Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 2 (Chemistry)
Foundation Tier

MV18

[GSS21]
THURSDAY 23 FEBRUARY 2017, MORNING

Time

1 hour, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

Information for Candidates

The total mark for this paper is 60.
Quality of written communication will be assessed in Question **9(b)**.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
A Data Leaflet, which includes a Periodic Table of the Elements, is included for your use.

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1 Materials that come from living things are described as natural.
Other materials are described as man-made.

(a) Place the following materials in the correct column of the table below. [2 marks]

polythene **wool** **cotton** **silk**

Natural	**Man-made**

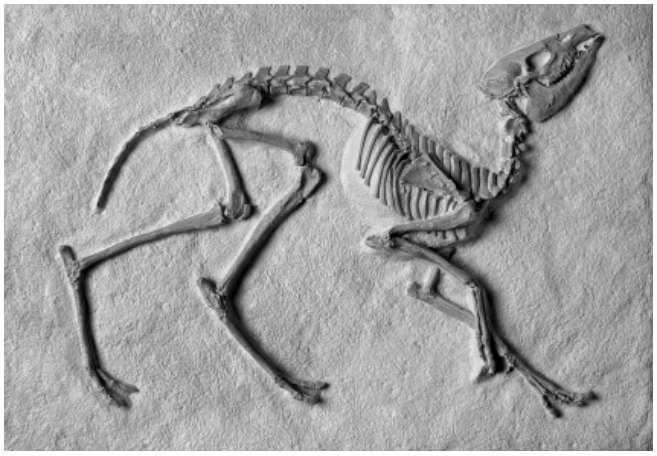
Most modern buckets are made from plastic rather than metal.

(b) Suggest **two** reasons why plastic is better than metal for making buckets. [2 marks]

1. _____

2. _____

2 A photograph of a fossil is shown below.



(a) What is a fossil? [2 marks]

_____

_____

(b) Complete the sentences below about different rock types. [2 marks]

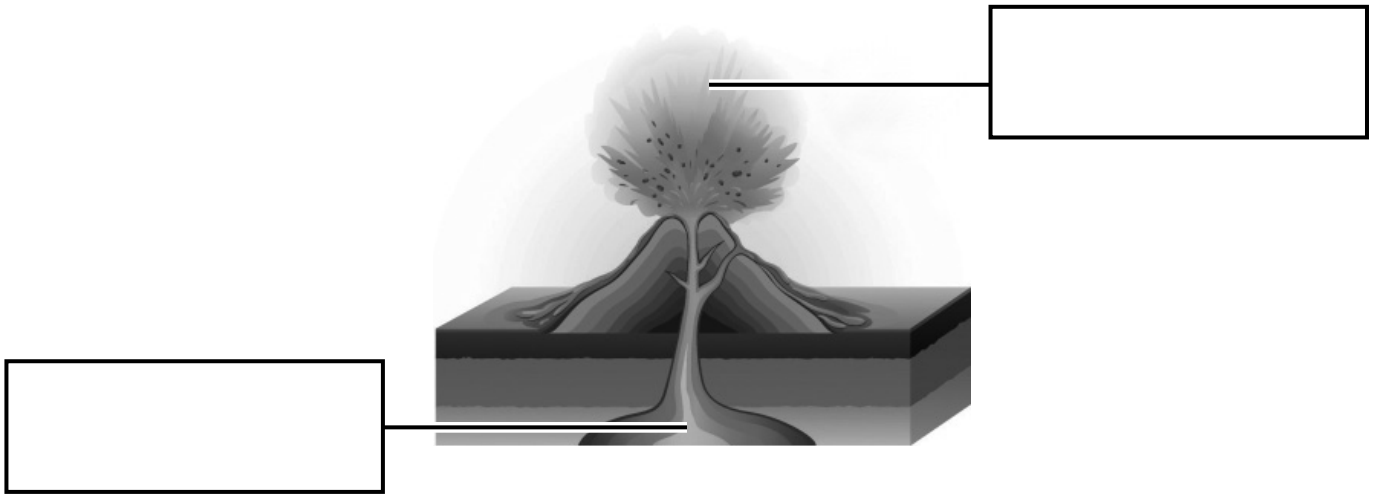
Volcanic eruptions produce a type of rock

called _____.

