Candidate Name	Centre Number					Candidate Number				
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GCSE

SCIENCE (Double Award)

UNIT 2: (Double Award) CHEMISTRY 1
FOUNDATION TIER

SAMPLE ASSESSMENT MATERIALS

(1 hour 15 minutes)

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**8**	
3.	**7**	
4.	**7**	
5.	**9**	
6.	**6**	
7.	**9**	
8.	**6**	
Total	**60**	

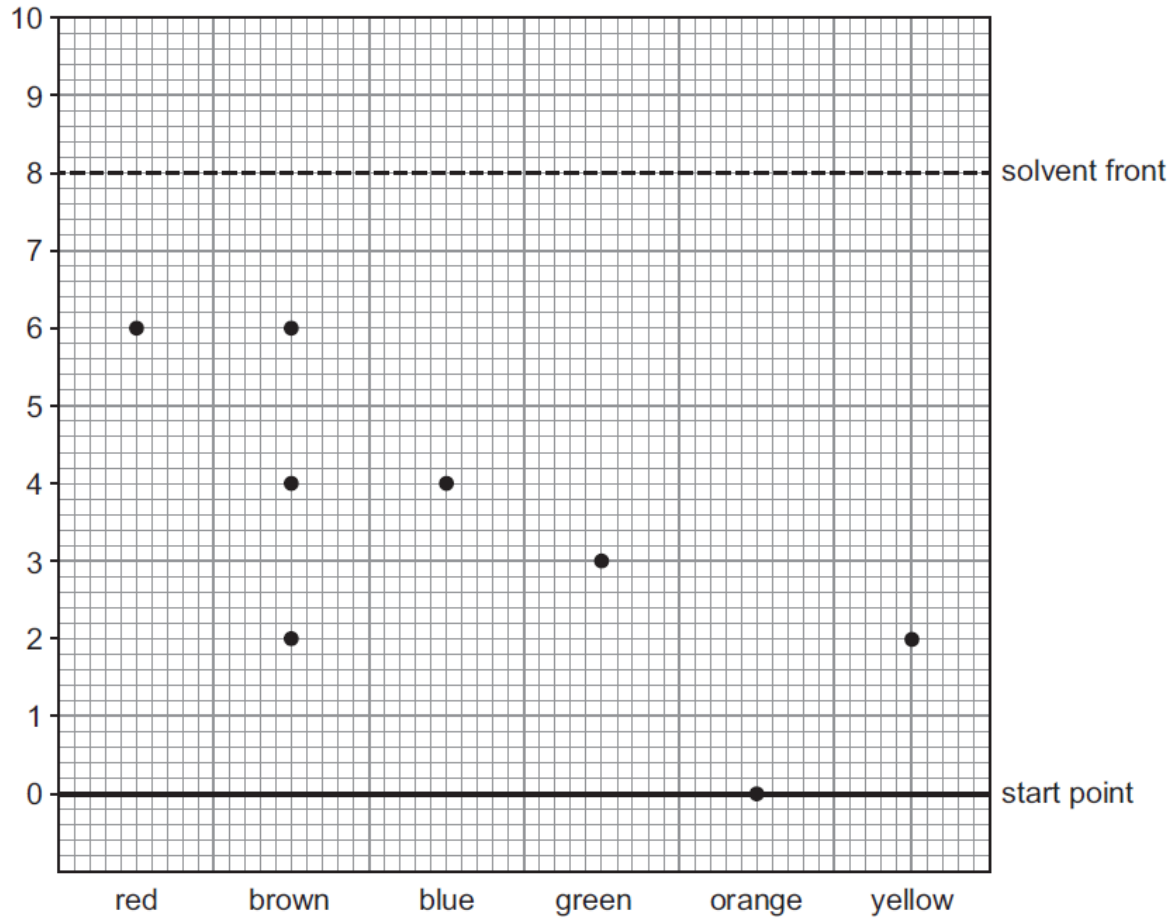
ADDITIONAL MATERIALS
In addition to this paper you will require a calculator.

INSTRUCTIONS TO CANDIDATES
Use black ink or black ball-point pen. Do not use gel 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.
Question **6** is a quality of extended response (QER) question where your writing skills will be assessed.

Answer **all** *questions*.

1. (a) The diagram below shows the chromatogram of six different coloured dyes from felt-tipped pens.



(i) Give the **three** coloured dyes which are mixed to give the brown coloured felt tipped pen. [1]

.....

.....

.....

