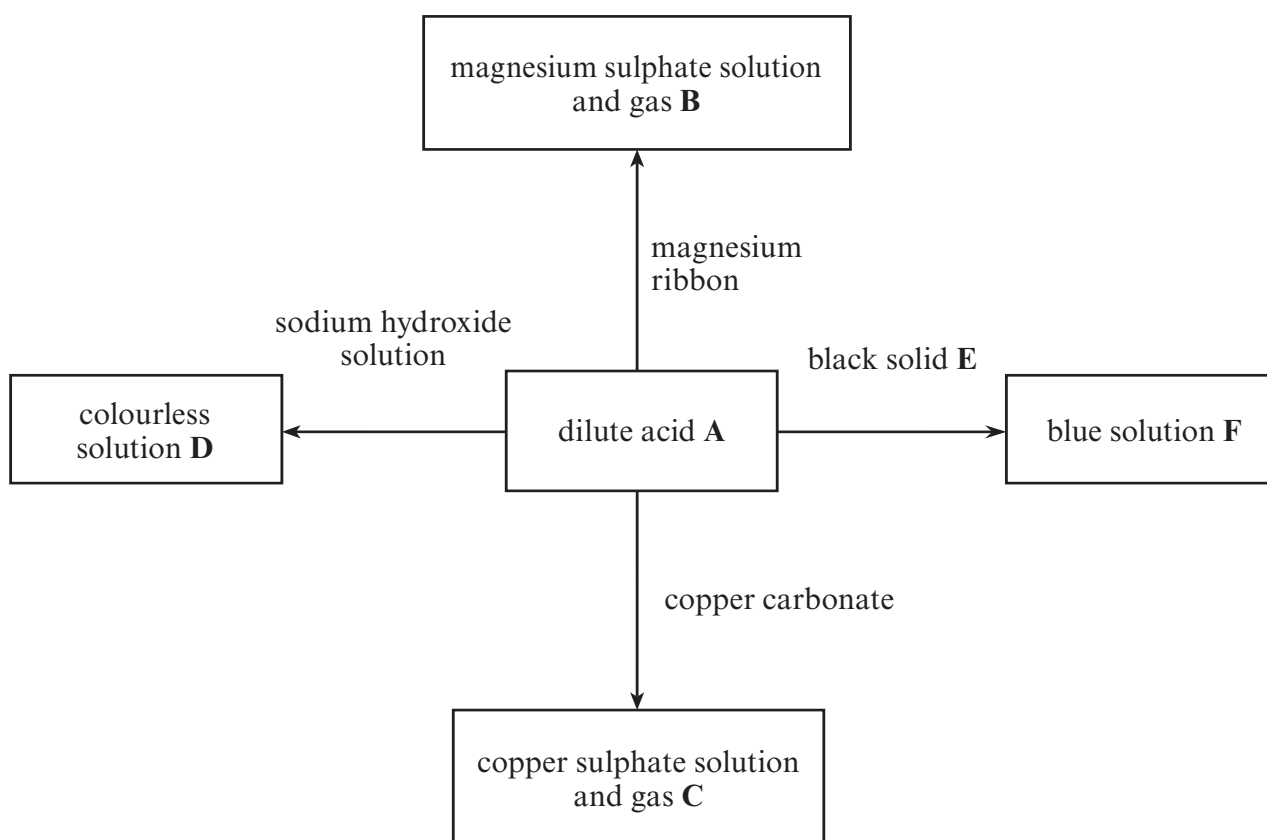
Give the name of

(a) acid **A**, ... [1]

(b) gas **B**, ... [1]

(c) gas **C**, ... [1]

(d) colourless solution **D**, ... [1]

(e) black solid **E**, ... [1]

(f) blue solution **F**. .... [1]

11. Briefly describe what happens at a boundary where two tectonic plates are moving apart. [3]

....

....

....

....

END OF PAPER

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al^{3+}	Bromide	Br^-
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^-
Calcium	Ca^{2+}	Fluoride	F^-
Copper(II)	Cu^{2+}	Hydroxide	OH^-
Hydrogen	H^+	Iodide	I^-
Iron(II)	Fe^{2+}	Nitrate	NO_3^-
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^+	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^+		
Silver	Ag^+		
Sodium	Na^+		
Zinc	Zn^{2+}		

PERIODIC TABLE OF ELEMENTS

Group

1	2											3	4	5	6	7	0
																	$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

$^{1}_{1}$H Hydrogen

Key:

Mass number	A
	X — Element Symbol
Atomic number	Z
	Name

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