One example of a sedimentary rock

is _____.

(c) The diagram below shows a volcanic eruption.



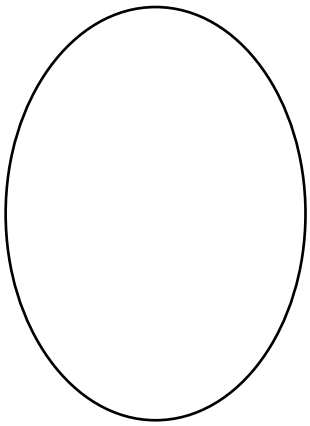
Label the parts of the volcano shown above.
[2 marks]

Choose from:

magma : lava : dust and ash : crust

3 Scientists can take fingerprints from crime scenes.

(a) (i) In the space below draw the pattern of a **whorl** fingerprint. [1 mark]



(ii) Apart from a whorl, name one **other** type of fingerprint. [1 mark]

_____

(b) Given below are the steps a scientist might use to take a fingerprint from a white surface at a crime scene. They are **not** in the correct order.

1. brush off excess powder

2. sprinkle carbon black powder onto the surface

3. transfer the print onto card

4. lift the print with clear tape

(i) Put the steps (**1**, **2**, **3**, and **4**) in the correct order. [2 marks]

_____ _____ _____ _____

(ii) Suggest one reason why aluminium powder is **not** used on a white surface. [1 mark]

_____

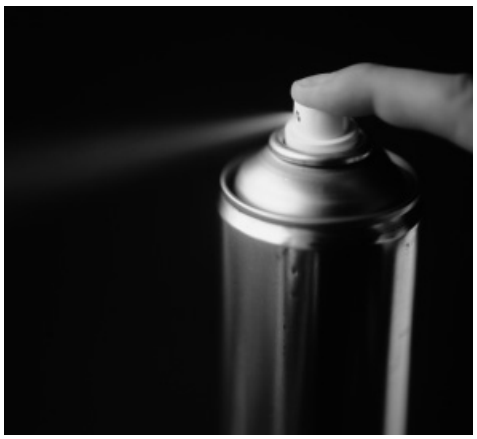
_____

4 Household substances can have a range of pH values.

(a) Complete the table below. [3 marks]

Household substance	pH	Colour with Universal Indicator	Type of solution
oven cleaner	13		strong alkali
lemon juice		yellow	weak acid
baking soda	8	green/blue	

(b) Most aerosols such as deodorants and air fresheners are flammable.