(ii) Give the coloured dye which is insoluble in the solvent.
Give the reason for your choice. [1]

Dye .....

Reason .....

.....

(iii) The R_f value of a substance can be used to identify that substance.

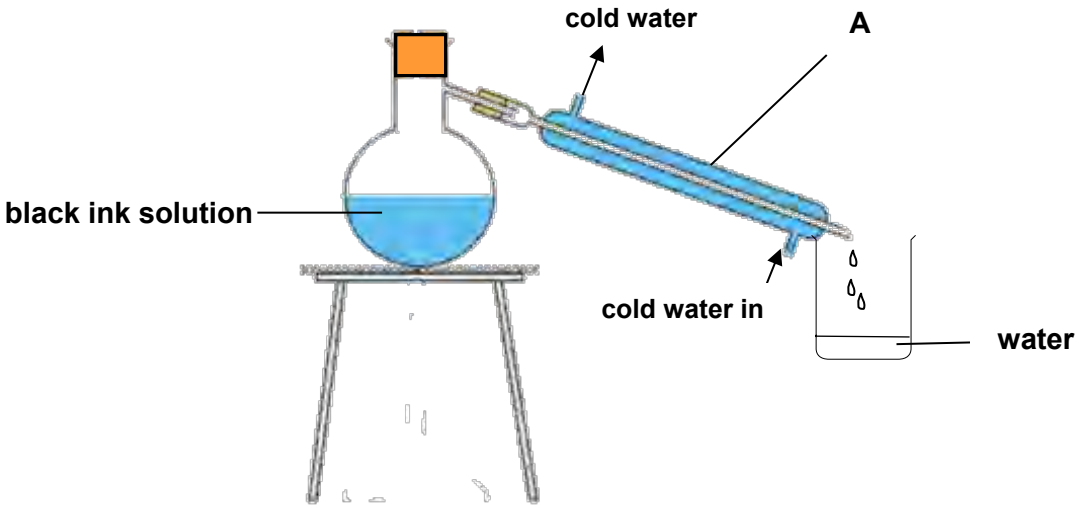
The R_f value is given by the formula:

$$R_f = \frac{\text{distance moved by the substance}}{\text{distance moved by the solvent front}}$$

Calculate the R_f value of the substance in the red pen. [2]

R_f = ...

(b) The diagram below shows the apparatus that can be used to obtain water from a black ink solution.



(i) The diagram is missing a piece of apparatus needed for the process to work. Draw the missing piece of apparatus onto the diagram. State the purpose of the missing piece of apparatus. [2]

.....

(ii) Describe the purpose of apparatus **A**. [2]

.....

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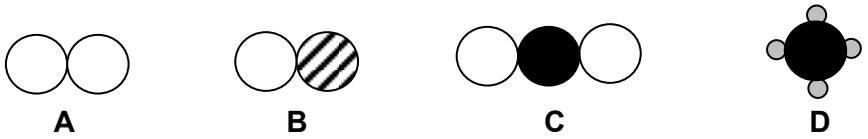
8

2. (a) The diagrams below represent carbon dioxide (CO_2), methane (CH_4), nitrogen oxide (NO) and oxygen (O_2) ***but not necessarily in that order***.



(i) Give the letter **A**, **B**, **C**, or **D** of the diagram which represents an element. Give the reason for your choice. [2]

Diagram ……

Reason ……....

……

(ii) Which substance is represented by diagram **C**? [1]

…….

(iii) Using the information above draw a diagram which represents one molecule of nitrogen trioxide, NO_3. [1]

(b) (i) Sodium chlorate, $NaClO_3$, is used to bleach paper.

$A_r(O) = 16$ $A_r(Na) = 23$ $A_r(Cl) = 35.5$

Calculate the relative molecular mass, M_r, of sodium chlorate. [2]

