GCSE

0236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. THURSDAY, 26 January 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**6**	
3.	**5**	
4.	**5**	
5.	**5**	
6.	**4**	
7.	**6**	
8.	**4**	
9.	**5**	
10.	**6**	
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.
Do not use correction fluid.

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 table below shows the physical properties of some elements.

Element	Melting point / °C	Boiling point / °C	Density / $g\,cm^{-3}$
nickel	1455	5267	8.9
iodine	114	184	4.9
tungsten	3422	5550	19.3
phosphorus	44	280	1.8
platinum	1768	3820	21.4

Use the information above to answer part *(a)*.

(a)   Give the **name** of the

(i)   **metal** with the lowest density, ... [1]

(ii) **non-metal** with the highest melting point. .... [1]

(b)   Element **X** (**X** is not the chemical symbol) has a melting point of 113 °C, a boiling point of 445 °C and a density of 2.1 $g\,cm^{-3}$.
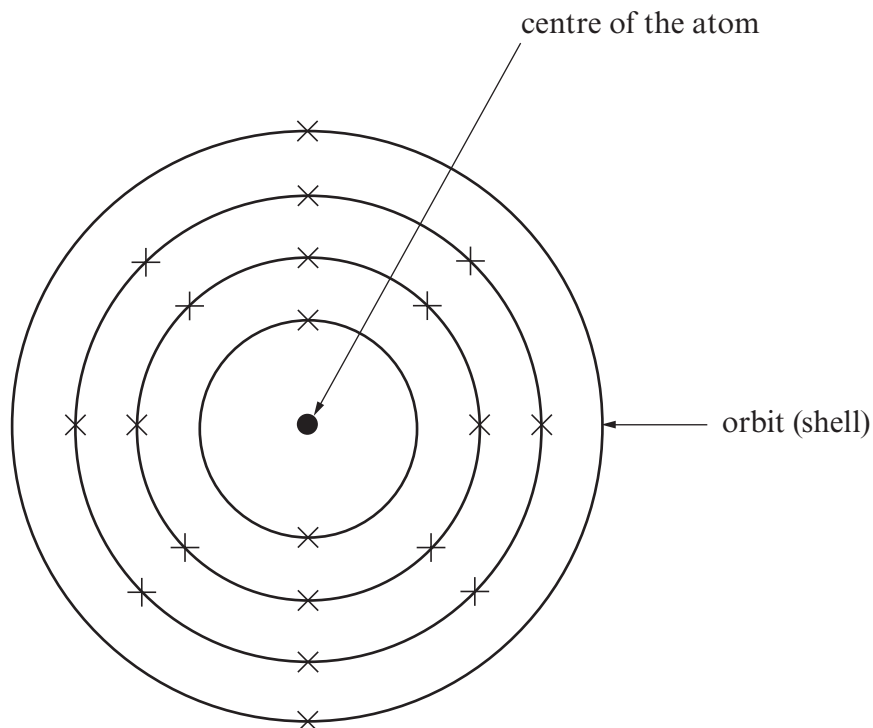
State, giving a reason, whether element **X** is a metal or a non-metal. [2]

Element **X** is a ....

Reason ....

2. *(a)* The diagram below shows an atom of calcium.

centre of the atom

orbit (shell)

(i) The box below shows the names of particles found in atoms.

electrons	**neutrons**	**protons**

Choose particles from the box to complete the following sentence.

The nucleus of a calcium atom contains .... and

.... [2]

(ii) Use only the numbers in the box below to complete the following sentences.

2	**8**	**10**	**18**	**20**	**40**

I. The atomic number of calcium is .... [1]

II. The electronic structure for an atom of calcium is 2,8, ... [1]

(b) Phosphoric acid, H_3PO_4 is found in some cola drinks.

(i) State how many phosphorus atoms are present in the formula, H_3PO_4.

.... [1]

(ii) Give the **total** number of atoms shown in the formula. .... [1]

Turn over.

6

3. The following table shows some substances, their formulae and diagrams that can be used to represent them.

Substance	Formula	Diagram
ammonia	NH_3	
carbon dioxide	CO_2	
hydrogen chloride	HCl	
methane	CH_4	
water	H_2O	

(a) Use the information in the table to work out the key being used to represent the different elements in the diagrams.

● represents the element .... [1]

⬤ represents the element .... [1]

◯ represents the element .... [1]

◍ represents the element .... [1]

(b) Choose from the box below the term used to describe all the substances in the table above.   [1]

compound	**element**	**mixture**

Answer ....

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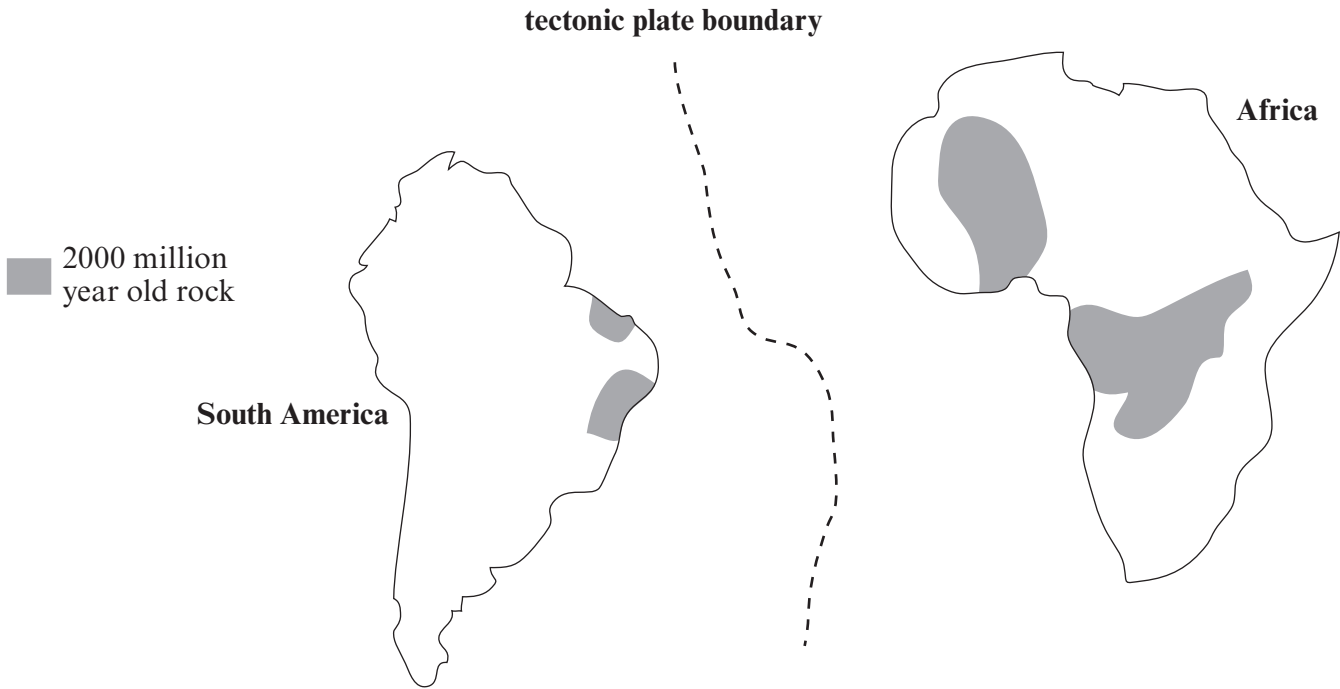
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ON THIS PAGE**

4. *(a)* The diagram below shows the position of the boundary between the tectonic plates on which South America and Africa lie. The shaded areas show where similar rock patterns are found.

tectonic plate boundary

Africa

■ 2000 million
year old rock

South America

Choose words/phrases from the box below to complete the sentences that follow.

moving towards each other	**moving away from each other**	**sliding past each other**
hour	**day** **week** **year**	

The similar rock patterns shown on the continents in the diagram suggest that Africa

and South America are .... They move with a

relative speed of a few centimetres per ....   [2]

(b) Use the information in the box below to answer parts (i) and (ii).

continental shrinking	**convection currents**	**continental expansion**
continental drift	**ocean currents**	**rotation of the Earth**

Tectonic plates are constantly moving.

(i) State the term used to describe the movement of tectonic plates.

.... [1]

(ii) State what causes tectonic plates to move. [1]

....

(c) Apart from rock patterns, give **one** other piece of evidence that is used to support the theory that the continents are moving. [1]

....

Turn over.

5

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5. The boxes below outline the arguments used by opponents and supporters of the fluoridation of drinking water. Read the information before attempting the questions that follow.

Opponents of fluoridation

Fluoridation of water is unnecessary if people take proper care of their teeth. Fluoride is only beneficial to growing children and has no benefits to adults.

Teeth can be stained if a child receives too much fluoride during tooth development.

Fluoride may have harmful side-effects such as an increased risk of bone cancer.

The government has no ethical right to give medication to an individual without personal consent.

Supporters of fluoridation

Fluoridation of water is an effective way of reducing tooth decay in children. Less tooth decay leads to fewer tooth extractions and therefore a reduction in the number of children given general anaesthetics.

Scientific studies show that fluoride in water, at or around 1 ppm, does not have any effect on the health of the body.

The public accepts that the chlorination of drinking water is necessary because it sterilises water making it safe to drink. Water fluoridation should be treated no differently.
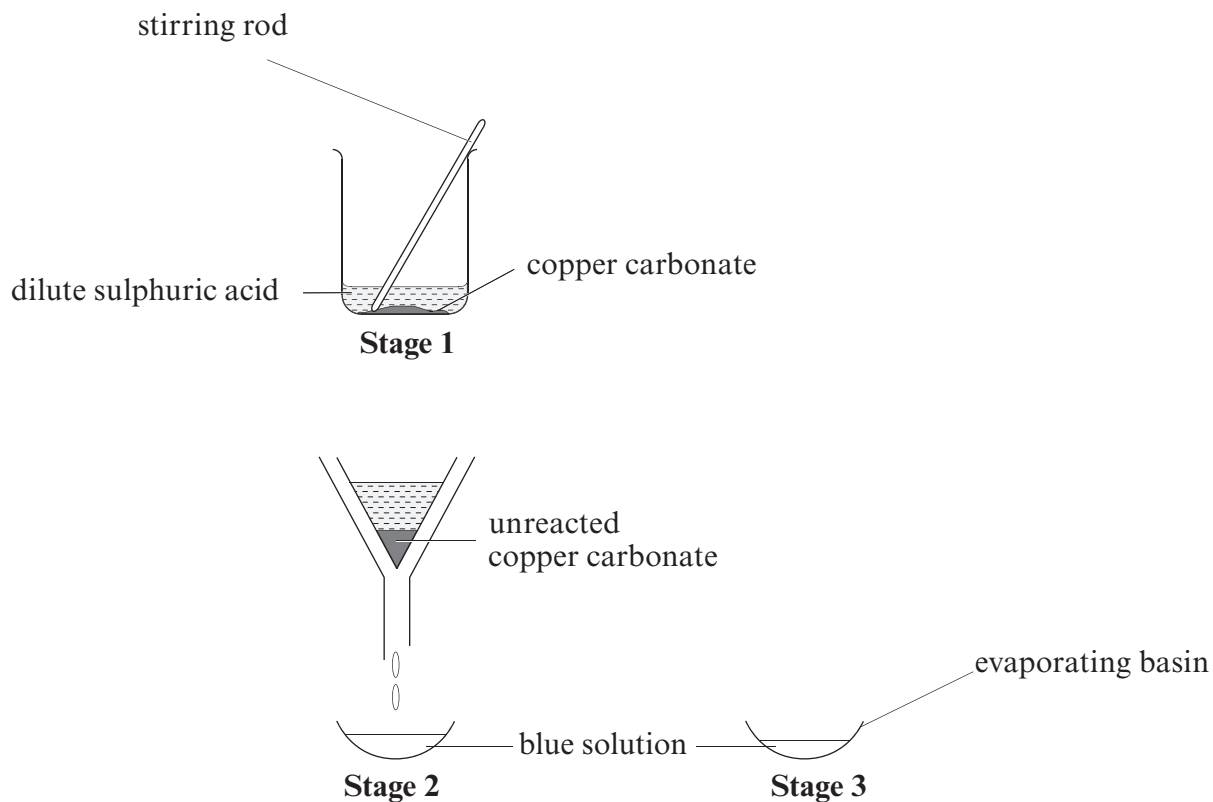
1 ppm = one part per million

Use only the information in the boxes to answer the following questions.

(a) Give the approximate quantity of fluoride in water that has been shown by some scientists not to have any effect on our health. [1]

....

(b) Give **one medical** argument used to

  (i)   support fluoridation, ... [1]

  (ii) oppose fluoridation. .... [1]

(c) Give **one ethical** argument used to oppose fluoridation. [1]

....

(d) Give the reason why opponents of fluoridation are not against the chlorination of water supplies. [1]

....

6. The diagram below shows the stages in making some **dry crystals** of copper sulphate by reacting copper carbonate with dilute sulphuric acid.

copper carbonate + sulphuric acid $\longrightarrow$ copper sulphate + water + carbon dioxide

stirring rod

dilute sulphuric acid

copper carbonate

Stage 1

unreacted
copper carbonate

evaporating basin

blue solution

Stage 2   **Stage 3**

Write a method describing how this experiment could be carried out. [4]

....

....

....

....

....

....
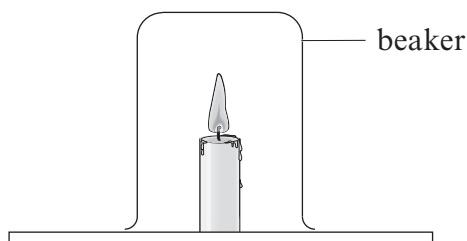
Turn over.

4

7. An investigation was carried out to find how long a candle stayed alight under different sized beakers.

The **average** burning time from three readings was calculated.
The results are shown in the table below.

Beaker volume / cm^3	Burning time / seconds			
	Reading 1	Reading 2	Reading 3	Average
100	4	4	4	4
200	12	11	10	11
400	20	18	22	20
600	30	29	31	30
800	60	20	40	40

(a) (i) Using the information in the table of results, give the beaker volume which has **unreliable** readings.

Beaker volume .... [1]

(ii) Give the reason for your choice in part (i). [1]

....

(b) On the grid below, plot the average burning times given in the table against beaker volume. Draw a line of best fit for these points. ***Your line should go through the origin (0,0).*** [3]
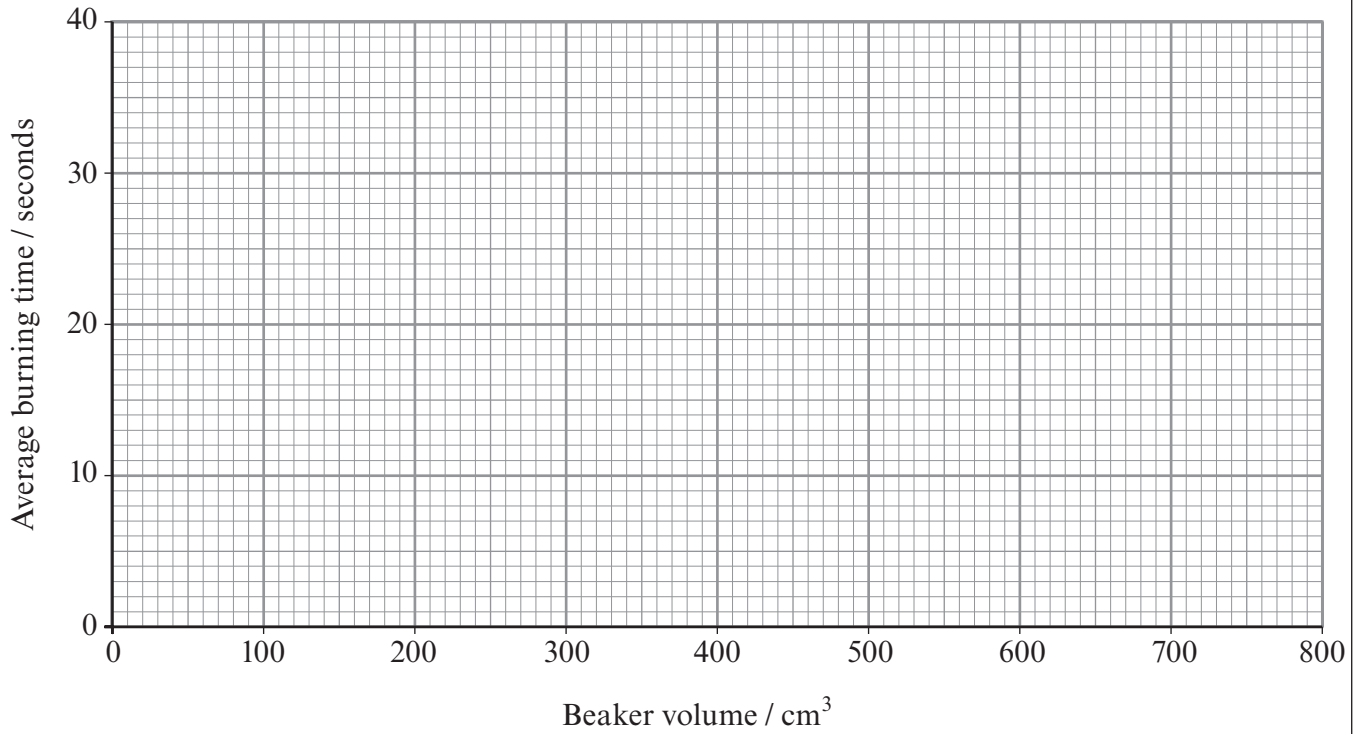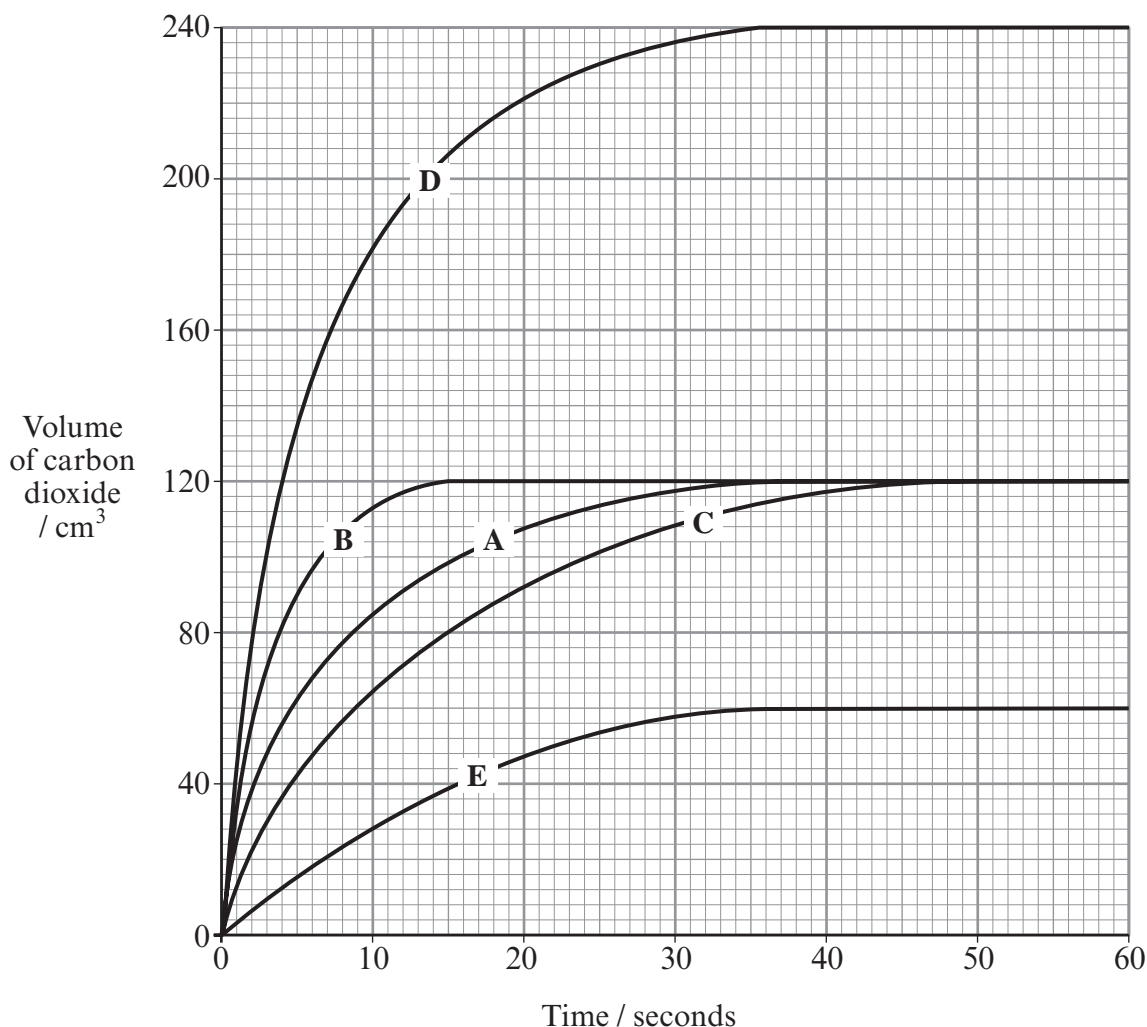

(c) State what happens to the burning time as the beaker volume increases. [1]

....

Turn over.

6

8. Marble chips (calcium carbonate) react with dilute hydrochloric acid forming carbon dioxide.

Graph **A** below, shows the volume of carbon dioxide formed during the reaction between 0.5 g of marble chips and *excess* dilute hydrochloric acid at 20 °C.

Give the letter, **B-E**, of the graph which could represent the results obtained when an *excess* of the same dilute hydrochloric acid as above was added to

(a)   0.5 g of marble chips at 10 °C, ...   [1]

(b)   0.25 g of marble chips at 20 °C, ...   [1]

(c)   1.0 g of marble chips at 20 °C, ...   [1]

(d)   0.5 g of **crushed** marble chips at 20 °C.   ....   [1]

4

9. Crude oil is a mixture of compounds called hydrocarbons, which can be separated into fractions.

(a) Give the name of the process which separates crude oil into fractions. [1]

....

(b) The table below shows some information about the main fractions obtained.

Main fraction	A hydrocarbon found in this fraction	The boiling point of this hydrocarbon / °C
refinery gases	propane, C_3H_8	–42
petrol	octane, C_8H_{18}	126
naphtha	decane, $C_{10}H_{22}$	170
paraffin (kerosene)	dodecane, $C_{12}H_{26}$	216
diesel oil (gas oil)	eicosane, $C_{20}H_{42}$	344

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

(i) State how the number of carbon atoms in a hydrocarbon affects its boiling point. [1]

....

(ii) Suggest a value for the **lowest** temperature needed to boil **all** the named hydrocarbons in the table. [1]

.... °C

(iii) Decane boils at 170 °C. State the temperature at which decane gas condenses to a liquid. [1]

.... °C

(iv) Name the elements present in **all** the fractions. [1]

.... and ....

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10. Sodium is found in Group 1 of the Periodic Table of Elements.

(a) When a freshly cut piece of sodium is exposed to air, its cut surface quickly reacts with oxygen forming sodium oxide.

(i) Sodium is normally stored in a liquid to prevent this reaction occurring.
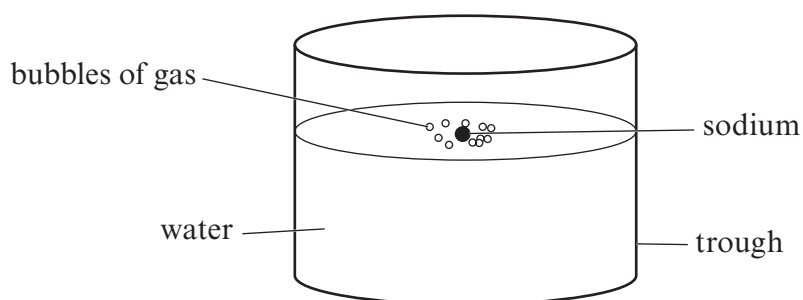
Give the name of this liquid. [1]

....

(ii) Balance the **symbol** equation for the reaction between sodium and oxygen. [1]

.... Na + ... O_2 ⟶ .... Na_2O

(b) The diagram below shows sodium reacting with water.

(i) Using the information in the diagram, state one **unusual** physical property of sodium that is not common to most metals. [1]

....

(ii) Universal indicator turns purple when added to the water after the sodium has reacted. Give the reason for this colour change. [1]

....

(iii) Give the **name** of the gas formed when sodium reacts with water. [1]

....

(iv) Name a Group 1 metal which would react **less** vigorously with water than sodium does. [1]

....

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^+		

PERIODIC TABLE OF ELEMENTS

Group

1	2											3	4	5	6	7	0
																	$^{4}_{2}$He Helium
$^{1}_{1}$H Hydrogen																	
$^{7}_{3}$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															

Key:

Mass number ⟶ A

X ⟶ Element Symbol

Atomic number ⟶ Z

Name

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