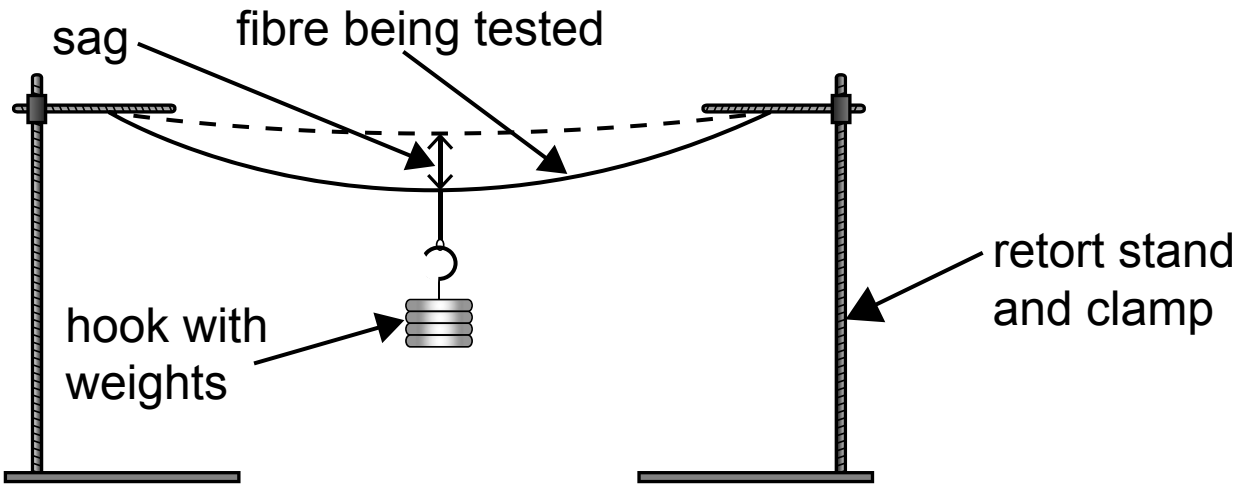


In the space below draw the hazard symbol you would expect to find on a flammable aerosol. [1 mark]

(c) A wasp sting is alkaline. Shown below are three statements made by pupils in a class discussion about treating a wasp sting.

Name the pupil who gave the best answer. Explain fully your choice. [3 marks]

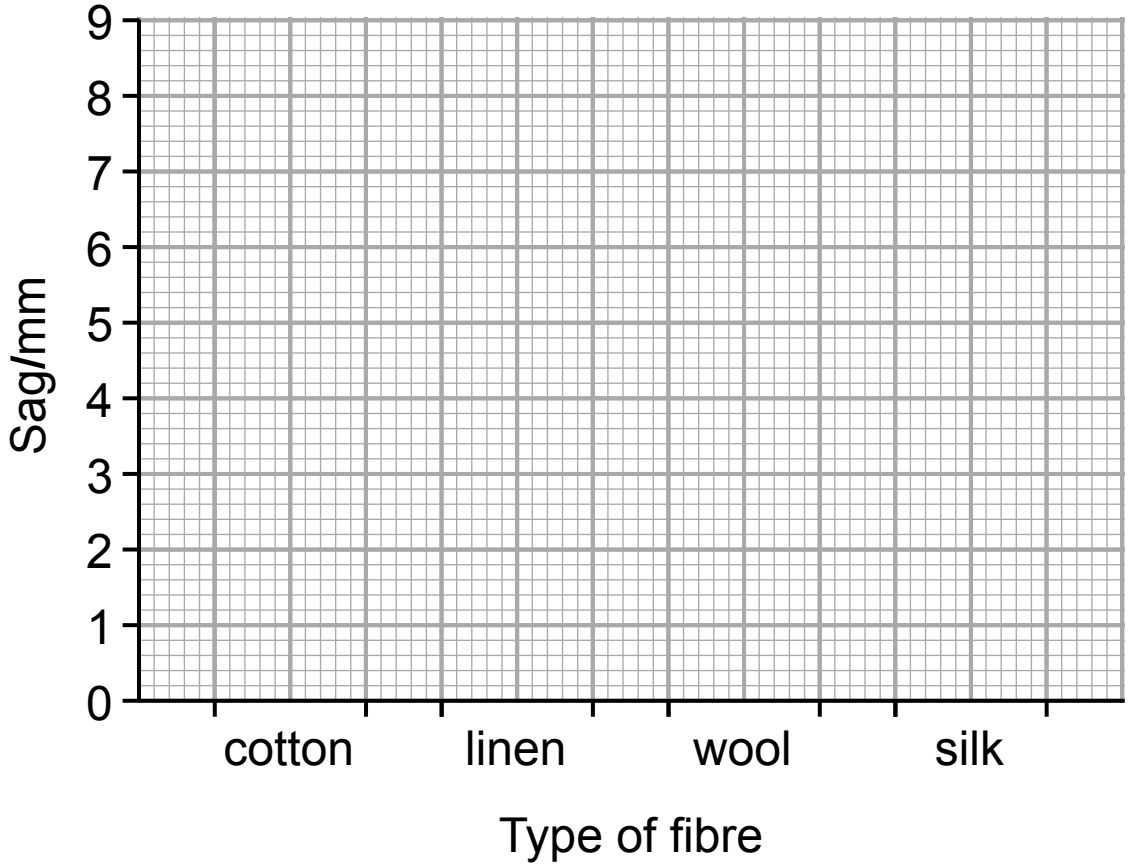
5 The apparatus shown below was used to test the flexibility of four different fibres.