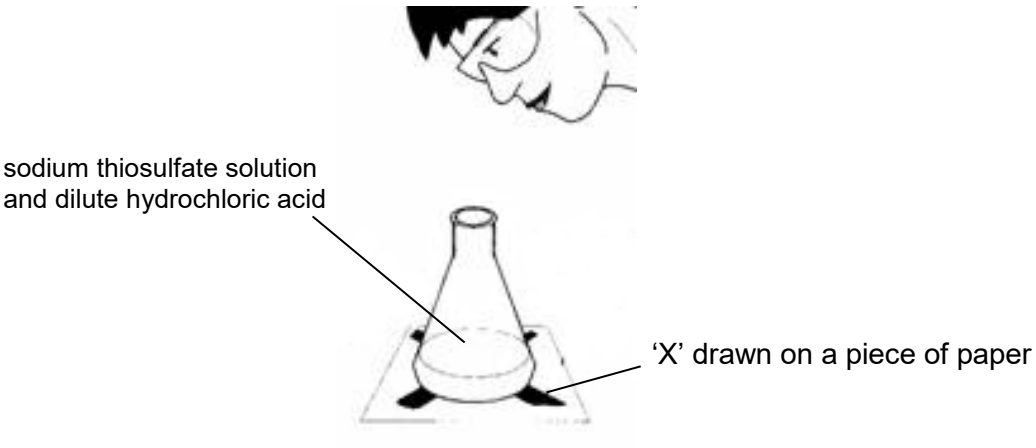
M_r = ……

(ii) Calculate the percentage of sodium in sodium chlorate. [2]

Percentage of sodium = …….

8

3. Sodium thiosulfate solution reacts with dilute hydrochloric acid forming a yellow precipitate. This reaction can be investigated using the 'disappearing cross' experiment. The yellow precipitate formed during the reaction causes the 'X' marked on a piece of white paper to disappear. The time taken for this to happen can be measured.



10 cm^3 of dilute hydrochloric acid were added separately to 50 cm^3 sodium thiosulfate solutions of five different concentrations. The results are shown below.

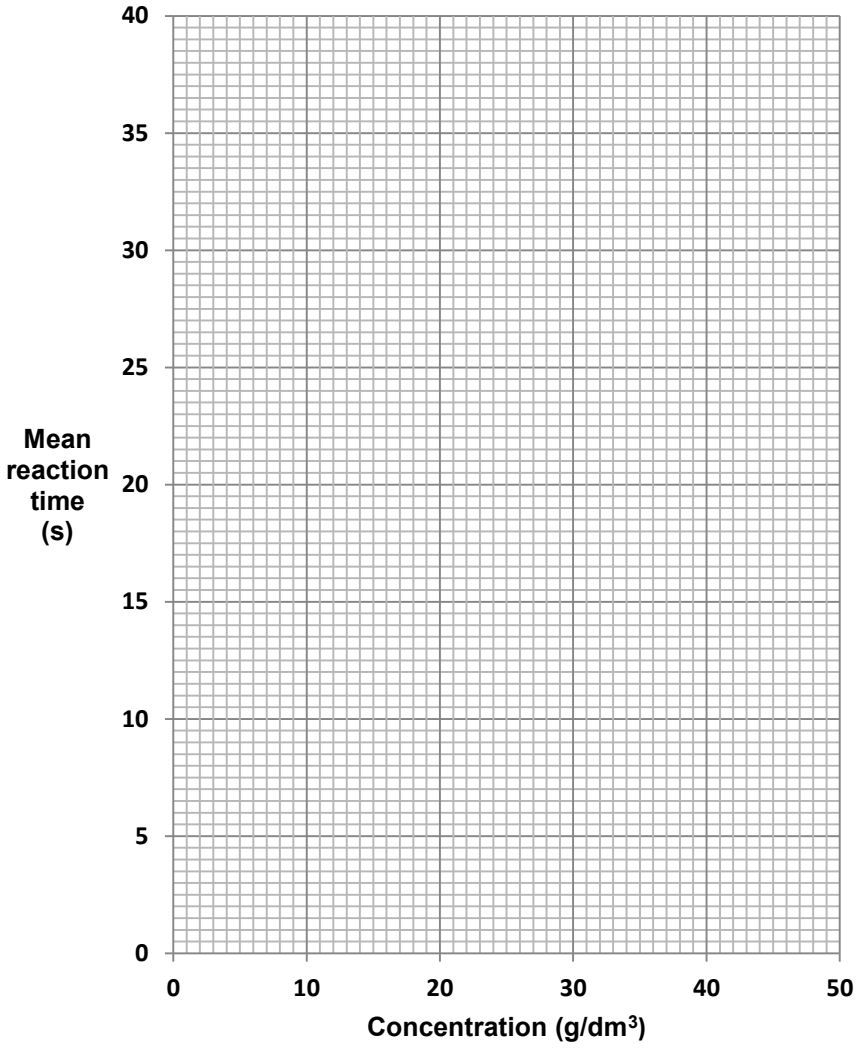
Concentration of sodium thiosulfate solution (g/dm^3)	**Reaction time (s)**			
	Run 1	**Run 2**	**Run 3**	**Mean**
40	6	7	5	6
32	7	7	7	7
24	10	9	11	10
16	19	17	18	18
8	37	38	39	38

(a) State whether you think the results are repeatable. Give the reason for your answer. [2]

……..

……..

(b) Plot the results from the table on the grid below and draw a suitable line. [3]



(c) Put a tick (✓) next to the statement you agree with. [1]

Increasing the concentration, increases the reaction time ☐

Increasing the concentration, decreases the reaction time ☐

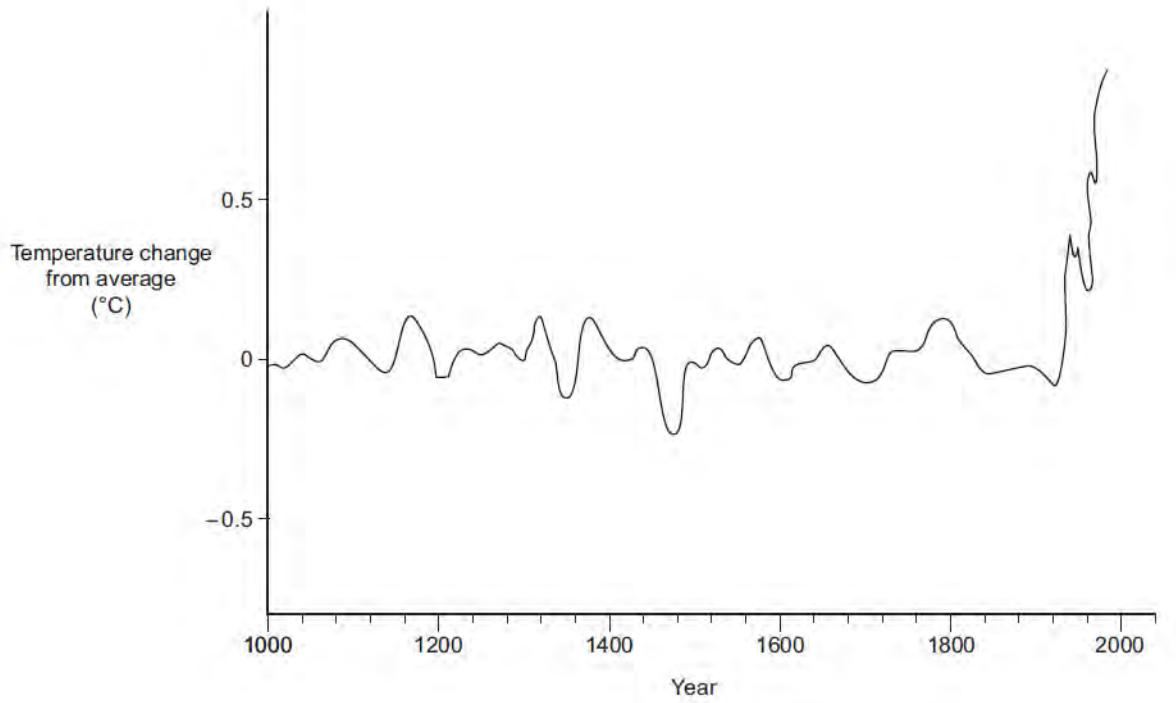
Increasing the concentration makes no difference to the reaction time ☐

(d) Apart from the volumes of both reagents and the concentration of the acid, name the **most** important factor which must be kept the same during each experiment. [1]

.....

7

4. The graph below shows how the Earth's global air temperature has changed from its average value over the last 1000 years. This has been used as evidence that global warming is taking place. Scientists started to record the temperature of the atmosphere in England in 1659. Temperatures before 1659 are based on data collected from ice cores, tree rings, ocean sediments and rock layers.



(a) Describe the trend in global air temperature over the last 1000 years. [2]

.....

.....

(b) Put a tick (✓) in the box that best describes how scientists obtain data to show the temperature of the Earth's atmosphere is increasing. [1]

make and record observations	☐	research the internet	☐
computer modelling	☐	debate the issue	☐

(c) Between which **two** dates is the graph most reliable? Give the reason for your answer. [2]

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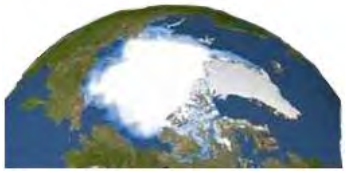
(d) The pictures below show the ice cap in the Earth's Arctic region.