When the weights were added the amount the fibre sagged was measured. The results are shown below.

Type of fibre	**Sag/mm**
cotton	7.0
linen	2.0
wool	8.5
silk	5.2

(a) (i) On the grid below, draw a **bar chart** for these results. [2 marks]



(ii) Which fibre is the most flexible? [1 mark]

_____

(b) State **one** thing that should have been done to make this a fair test. [1 mark]

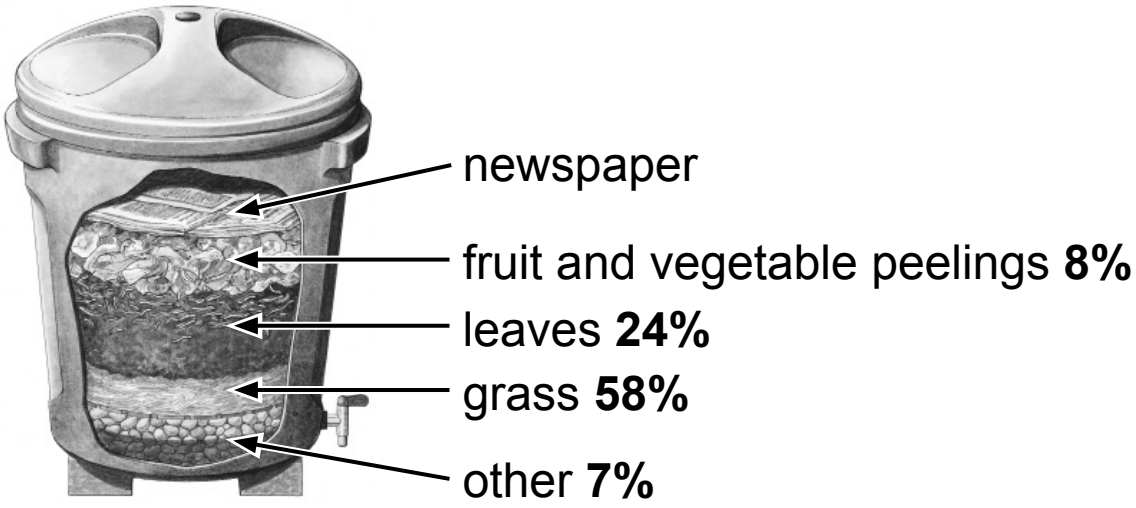
_____

_____

(c) State **one** thing that should have been done to make the results reliable. [1 mark]

_____

6 Below is some information about the percentage of different types of waste in a compost bin.



(a) Calculate the percentage of newspaper in the compost bin. [1 mark]

_____**%**

(b) All the waste in a compost bin is biodegradable. What is meant by the term **biodegradable**? [2 marks]

_____

_____

(c) Suggest **one** reason why the percentage of grass added to the compost bin decreases in winter. [1 mark]

_____

_____

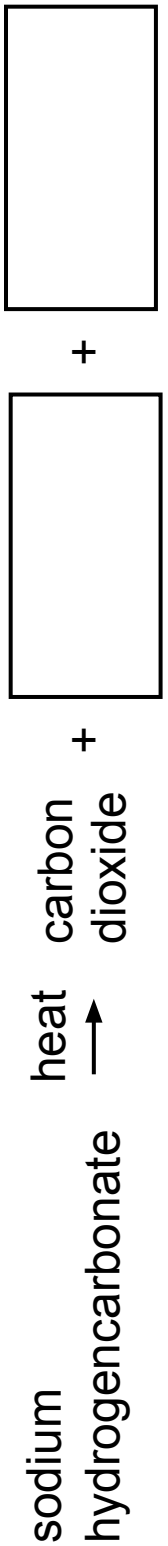
(d) Aluminium is a material that can be recycled. Give **two** reasons why it is important to recycle aluminium.
[2 marks]

1. _____

2. _____

7 **(a)** Carbon dioxide is produced when sodium hydrogencarbonate is heated.

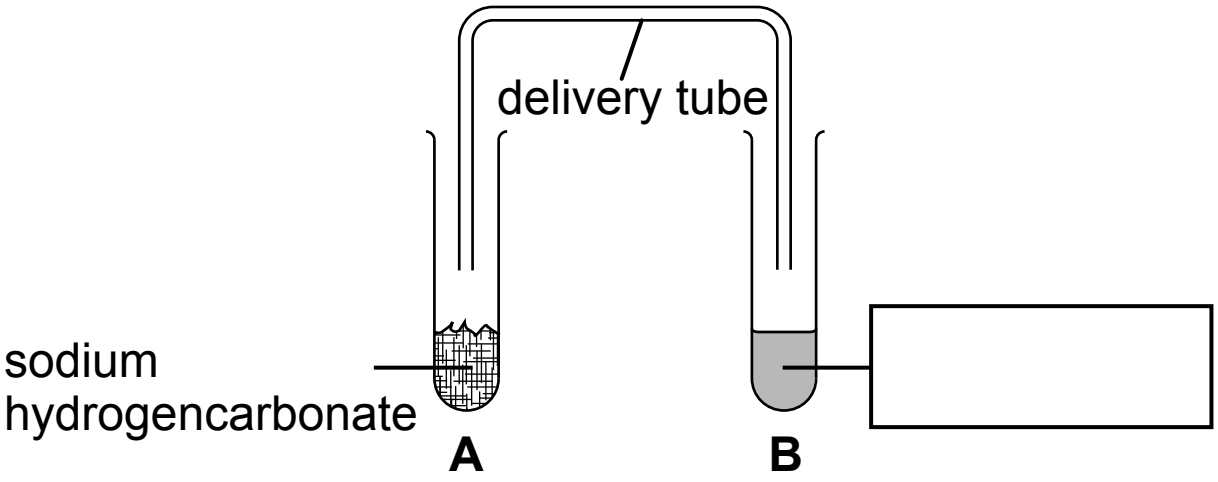
(i) Complete the word equation for this reaction. [2 marks]



(ii) What name is given to this **type** of reaction?
[1 mark]

_____

(b) A student wanted to use the apparatus shown below to make and test for carbon dioxide. However, it did not work as it was not correctly set up.



(i) On the diagram above, name the chemical in test tube **B**, that is used to test for carbon dioxide.
[1 mark]

(ii) Describe one mistake in the set-up of test tube **A** and one mistake in the set-up of test tube **B**.
[1 mark for each]

Test tube **A** _____

_____

Test tube **B** _____

_____

(c) Baking powder contains sodium hydrogencarbonate and is used in making cakes.

(i) Name the chemical added to sodium hydrogencarbonate to make baking powder. [1 mark]

_____

(ii) State **one** reason why baking powder is used in making cakes. [1 mark]

_____

_____

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(Questions continue overleaf)

8 The table below gives some properties of five materials.

material	relative heaviness	relative strength	relative stiffness	relative cost
steel	7800	10	105	low
Kevlar	1400	30	70	high
graphene	1000	2000	5	very high
glass reinforced plastic	1900	15	10	medium
wood	5000	5	40	low

Using **only** the information in the table, answer the questions below.

(a) Traditionally, canoe bodies were made from wood. However, modern canoes can be made from Kevlar.

State the main advantage and the main disadvantage of using Kevlar. [2 marks]

Advantage _____

Disadvantage _____

(b) The first tennis rackets were made from wood. However, scientists are now investigating the use of graphene instead of wood.
Describe fully how graphene tennis rackets will be different from wooden rackets when used. [2 marks]

9 **(a)** **(i)** What is meant by the term **hard water**? [2 marks]

_____

_____

(ii) Name **one** ion that can cause water to be hard. [1 mark]

_____

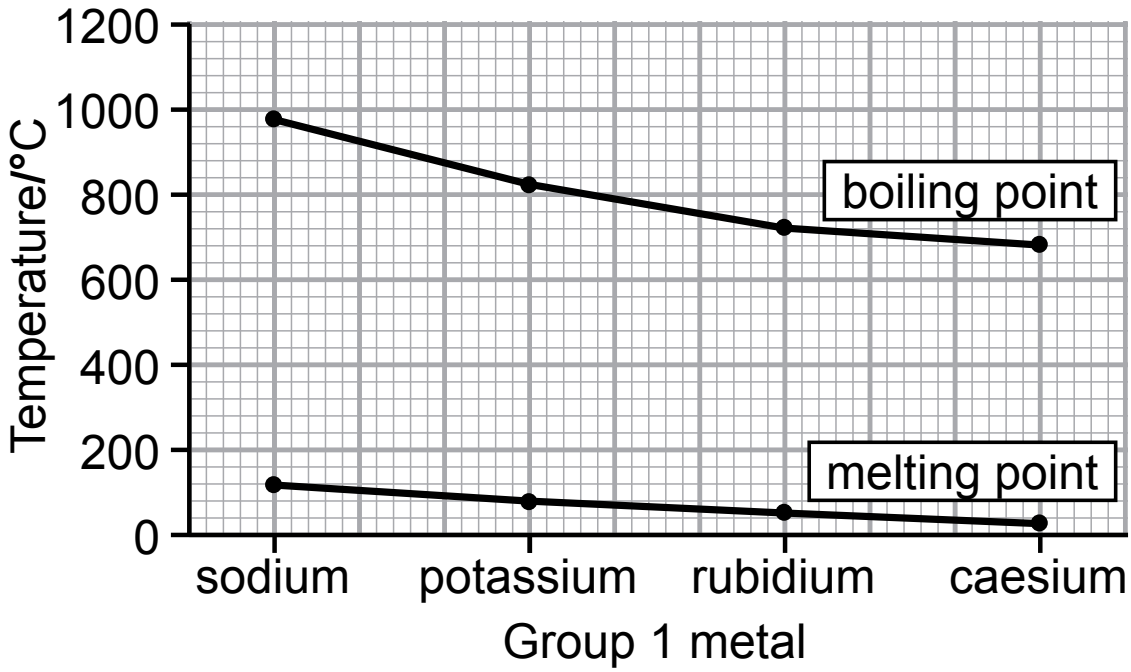
(b) Describe an experiment to distinguish between the two types of hard water.

Your answer should include:

- the names of the two types of hard water
- a method for the experiment including how to make it a fair test
- the expected results for each type of hard water

In this question you will be assessed on your written communication skills including the use of specialist scientific terms. [6 marks]

10 The graph below shows the melting and boiling points of some Group 1 metals.



You may find your Data Leaflet helpful.

(a) Give **one** similarity and **one** difference between the trends in melting points and boiling points of the metals in Group 1. [1 mark for each]

Similarity _____

_____

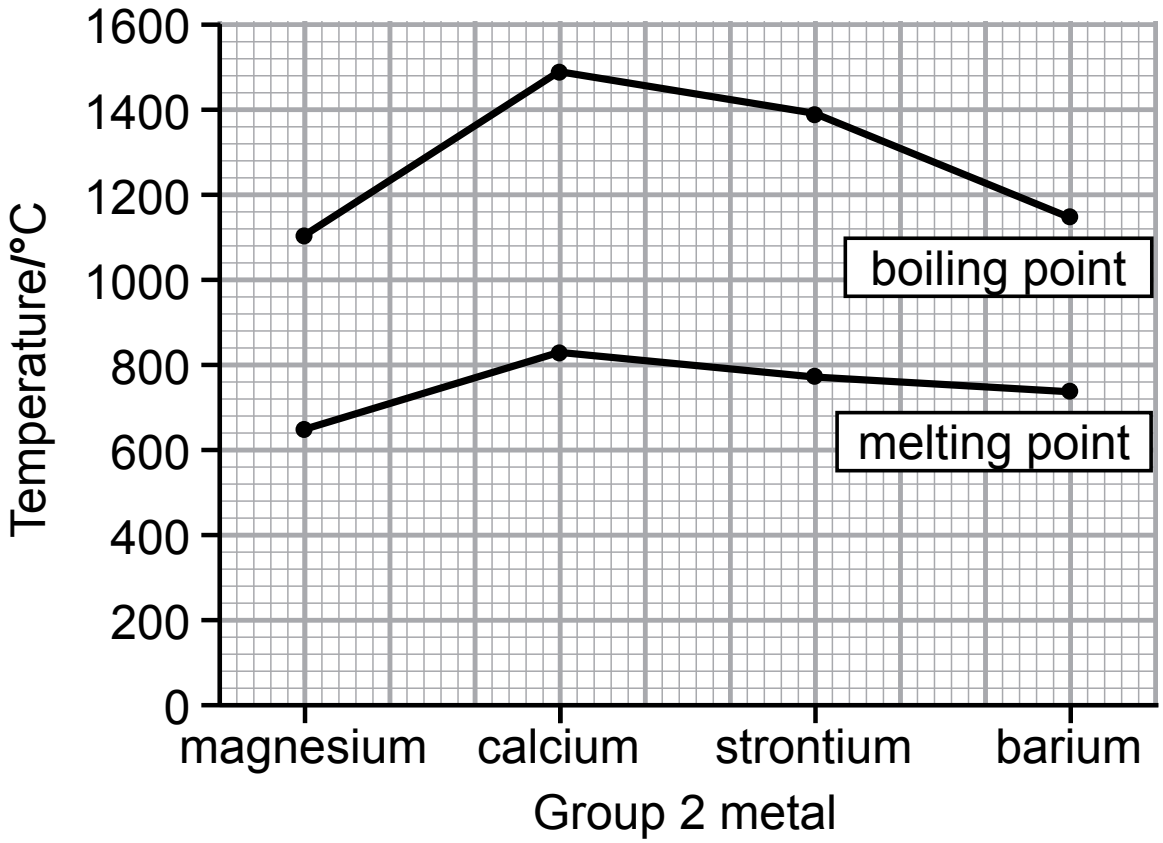
Difference _____

_____

(b) What name is given to the metals in Group 1 of the Periodic Table? [1 mark]

_____

The graph below shows the melting and boiling points of some Group 2 metals.



You may find your Data Leaflet helpful.

(c) Describe fully the trend in **boiling** points of the metals in Group 2. [2 marks]

_____

_____

_____

(d) Predict the melting point of radium, which is another Group 2 metal. [1 mark]

_____ °C

THIS IS THE END OF THE QUESTION PAPER

SOURCES

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Q7(a) .....Source: Principal Examiner
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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

SYMBOLS OF SELECTED IONS

Positive ions

Name	Symbol
Ammonium	NH_4^+
Chromium(III)	Cr^{3+}
Copper(II)	Cu^{2+}
Iron(II)	Fe^{2+}
Iron(III)	Fe^{3+}
Lead(II)	Pb^{2+}
Silver	Ag^+
Zinc	Zn^{2+}

Negative ions

Name	Symbol
Carbonate	CO_3^{2-}
Dichromate	$Cr_2O_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogen carbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	$HCOO^-$
Nitrate	NO_3^-
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

Soluble
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble

Insoluble
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

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DATA LEAFLET

For the use of candidates taking
Science: Chemistry,
Science: Double Award
or Science: Single Award

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations.

Contents **Page**

gcse
science
chemistry
double award
single award

Rewarding Learning

THE PERIODIC TABLE OF ELEMENTS

Group

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	64 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	99 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	210 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	263 Sg Seaborgium 106	262 Bh Bohrium 107	265 Hs Hassium 108	266 Mt Meitnerium 109	269 Ds Darmstadtium 110	272 Rg Roentgenium 111	285 Cn Copernicium 112						

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	242 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	245 Bk Berkelium 97	251 Cf Californium 98	254 Es Einsteinium 99	253 Fm Fermium 100	256 Md Mendelevium 101	254 No Nobelium 102	257 Lr Lawrencium 103

* 58 – 71 Lanthanum series
† 90 – 103 Actinium series

a / b x
a = relative atomic mass (approx)
x = atomic symbol
b = atomic number