Average extent of the ice during the month of September 1979, 1980 and 1981

Extent of ice in September 2000

Explain how these pictures support the information in the graph. [2]

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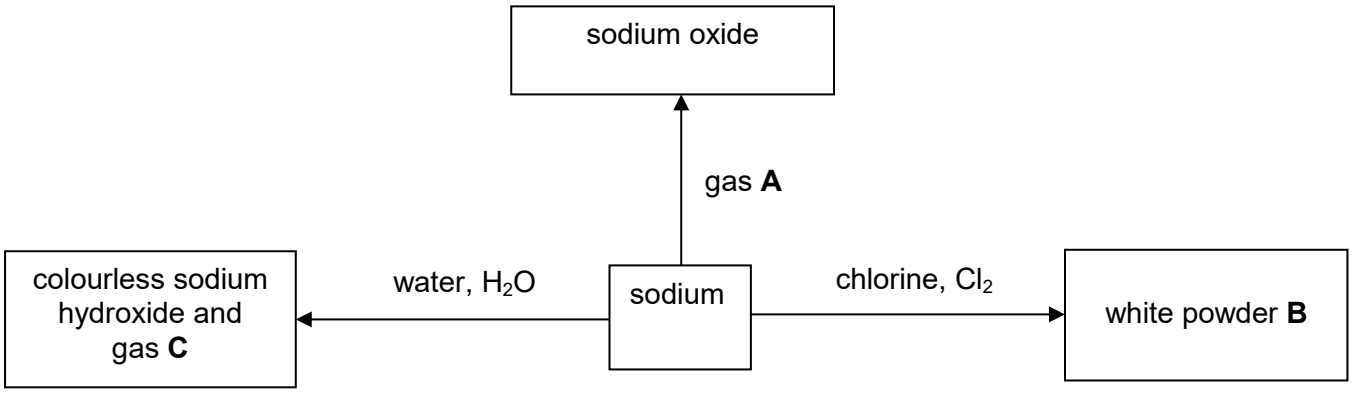
7

5. The diagram below shows some reactions of sodium.



(a) Give the chemical names for substances **A** and **B**. [2]

A ……..……..

B ……..……..

(b) Gas **C** 'pops' when tested with a lighted splint. Name gas **C**. [1]

……..

(c) Complete and balance the symbol equation. [2]

$2Na + 2H_2O \longrightarrow$ ……..…… + ……..……

(d) A flame test was carried out on the white powder **B**. Describe what you would expect to **see** during the flame test and give the reason for the observation. [2]

Observation ……

Reason …..……

(e) Lithium lies above sodium in Group 1.

Put a tick (✓) in the box which best describes how the reaction of lithium and water compares with that of sodium and water. Give the reason for your choice. [2]

more violent ☐ about the same ☐ less violent ☐

Reason .....

.....

9

6. Describe the treatment of the public water supply.

Include in your answer the three main stages in the purification process and the reasons for each stage. [6 QER]

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6

7. (a) (i) Complete the following table that shows information about the atom of potassium. [2]

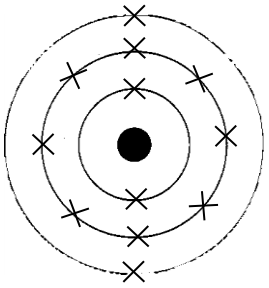
Element	Symbol	Number of protons	Number of neutrons	Number of electrons
potassium	$^{39}_{19}K$	……..	……	……

(ii) Use the Periodic Table of Elements to give the element

I in Group 2 and Period 2 ..... [1]

II which has electronic structure 2,8,6. …… [1]

(iii) The diagram below shows the electronic structure of an element in the Periodic Table.



Using **X** to represent an electron, draw a similar style diagram to show the electronic structure of the element which lies directly **above** this one in the Periodic Table. [1]

(b) (i) The chemical formula of aluminium nitrate is $Al(NO_3)_3$. Give the number of nitrogen atoms in the formula $Al(NO_3)_3$. [1]

……

(ii) Give the chemical formula of potassium carbonate. [1]

……

(c) Boron has two isotopes, $^{11}_{5}\mathrm{B}$ and $^{10}_{5}\mathrm{B}$.

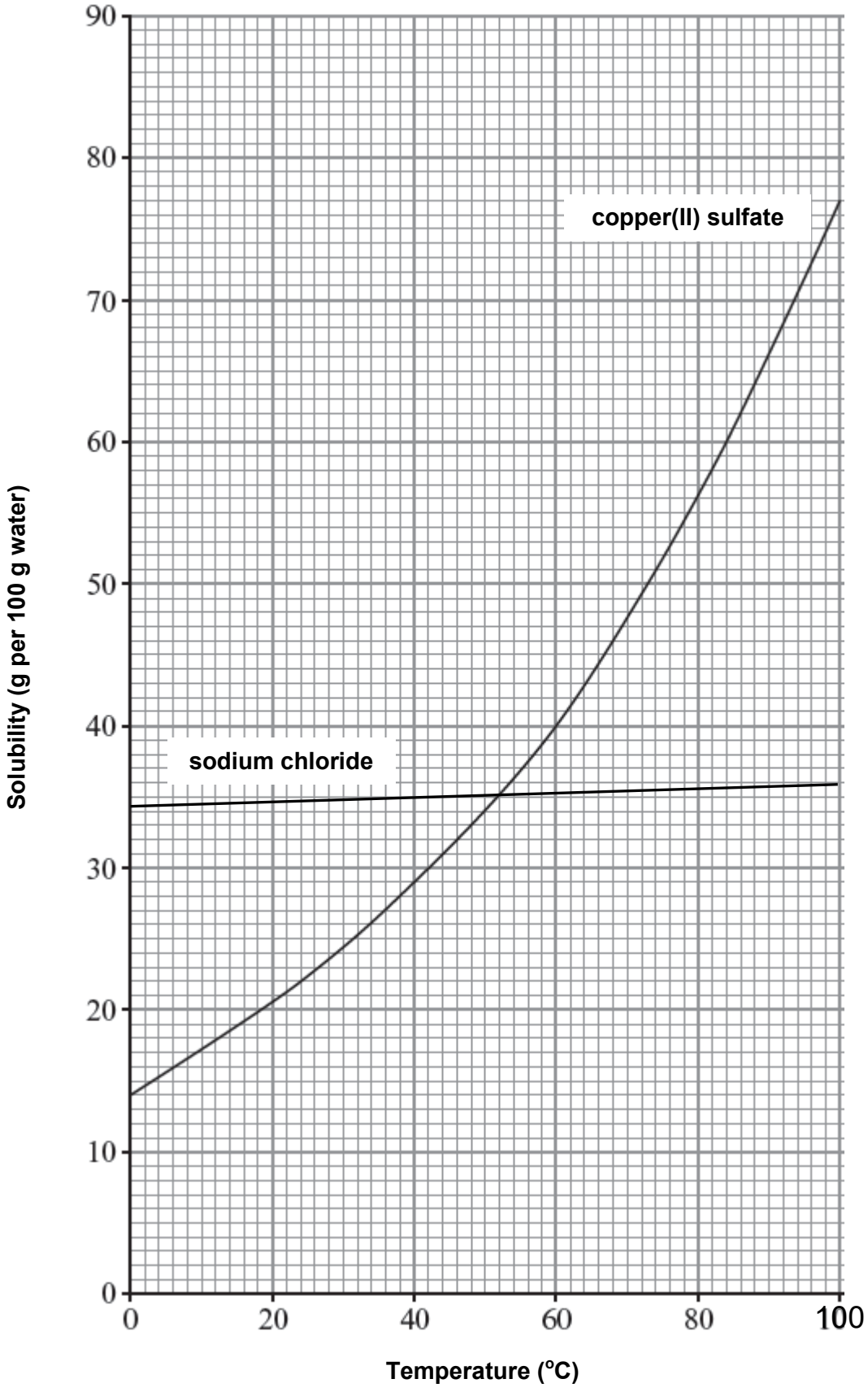
In terms of particles, give **one** similarity and **one** difference between the **nuclei** of these two boron atoms. [2]

Similarity .....

Difference .....

9

8. The graphs below show the solubilities of sodium chloride and copper(II) sulfate in water at different temperatures.



(a) Compare how the solubilities of copper(II) sulfate and sodium chloride change as temperature increases. [3]

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(b) Calculate the mass of solid copper(II) sulfate that forms when a saturated solution in 50 g of water at 80 °C cools to 40 °C. [2]

Mass = ... g

(c) State why the temperature scale on solubility graphs generally ranges from 0 °C to 100 °C. [1]

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6

END OF PAPER

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^{+}	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		
Zinc	Zn^{2+}		

Avogadro's number, $L = 6 \times 10^{23}$

PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}H$ Hydrogen									$^{4}_{2}He$ 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	$^{32}_{16}S$ Sulfur	$^{35}_{17}Cl$ 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: