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EDEXCEL GCSE CHEMISTRY: QUESTIONS BY TOPIC

Groups in the Periodic Table (6)

GCSE Chemistry (Higher) Topic 6

14 questions · 144 marks · Mark schemes included

Pearson Edexcel GCSE (9-1) Chemistry 1CH0, Higher Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme.

Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

QUESTION	SOURCE	MARKS	PAGE
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2. Q2 <i>also Topic 1</i>	Paper 2 November 2020	9	6
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QUESTIONS

14 questions · 144 marks · lowest tariff first



9-MARK QUESTIONS

6 questions in this booklet



2 (a) A chlorine atom contains 17 electrons, 18 neutrons and 17 protons.

(i) State the mass number of this chlorine atom.

(1)

(ii) Give the electronic configuration of this chlorine atom.

(1)

(b) Describe what you would **see** if damp, blue litmus paper is placed into chlorine gas.

(2)

(c) Chlorine exists as diatomic molecules.

In a molecule, two chlorine atoms are joined by a covalent bond.

(i) Describe what is meant by a **covalent bond**.

(2)

(ii) Explain why chlorine is a gas, rather than a liquid, at room temperature.

(2)



- (d) When the gas hydrogen chloride, HCl , is dissolved in water, a solution forms. Blue litmus paper dipped in this solution turns red.

State why the litmus paper turns red.

(1)

(Total for Question 2 = 9 marks)



2 (a) An atom of potassium has atomic number 19 and mass number 39.

(i) Give the electronic configuration of this potassium atom.

(1)

.....

(ii) This potassium atom forms the ion K^+ .

Which row shows the number of protons and the number of neutrons in this potassium ion, K^+ ?

(1)

	number of protons	number of neutrons
☐ A	19	19
☐ B	19	20
☐ C	20	19
☐ D	20	20

(b) Potassium and caesium are in the same group of the periodic table.

Explain, in terms of electrons, why potassium and caesium are in the same group.

(2)

.....

(c) Fluorine boils at -188°C .

There are forces between fluorine molecules.

Explain, in terms of these forces, why the boiling point of fluorine is low.

(2)

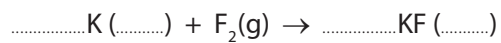
.....



- (d) Potassium reacts with fluorine to form potassium fluoride.
Potassium fluoride is a solid.

Complete the balanced equation for this reaction and add the state symbols.

(3)



(Total for Question 2 = 9 marks)



3 This question is about gases.

(a) When sodium is added to water, hydrogen gas is produced.

Which observation shows that a gas has been produced?

(1)

- ☐ A a white precipitate forms
- ☐ B effervescence is seen
- ☐ C the sodium sinks in the water
- ☐ D the water changes to a pink colour

(b) Some damp litmus paper is placed in a gas.
The litmus paper is bleached.

Which gas bleaches damp litmus paper?

(1)

- ☐ A carbon dioxide
- ☐ B chlorine
- ☐ C hydrogen
- ☐ D oxygen

(c) When calcium carbonate is heated it decomposes.



When 5.000 g of calcium carbonate is heated, the mass of solid remaining is 2.800 g.

Calculate the mass of carbon dioxide that has been released.

Give your answer to three significant figures.

(2)

.....
.....

mass of carbon dioxide = ... g



(d) A diagram of an atom of helium is shown in Figure 5.

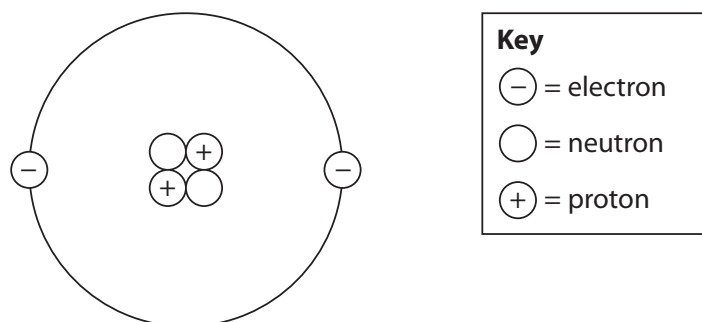


Figure 5

(i) Explain, using Figure 5, why helium is inert.

(2)

.....

.....

.....

(ii) Helium is used to fill balloons.

State one property of helium, apart from it being inert, that makes it suitable for filling balloons.

(1)

.....

(e) Oxygen gas has the formula O_2 .

Calculate the number of oxygen **atoms** in 3.50 mol of oxygen gas.

(Avogadro constant = 6.02×10^{23})

(2)

.....

.....

.....

number of oxygen atoms = ...

(Total for Question 3 = 9 marks)



3 Figure 6 shows some information about the group 1 metals.

group 1 metal	atomic number	relative atomic mass
lithium	3	7
sodium	11	23
potassium	19	39
rubidium	37	85
caesium	55	133

Figure 6

(a) Explain, in terms of their electronic configurations, why these metals are placed in group 1 of the periodic table.

(2)

.....

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.....

(b) Which row shows two correct properties of group 1 metals?

(1)

properties of group 1 metals		
☐ A	compounds are white in colour	high density
☐ B	low melting points	compounds are blue in colour
☐ C	soft enough to be cut by a knife	low melting points
☐ D	high density	conduct electricity

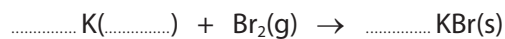


(c) The word equation for the reaction of potassium with bromine is

potassium + bromine $\rightarrow$ potassium bromide

Add the missing state symbol and balance the equation for this reaction.

(2)



(d) A sample of potassium contains three isotopes, potassium-39, potassium-40 and potassium-41.

(i) Explain the meaning of the term **isotopes**.

(2)

.....

.....

.....

.....

(ii) This sample of potassium contains

93.25% potassium-39

0.02% potassium-40

6.73% potassium-41

Calculate the relative atomic mass of this sample of potassium.

(2)

.....

.....

.....

.....

relative atomic mass = ...

(Total for Question 3 = 9 marks)



- 6 Chlorine gas can be prepared by reacting concentrated hydrochloric acid with solid potassium manganate(VII).

Figure 10 shows the apparatus used.

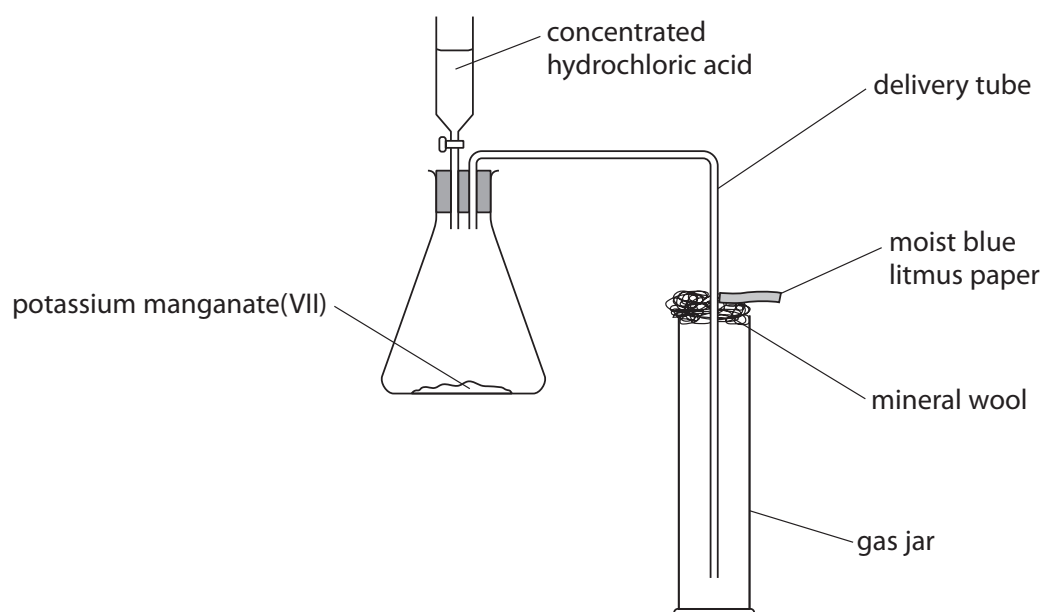


Figure 10

- (a) Figure 11 shows the hazard symbols for concentrated hydrochloric acid, potassium manganate(VII) and chlorine gas.

substance	hazard symbol
concentrated hydrochloric acid	 
potassium manganate(VII)	  
chlorine gas	  

Figure 11

Use the information in Figure 11 to help you answer (a)(i) and (a)(ii).

(i) What are the hazards associated with potassium manganate(VII)?

(1)

- ☐ **A** flammable, harmful and corrosive
- ☐ **B** flammable, toxic and hazardous to the environment
- ☐ **C** oxidising, harmful and hazardous to the environment
- ☐ **D** oxidising, toxic and corrosive

(ii) Explain **one** precaution that should be taken when preparing the sample of chlorine gas.

(2)

precaution

reason

(b) State the purpose of the delivery tube.

(1)

(c) Suggest why damp blue litmus is placed at the top of the gas jar.

(2)

(d) In the reaction, potassium manganate(VII), KMnO_4 , reacts with hydrochloric acid to form manganese chloride, MnCl_2 , potassium chloride, chlorine and water.

Write the balanced equation for the reaction.

(3)

(Total for Question 6 = 9 marks)



6 This question is about the noble gas xenon.

(a) Xenon is unreactive.

Explain, in terms of its electronic configuration, why xenon is unreactive.

(2)

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(b) Under extreme conditions, xenon can be made to react with fluorine to form xenon tetrafluoride, XeF_4 .

(i) Write the balanced equation for this reaction.

(1)

.....

(ii) Some information about xenon tetrafluoride is shown in Figure 7.

colour of solid	melting point in $^{\circ}\text{C}$	conductor of electricity?
colourless	117	no

Figure 7

State and explain, with reasons, the type of structure and bonding in xenon tetrafluoride.

(3)

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(c) Under extreme conditions, xenon reacts with fluorine to form xenon hexafluoride.

The reaction is exothermic.

The energy change for the reaction is -400 kJ mol^{-1} .

On Figure 8

- add a label to the y-axis
- draw the reaction profile for this reaction
- label the energy change and the activation energy for the reaction.

(3)

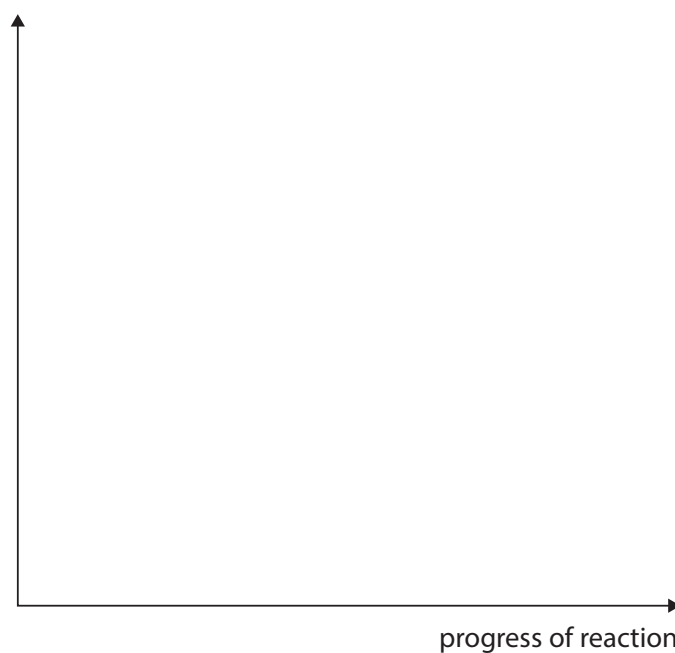


Figure 8

(Total for Question 6 = 9 marks)

10-MARK QUESTIONS

2 questions in this booklet



6 The elements in group 7 of the periodic table are known as the halogens.

(a) Name the halogen that is in period 4 of the periodic table.

(1)

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(b) Explain why chlorine is more reactive than iodine.

(3)

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(c) A piece of burning sodium is placed into a gas jar containing chlorine gas, as shown in Figure 9.

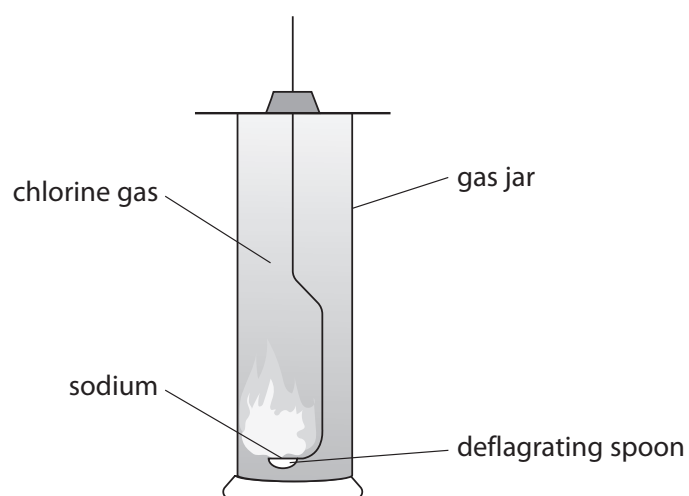


Figure 9

At the end of the reaction, the inside of the gas jar is coated with white crystals.

Identify the white crystals.

(1)

.....

(d) Sodium also reacts with bromine.

(i) Write the balanced equation for the reaction between sodium and bromine.

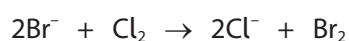
(2)

(ii) In another experiment, a student adds colourless sodium bromide solution to chlorine water.

State what you would **see** in this reaction.

(1)

(iii) The ionic equation for the reaction between sodium bromide and chlorine is:



Explain which species has been oxidised in this reaction.

(2)

(Total for Question 6 = 10 marks)



5 Group 1 elements are known as the alkali metals.

(a) Which row gives two physical properties of the alkali metals?

(1)

	hardness	melting point
☐ A	hard	low
☐ B	hard	high
☐ C	soft	low
☐ D	soft	high

(b) The alkali metals react with water.

(i) A teacher adds a small piece of potassium to water.

Give **two** observations that would be seen.

(2)

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(ii) The reaction of lithium with water is much less vigorous than the reaction of potassium with water.

Explain why, in terms of their electronic configurations.

(3)

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(iii) When sodium reacts with water, a solution of sodium hydroxide is formed.

When the solution is left in air, the hydroxide ions react with carbon dioxide, forming carbonate ions, CO_3^{2-} , and one other product.

Complete the ionic equation for this reaction.

(2)



(c) The relative atomic mass of caesium is 132.905.

Calculate the average mass of one atom of caesium.

(Avogadro constant = 6.02×10^{23})

(2)

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mass = ... g

(Total for Question 5 = 10 marks)



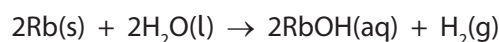
11-MARK QUESTIONS

3 questions in this booklet



8 The first four elements in group 1 are lithium, sodium, potassium and rubidium.

(a) Rubidium reacts with water to form rubidium hydroxide and hydrogen.



(i) Predict what you would **see** when a small piece of rubidium is placed in a large volume of water.

(3)

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(ii) Why is rubidium more reactive than potassium?

(1)

- ☐ **A** the metallic bonds in rubidium are weaker than those in potassium
- ☐ **B** rubidium is a softer metal than potassium
- ☐ **C** the outer electron of a rubidium atom is further from the nucleus than potassium's
- ☐ **D** rubidium has a more exothermic reaction with water than potassium does

(iii) 8.5 g of rubidium are reacted completely with water.

The reaction makes a solution of rubidium hydroxide.

The volume of this solution is 2.5 dm³.

Calculate the concentration of the rubidium hydroxide solution in g dm⁻³.

(relative atomic mass: Rb = 85; relative formula mass: RbOH = 102)

(4)

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concentration = ... g dm⁻³



(b) An example of an endothermic reaction is the reaction between rubidium hydroxide and ammonium carbonate, $(\text{NH}_4)_2\text{CO}_3$.

This reaction forms rubidium carbonate, Rb_2CO_3 , ammonia and one other product.

Write the balanced equation for this reaction.

(3)

.....

.....

(Total for Question 8 = 11 marks)



5 This question is about potassium and zinc.

(a) Which of the following temperatures is most likely to be the melting point of potassium?

(1)

☐ A -63°C

☐ B 6.3°C

☐ C 63°C

☐ D 630°C

(b) Explain how the electronic configuration of an atom of potassium is related to its position in the periodic table.

(2)

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(c) Potassium reacts with oxygen to form potassium oxide.

(i) Describe the test to show that a gas is oxygen.

(2)

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(ii) Potassium oxide is ionic.

Write the electronic configurations for the ions in potassium oxide, K_2O .

(2)

potassium ion:

oxide ion:

(d) Figure 6 shows two gas syringes connected by a glass tube.

Inside the glass tube there are some pieces of zinc.

Zinc reacts with oxygen at a temperature of over 225°C .

Not all the oxygen reacts at once, the oxygen reacts only when in contact with the zinc.

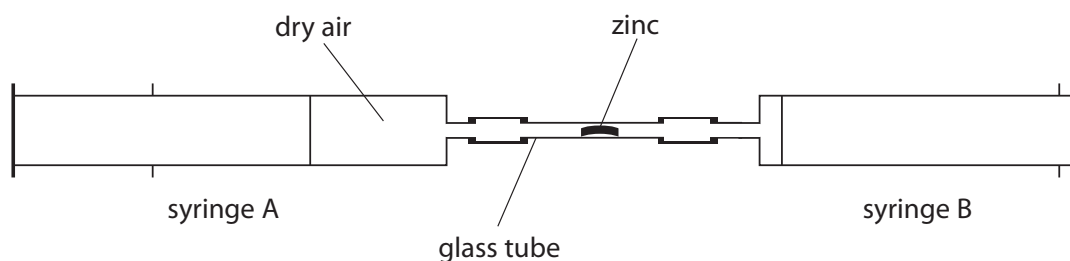


Figure 6

Devise a plan to find the volume of oxygen contained in a known volume of air, using the apparatus shown in Figure 6.

(4)

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(Total for Question 5 = 11 marks)

- 7 (a) The relative atomic mass of argon is 40 and the relative atomic mass of potassium is 39 but potassium appears after argon in the periodic table.

State why potassium appears after argon in the periodic table.

(1)

- (b) Potassium reacts with water to form two products.

- (i) Give the formulae of both products.

(1)

..... and

- (ii) The reaction of potassium with water is exothermic.

On Figure 9, draw and label the reaction profile diagram for this reaction, labelling the activation energy.

(2)



Figure 9

(c) Some reactions are endothermic.

Explain, in terms of bond breaking and bond forming, why some reactions are endothermic.

(3)



(d) Ethene reacts with hydrogen chloride.

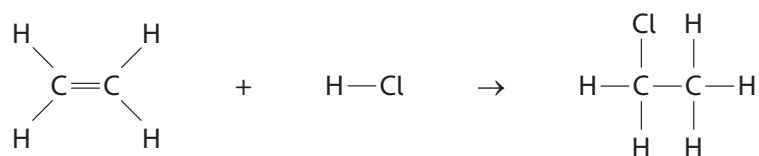


Figure 10 shows the bond energies for the different bonds in the three molecules in the reaction.

bond	bond energy in kJ mol^{-1}
$\text{C}-\text{H}$	412
$\text{C}=\text{C}$	612
$\text{C}-\text{C}$	348
$\text{H}-\text{Cl}$	431
$\text{C}-\text{Cl}$	338

Figure 10

Calculate the energy change for this reaction.

(4)

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energy change = ... kJ mol^{-1}

(Total for Question 7 = 11 marks)

12-MARK QUESTIONS

2 questions in this booklet



- 7 (a) Describe what is **seen** when chlorine water is added to potassium bromide solution and the mixture shaken.

(2)

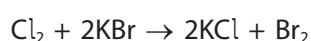
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- (b) Chlorine reacts with potassium bromide to form potassium chloride and bromine. In this reaction chlorine forms chloride ions



- (i) In this reaction, chlorine has been reduced.

Explain, using the equation, how you know that chlorine has been reduced.

(2)

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- (ii) Write the half equation for the formation of bromine from bromide ions.

(2)

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(c) Aluminium reacts with chlorine to form aluminium chloride.

Write the balanced equation for this reaction.

(3)

(d) A solid ionic compound is dissolved in water to form a solution.

Describe a simple experiment to show that charged particles are present in this solution.

(3)

(Total for Question 7 = 12 marks)



8 This question is about some of the elements in group 7 of the periodic table.

- (a) Which row in the table correctly shows the colours and physical states of the elements at room temperature?

(1)

☐ A	iodine: purple gas	bromine: yellow liquid
☐ B	chlorine: pale green gas	iodine: brown solid
☐ C	bromine: red-brown liquid	chlorine: yellow liquid
☐ D	iodine: dark grey solid	bromine: red-brown liquid

- (b) The compound phosphorus oxychloride has the formula POCl_3 .

Calculate the percentage by mass of chlorine in phosphorus oxychloride.

(relative atomic masses: O = 16.0, P = 31.0, Cl = 35.5)

(2)

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.....

percentage by mass of chlorine = ...

- (c) When iron reacts with chlorine, iron chloride is formed.

Two possible equations for this reaction are



In an experiment, 8.40 g iron reacts with chlorine to form 19.05 g iron chloride.

Show, using a calculation, which reaction, **A** or **B**, is taking place.

You must show your working.

(relative atomic masses: Cl = 35.5, Fe = 56.0)

(3)

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(Total for Question 8 = 12 marks)

13-MARK QUESTIONS

1 question in this booklet



9 The elements in group 7 of the periodic table are the halogens.

(a) Which row shows the colour and physical state of iodine at room temperature?

(1)

	colour	physical state
☐ A	dark grey	solid
☐ B	red brown	liquid
☐ C	green	solid
☐ D	purple	gas

(b) Iron wool is heated with bromine vapour as shown in Figure 12.

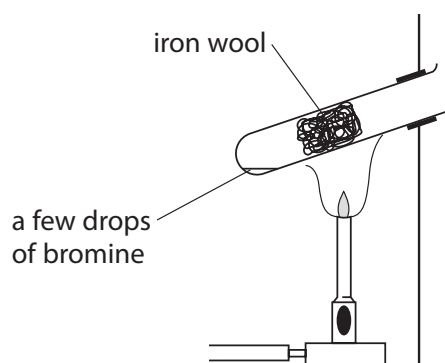


Figure 12

At the end of the reaction, a solid forms at the top of the test tube.

Identify the solid.

(1)

(c) Aluminium reacts with bromine.

Write the balanced equation for the reaction between aluminium and bromine.

(3)

Handwriting practice area with 20 horizontal dotted lines.



(ii) Explain why the displacement reactions of halogens are redox reactions.

(2)

(Total for Question 9 = 13 marks)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Additional guidance	Mark
2(a)(i)	35	reject 35.5	(1) AO 1 1

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	2.8.7	allow any separator including gaps e.g. 2 8 7	(1) AO 1 1

Question Number	Answer	Additional guidance	Mark
2(b)	A description to include • (blue litmus) (first turns) red (1) • (then) bleaches / turns white (1)	allow shades of red and pink but not other colours e.g. red-purple allow colour disappears/goes colourless ignore yellow/colour fades/discolours white then red = 0; just 'goes white' = 1	(2) AO 1 2

Question Number	Answer	Additional guidance	Mark
2(c)(i)	A description to include • shared electron(s) (1) • {a pair of / two} (electrons) (1)	allow a diagram for both mark points reference to ionic bonding/ions scores 0 e.g. gains two electrons = 0	(2) AO 1 1



Question Number	Answer	Additional guidance	Mark
2(c)(ii)	An explanation linking any two from - intermolecular forces / forces between molecules (1) (intermolecular) forces {weak / take little energy to break} / little energy to separate molecules (1) - boiling point is below room temperature / has a low boiling point (1)	if answer relates to the breaking of any type of bond first two marking points cannot be scored (but 3rd could) allow 'attractions' instead of 'forces'	(2) AO 1 1

Question Number	Answer	Additional guidance	Mark
2(d)	(the solution is) acid(ic) / contains {hydrogen ions/ H ⁺ }	allow pH < 7 allow hydrogen chloride is acidic if incorrect identity of acidic solution then 0 marks (e.g. chlorine is acidic = 0)	(1) AO 2 1

(Total for Question 2 = 9 marks)



Question number	Answer	Additional guidance	Mark
2(a)(i)	2.8.8.1	allow any separator including gaps e.g. 2 8 8 1 send to review any diagrams	(1)

Question number	Answer	Mark
2(a)(ii)	B 19 (protons) 20 (neutrons) is the only correct answer. A is incorrect because there are 20 neutrons in the ion C is incorrect because there are 19 protons and 20 neutrons D is incorrect because there are 19 protons in the ion	(1)

Question number	Answer	Additional guidance	Mark
2(b)	An explanation linking - outer (electron) shell (1) (both have) {same number / 1} electron(s) (1)	allow both lose 1 electron (to form ion / to form noble gas configuration) reject same number of outer shells / same number of electrons MP2 depends on MP1	(2)





Question number	Answer	Additional guidance	Mark
2(c)	An explanation linking (intermolecular) forces are weak (1) - little energy needed (to overcome forces) (1)	allow intermolecular bonds / weak bonds between molecules ignore needs a low temperature to break	(2)

Question number	Answer	Additional guidance	Mark
2(d)	2K (s) + F₂ (g) → 2KF (s) 2 K (1) 2 KF (1) s, s (1)	ignore words	(3)



Question number	Answer	Mark
3(a)	B effervescence is seen is the only correct answer. A, C and D are incorrect as they are not linked to gas production	(1) AO1 2

Question number	Answer	Mark
3(b)	B chlorine is the only correct answer. A, C and D are incorrect because only chlorine bleaches litmus.	(1) AO1 1

Question number	Answer	Additional guidance	Mark
3(c)	2.20 with or without working scores (2) 5(.000) – 2.8(00) = 2.2(00) (1) = 2.20 (1)	reject additional processing for MP1 (e.g 5 – 2.8 = 2.2 then $\frac{2.2}{100} = 0.0220$) does not score MP1 – additional process of dividing by 100 does not score MP2 - using a number not in the question for MP2 final answer must be to 3sf, correct evaluation of expression using only numbers from the question 2.2 / 2.200 scores 1 mark $\frac{5.000}{2.800} = 1.79$ scores 1 mark $\frac{2.800}{5.000} = 0.560$ scores 1 mark [0.56 = 0] 5.000 5.000 × 2.800 = 14.0 scores 1 mark [14 = 0] 5.000 + 2.800 = 7.80 scores 1 mark [7.8 = 0]	(2) AO2 1



Question number	Answer	Additional guidance	Mark
3(d)(i)	An explanation linking: - it has two electrons in outer shell/ it has a full outer shell / OWTTE (1) - so does not {gain/ lose/ transfer/ share} electrons (1)	MP1 – reject if number of electrons in outer shell is stated and not 2 ignore references to protons and neutrons allow helium has two electrons in its (only) shell / helium's (only) shell is full ignore helium does not need to react	(2) AO1 1

Question number	Answer	Additional guidance	Mark
3(d)(ii)	less dense than air	allow less dense than nitrogen allow low density / not (very) dense allow diffuses slowly out of balloon ignore less dense than oxygen ignore it is a gas / light / lightweight / inert/ unreactive/ non-flammable / lighter than air / makes balloon float / it rises/ it floats ignore non-toxic / not poisonous	(1) AO2 1

Question number	Answer	Additional guidance	Mark
3(e)	4.214×10^{24} with or without working scores (2) 2×3.5 (1) (= 7(.0)) $7(.0) \times 6.02 \times 10^{23}$ (1) (= 4.214×10^{24}) OR $3.5 \times 6.02 \times 10^{23}$ (1) (= 2.107×10^{24}) $2 \times 2.107 \times 10^{24}$ (1) (= 4.214×10^{24})	allow any number of sig figs except 1 for full marks allow answer not in standard form	(2) AO2 1

(Total for question 3 = 9 marks)



Question number	Answer	Additional guidance	Mark
3(a)	An explanation linking 1 <u>electron</u> (1) - in outer shell(s) (1)	allow 1 is the last number of the electronic configuration (1) ignore electronic configurations written out reject incorrect number of electrons MP2 depends on MP1 for outer allow {highest energy / last} for shell allow ring, energy level, orbital allow: 1 outer electron (2) 1 valence electron (2) have to lose 1 electron to get full outer shell (2) same number of electrons in outer shell (1) forms a +1 ion by losing one electron (1)	(2) AO1-1

Question number	Answer	Mark
3(b)	C soft enough to be cut by a knife / low melting point is the only correct answer A and D are incorrect because alkali metals do not have a high density B is incorrect because alkali metal compounds are not blue in colour	(1) AO1-1

Question number	Answer	Additional guidance	Mark
3(c)	$2 \text{ K(s)} + \text{Br}_2(\text{g}) \rightarrow 2 \text{ KBr(s)}$ balancing (1) state symbol s (1)	allow multiples ignore 'two' ignore 'solid'	(2) AO2-1



Question number	Answer	Additional guidance	Mark
3(d)(i)	An explanation linking (atoms) {of same element / with same number of protons} / all contain 19 protons / same atomic number (1) - different number of neutrons / different mass <u>number</u> / have 20, 21, 22 neutrons (1)	reject compound/ molecule/ ion / elements <u>s</u> once allow same protons ignore electrons reject different protons allow different / extra / more / fewer neutrons ignore different mass / relative atomic mass reject different electrons	(2) AO1-1

Question number	Answer	Additional guidance	Mark
3(d)(ii)	39.1348/39.135/ 39.13/ 39.1 with or without working scores 2 $93.25 \times 39 + 40 \times 0.02 + 6.73 \times 41 = 3913.48$ (1) $\frac{3913.48}{100} = 39.1348$ (1) OR $\frac{39 \times 93.25}{100}$ and $\frac{0.02 \times 40}{100}$ and $\frac{6.73 \times 41}{100}$ (1) $36.3675 + 0.008 + 2.7593 = 39.1348$ (1)	Final answer of 39 with no working scores 0. Final answer of 39 rounded from correct working scores 2. allow rounding of values in the 3 sums allow ecf for MP2 if transcription error(s) e.g 93.52 allow ecf for MP2 if formula is correct but error in calculation	(2) AO2-1



Question number	Answer	Mark
6(a)(i)	C oxidising, harmful and hazardous to the environment is the only correct answer A, B are incorrect because none of the substances are flammable D is incorrect because the third symbol does not mean corrosive	(1) A01-1

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation linking one pair from: • use a fume cupboard (1) • because (chlorine/it) is a toxic gas (1) OR • wear gloves/ goggles/ safety glasses (1) • because the concentrated hydrochloric acid is corrosive (1) OR • do not dispose of any reactants / products down the drain (1) • because {potassium manganate/ chlorine /it} is hazardous to the environment (1)	mark independently ignore any other suggestions not included in markscheme ignore masks/ breathing apparatus/ well ventilated room allow poisonous allow acids 'burns' skin/ eyes allow dispose of substances correctly allow specific hazards e.g. kills fish	(2) A02-2



Question number	Answer	Additional guidance	Mark
6(b)	so {gas / chlorine} moves (from flask) to gas jar	ignore to deliver substances ignore to connect the apparatus / to stop gas escaping	(1) AO1-1

Question number	Answer	Additional guidance	Mark
6(c)	An explanation linking: chlorine will turn the damp litmus paper (red then) white / bleached (1) - so that you can see when the jar is full (1)	reject <u>chloride</u> once reject bleaches then turns red for MP1 allow so you know {when to stop the reaction/ when enough chlorine has been made}/ to detect chlorine / to show that chlorine has been made / to see if chlorine is escaping allow gas for chlorine in MP2 reject to test pH for MP2	(2) AO2-2



Question number	Answer	Additional guidance	Mark
6(d)	$2\text{KMnO}_4 + 16\text{HCl} \rightarrow 2\text{MnCl}_2 + 2\text{KCl} + 5\text{Cl}_2 + 8\text{H}_2\text{O}$ all 6 formulae on correct sides of arrow (2) 4 or 5 formulae on correct sides of arrow (1) balancing of correct formulae only (1)	allow multiples do not penalise incorrect cases, subscripts e.g allow Cl^2 ignore state symbols	(3) A02-1

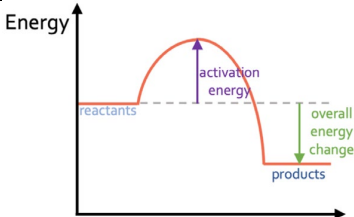
Question number	Answer	Additional guidance	Mark
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Question number	Answer	Additional Guidance	Mark
6(a)	An explanation linking - atoms have full <u>outer</u> (electron) shell (1) (so) do not need to { gain / lose / share } electron(s) (1)	allow (electron) shells are full ignore hard to remove electrons	(2) A01-1

Question number	Answer	Additional Guidance	Mark
6(b)(i)	$\text{Xe} + 2\text{F}_2 \rightarrow \text{XeF}_4$ (1)	allow multiples ignore any state symbols even if incorrect reject non-subscripted {2 / 4} and 'E' reject Fl / f for fluorine	(1) A02-1

Question number	Answer	Additional Guidance	Mark
6(b)(ii)	An answer linking - structure: simple / molecular (1) - bonding: covalent (1) (because) non-conductor AND low melting point / low melting point because of weak intermolecular forces / does not conduct because no {ions/delocalised electrons} present (1)	score 0 for whole answer if 'ionic' is mentioned in structure or bonding ignore 'free electrons'	(3) A03-2

Question number	Answer	Additional Guidance	Mark
6(c)	 (3) <u>axis:</u> y axis 'energy' (1) <u>shape:</u> products line below reactants line with activation energy peak (1) <u>labels:</u> {energy change / ΔH / -400} and activation energy labelled with arrows (1)	<u>axis:</u> allow heat energy / energy level. Ignore any units. reject 'energy change' <u>shape:</u> can consist of straight lines energy levels do not need labelling but penalise if reactants & products are the wrong way round <u>labels:</u> allow any unambiguous labelling of activation energy and energy change. ignore direction of arrows. endothermic graph can score MP1 and MP3	(3) AO1-1

Total for Question 6 = 9 marks

Question number	Answer	Additional guidance	Mark
6(a)	bromine	ignore Br	(1) AO1 1

Question number	Answer	Additional guidance	Mark
6(b)	An explanation linking - outer {shell / electron(s)} is further from nucleus in iodine/OR A (1) {force / attraction} between nucleus and (electrons in) outer shell is less in iodine/OR A (1) - iodine does not gain (an) electron(s) as readily/OR A (1)	accept reverse argument throughout allow iodine has more shells / larger atomic radius / OR A reject 'more outer shells' chlorine has {fewer (electron) shells / smaller atomic radius} allow shielding arguments for either MP1 OR MP2 for either iodine or chlorine allow outer electrons / incoming electron if no other mark scored (group 7 elements) gain one electron (when they react) (1)	(3) AO1 1

Question number	Answer	Additional guidance	Mark
6(c)	sodium chloride	allow NaCl ignore 'salt' reject sodium chlorine / incorrect formula	(1) AO2 1

Question number	Answer	Additional guidance	Mark
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Question number	Answer	Additional guidance	Mark
6(d)(ii)	turns yellow / orange (liquid / solution)	reject brown as standalone colour ignore brown as in 'yellow-brown' ignore red as in 'red-orange' reject other changes eg effervescence	(1) A02 2

Question number	Answer	Additional guidance	Mark
6(d)(iii)	bromide (ions)/ (2)Br ⁻ (1) loses/lost electrons (1)	reject bromine / Br allow bromine loses electrons for MP2 only reject answers in terms of {chlorine / chloride} being oxidised reject Br ₂ loses electrons	(2) A01 1

(Total for question 6 = 10 marks)



Question number	Answer	Mark
5(a)	C soft, low is the only correct answer A, B and D are incorrect because alkali metals are soft with low melting points	(1) A01-1

Question number	Answer	Additional guidance	Mark
5(b)(i)	An answer including any two from - metal melts / forms a ball (1) - effervescence / fizzing / bubbles (1) - metal floats (1) - metal moves (1) - metal ignites (1) - metal disappears (1) - metal explodes (1) (lilac / purple) flame (1) - white smoke (1)	ignore (named) gas(es) allow metal dissolves allow spits allow 'coloured' flame reject incorrect colours ignore sparks ignore any temperature changes	(2) A01-2

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation linking any three from - lithium has fewer (electron) shells (1) (because) outer electron closer to nucleus (1) (because) (outer electron) more strongly attracted to nucleus / has greater electrostatic attraction to nucleus (because) (outer) electron harder to remove (1) (because) less shielding in lithium (than K) (1)	allow reverse argument for potassium correct electronic configurations score MP1 for Li and K reject 'outer shells' for mp1 allow outer shell is closer to nucleus allow smaller atom (for Li) allow 'attractive forces' in place of electrostatic attraction reject any incorrect forces or intermolecular forces for MP3&4	(3) A01-1

	Answer	Additional guidance	Mark
5(b)(iii)	$2 \text{OH}^- + \text{CO}_2 \rightarrow \text{CO}_3^{2-} + \text{H}_2\text{O}$ (2) both formulae of CO_2 and H_2O (1) balancing correct formulae only (1)	allow multiples reject equation if Na^+ in front of OH^-	(2) A02-1



Question number	Answer	Additional guidance	Mark
5(c)	$\frac{132.905}{6.02 \times 10^{23}} \text{ (1)}$ $= 2.208 \times 10^{-22} \text{ (g) (1)}$	an answer of $2.20772425249 \times 10^{-22}$ to 2 or more sig figs with or without working (2) allow 2 or more sig fig allow $\frac{6.02 \times 10^{23}}{132.905} = 4.5296 \times 10^{21} \text{ (1)}$ allow $132.905 \times 6.02 \times 10^{23} = 8.000881 \times 10^{25} \text{ (1)}$	(2) A02-1

Total for Question 5 = 10 marks



Question number	Answer		Mark
8(a)(i)	A description to include any three from - metal disappears (1) - metal moves around (1) - fizzing/ effervescence/ bubbling (1) (any colour) flame (1) - explodes/ reacts violently (1)	ignore floats/ sinks/ on surface of water allow dissolves/ gets smaller ignore gas / smoke / steam / water vapour / hydrogen allow forms a ball / melts	(3)

Question number	Answer	Mark
8(a)(ii)	C rubidium atoms outer electrons are further from the nucleus than potassium atoms is the only correct answer. A, B and D are true but does not affect the reactivity	(1)

Question number	Answer	Additional guidance	Mark
8(a)(iii)	4.08 as final answer with or without working scores 4 - moles Rb = $8.5/85$ (= 0.1 mol) (1) - moles RbOH = 0.1 mol (1) - mass RbOH = 0.1×102 (=10.2 g) (1) - conc = $10.2/2.5$ (= 4.08 gdm⁻³) (1) OR $2\text{Rb} \rightarrow 2\text{RbOH}$/ 1:1 ratio (1) $85 \text{ (x2) (g)} \rightarrow 102 \text{ (x2) (g)}$ (1) $8.5 \text{ (g)} \rightarrow 10.2 \text{ (g)}$ (1) - conc = $10.2/2.5$ (= 4.08 gdm⁻³) (1)	allow 8.5/ 2.5 (=3.4) to score MP4 working leading to 10.2 will score 3	(4)



Question number	Answer	Mark
8(b)	$(\text{NH}_4)_2\text{CO}_3 + 2\text{RbOH} \rightarrow \text{Rb}_2\text{CO}_3 + 2\text{NH}_3 + 2\text{H}_2\text{O}$ (3) Four formulae on correct side of equation (regardless of any other formulae, correct or otherwise) (1) Equation with all five formulae and no others (2) Fully correct balanced equation (3) do not penalise incorrect subscripts/ superscripts/ small letters/ capital letters. Ignore state symbols.	(3)



Question number	Answer	Mark
5(a)	C 63 °C Is the only answer. A would be a gas at room temperature B would be a liquid at room temperature D alkali metals have low melting points – this is too high	(1) AO1

Question number	Answer	Mark
5(b)	An explanation linking - number of electrons on outer shell gives the group number / 1 electron on outer shell so group 1 (1) - number of electron shells gives the period number / 4 electron shells so period 4 (1)	(2) AO1

Question number	Answer	Additional guidance	Mark
5(c)(i)	A description to include - use of glowing splint (1) (glowing splint) relights (1)	2 nd mark dependent on correct test	(2) AO1

Question number	Answer	Additional guidance	Mark
5(c)(ii)	potassium ion: 2.8.8 (1) oxide ion: 2.8 (1)	Allow other separators between the numbers including spaces	(2) AO1



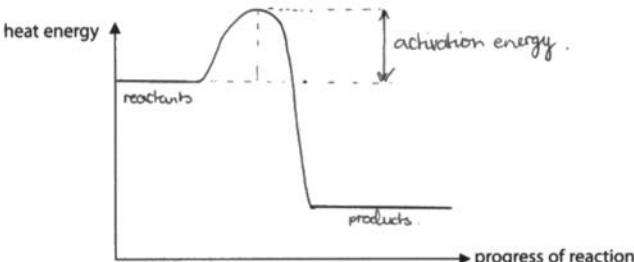
Question number	Answer	Additional guidance	Mark
5(d)	A plan to include • heating tube where zinc is (1) • pass {gas / air} over (heated) zinc (1) • until no further change in volume (1) • measuring volume of gas after experiment / calculate difference in volume (1)		(4) AO3

Total for Question 5 = 11 marks



Question number	Answer	Additional guidance	Mark
7(a)	periodic table is in atomic number order/ argon has atomic number 18 and potassium 19/ argon has 18 protons and potassium has 19 / (potassium has) higher atomic number	allow potassium (atoms) have more protons ignore electrons and neutrons allow proton number for atomic number ignore potassium is in group 1 and argon is in group 0	(1) AO2 1

Question number	Answer		Mark
7b(i)	KOH AND H ₂	allow formulae in either order allow KHO ignore HOK / OHK / HKO / OKH allow incorrect case and subscript reject 2H	(1) AO1 1

Question number	Answer	Additional guidance	Mark
7(b)(ii)	 products line (ends to) right of reactants line AND lower (1)	allow labels of names of reactants and products allow unlabelled reactants and products but reject if labels reversed allow energy at start/ end as labels	(2) AO2 1

Question number	Answer	Additional guidance	Mark
7(c)	an explanation linking • bond breaking {endothermic/ requires energy} (1) • bond forming {exothermic/ releases energy} (1) • less energy is released (forming bonds) than is required (to break bonds) (1)	allow heat for energy ignore number of bonds/ more bond breaking etc. MP3 dependant on scoring MP1 AND MP2 energy needed to break bonds is more than energy released forming bonds (3)	(3) AO1 1

Question number	Answer		Mark
7(d)	-55 with or without working scores 4 BROKEN: $612 + 4(412) + 431 = 2691$ (1) MADE: $412 + 348 + 338 + 4(412) = 2746$ (1) DIFFERENCE: $2691 - 2746$ (1) ANSWER: = - 55 (1)	allow positive or negative allow positive or negative allow ecf for +broken -made allow ecf for addition or subtraction of 2 <u>calculated</u> values (working required) using bond energies	(4) AO2 1



	OR BROKEN: $612 + 431 = 1043$ (1) MADE: $412 + 348 + 338 = 1098$ (1) DIFFERENCE: $1043 - 1098$ (1) ANSWER: = - 55 (1)	allow positive or negative allow positive or negative allow ecf for +broken -made allow ecf for addition or subtraction of 2 <u>calculated</u> values (working must be seen) using bond energies with or without working, final answers of: -55 scores 4 (+) 55 scores 3 (+)293 scores 3 (+)705 scores 3 -486 scores 3 (+)486 scores 2	
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Total for question 7 = 11 marks



Question Number	Answer	Additional guidance	Mark
7(a)	A description including the following points : (potassium bromide solution) colourless (1) (mixture) turns yellow / brown / orange / red (1)	ignore clear ignore reference to colour of chlorine water /change in colour allow colour combinations e.g. yellow-orange reject additional incorrect observations for MP2 but ignore yellow/orange/red/brown vapours	(2) AO 1 2

Question Number	Answer	Additional guidance	Mark
7(b)(i)	An explanation linking (chlorine) gains (an) electron(s) (1) - to form {a chloride (ion) / Cl^- / negative ion} (1) MP2 dependent on MP1	reject chlorine gains an electron from potassium reject sharing of electrons allow $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$ even if unbalanced (2) ignore chlorine ion	(2) AO 1 1

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	$2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$ (2) correct species (in correct place) (1) balancing of correct species (1)	allow $2\text{Br}^- - 2\text{e}^- \rightarrow \text{Br}_2$ (2) unbalanced 1 max allow multiples	(2) AO 2 1



Question Number	Answer	Additional guidance	Mark
7(c)	$2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$ (3) LHS (1) RHS (1) balancing of correct formulae (1)	penalise the use of 'CL' or 'AL' once only ignore state symbols allow multiples ignore use of capital L for MP3	(3) AO 2 1

Question Number	Answer	Additional guidance	Mark
7(d)	A description to include the following points • insert electrodes (into aqueous solution)(1) • connect to electrical supply /powerpack /battery/cell (1) • bulb lights / ammeter shows current / electrolyte decomposes (1)	first two marks can be given for a suitable diagram allow anode and cathode allow carry out an electrolysis experiment alone / see if solution conducts electricity (1) allow pass an electric current through (the solution) (1) ignore electricity alone allow correct observation at one electrode (1)	(3) AO 3 3a

(Total for Question 7 = 12 marks)



Question number	Answer	Mark
8(a)	D iodine: dark-grey solid bromine: red-brown liquid Is the only correct answer A, B and C all contain at least one incorrect piece of information	(1) AO1

Question number	Answer	Additional guidance	Mark
8(b)	Formula mass $\text{POCl}_3 = (31 + 16 + 3 \times 35.5)$ (1) (= 153.5) % Cl = $\frac{3 \times 35.5}{153.5} \times 100$ (1) (= 69.4%)	allow answers to 2 or more sig figs allow ecf on formula mass allow % Cl = $\frac{35.5}{82.5} \times 100 = 43\%$ (1)	(2) AO2



Question number	Answer	Additional guidance	Mark
8(c)	mass of chlorine = $19.05 - 8.40$ (1) (= 10.65 g) EITHER moles iron = $\frac{8.40}{56}$ and moles chlorine = $\frac{10.65}{35.5 \times 2}$ (1) (= 0.15) (= 0.15) ratio 1:1 so equation A represents reaction (1) OR moles iron = $\frac{8.40}{56}$ and moles chlorine atoms = $\frac{10.65}{35.5}$ (1) (=0.15) (=0.30) Ratio 1:2 for formula of product FeCl₂ so equation A (1) OR formula mass FeCl₂ = $56 + 2 \times 35.5$ (=127) (1) moles Fe = $\frac{8.4}{56}$ and moles FeCl₂ = $\frac{19.05}{127}$ (1) (=0.15) (=0.15) ratio 1:1 so equation A represents reaction (1)	allow not finding mass of chlorine initially: moles iron = $\frac{8.40}{56}$ (=0.15) and moles chlorine atoms = $\frac{19.05}{35.5}$ (=0.537) (1) simplest ratio: $\frac{0.15}{0.15} : \frac{0.537}{0.15}$ or 1 : 3.58 allow: mass of chlorine = $19.05 - 8.40$ (1) (= 10.65 g) for reaction A, mass of chlorine needed $\frac{2 \times 35.5}{56} \times 8.4 = 10.65$ (g) (1) mass of chlorine needed = mass of chlorine reacted, so equation A represents reaction (1) accept calculations based on expected mass of FeCl₂ or mass of FeCl₃ to show which reaction is taking place	(3) AO3



Question number	Indicative content	Mark
8(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. • group 1 metals form positive ions • outer electron lost • further down the group outer electron more easily lost • due to electron shell further from nucleus OR greater electron shielding • so lower nuclear attraction • group 1 metal becomes more reactive • order of reactivity $\text{Li} < \text{K} < \text{Rb}$ • group 7 elements form negative ions • gains electron to complete outer shell • further down the group electron is less easily gained • due to outer electron shell further from nucleus OR greater electron shielding • so lower nuclear attraction • group 7 element becomes less reactive • order of reactivity $\text{F} > \text{Br} > \text{I}$ • most reactive pair likely to be potassium + fluorine with suitable justification (K low in group 1 and F is at the top of group 7) • allow rubidium + iodine with justification (Rb lower in group 1 than K and so more reactive)	(6) AO1 AO2



Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated backed up by detail will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> States some simple facts about group 1 OR group 7 elements OR Correctly identifies most violent reaction(s) with simple reasoning	<u>Possible candidate responses</u> - Group 1 elements lose 1 electron from outer shell. - Group 7 elements are more reactive up the group. - The most violent reaction could be potassium with fluorine as fluorine is the most reactive group 7 element (2)
Level 2	3–4	<u>Additional guidance</u> Correctly identifies most violent reaction(s) with a simple justification OR A simple explanation of the reactivity of group 1 AND group 7 elements. OR A detailed explanation of the reactivity of group 1 OR group 7 elements.	<u>Possible candidate responses</u> - The most violent reaction could be rubidium with iodine as rubidium is the most reactive of the group 1 elements given. Rubidium is so reactive because it loses its outer electron easily. - Group 1 elements are more reactive down the group as the distance between the nucleus and the outer electron is further, so the force of attraction between them is weaker and the electron is more easily lost. - Fluorine is the most reactive halogen because its outer electron shell is closer to the nucleus. Group 1 elements are more reactive down the group as their outer shell gets further from the nucleus.
Level 3	5–6	<u>Additional guidance</u> Correctly identifies the most violent reaction with a detailed justification. OR A detailed explanation of the reactivity of group 1 AND group 7 elements.	<u>Possible candidate responses</u> - The most violent reaction is potassium and fluorine as fluorine is the most reactive element in group 7. Potassium loses its outer electron easily as there is a weak nuclear attraction, and fluorine gains this electron easily as it has a strong nuclear attraction. - Group 1 elements become more reactive down the group. They lose 1 electron to form cations and the larger the distance between the nucleus and the outer shell, the more easily the electron is lost. Group 7 elements gain 1 electron to form anions and the smaller elements gain this electron more easily. This is because the force between the nucleus and the outer shell is stronger.



Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Total for Question 8 = 12 marks



9(a)	A dark grey solid is the only correct answer B, C and D are incorrect as iodine is grey	(1) AO1 1
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Question number	Answer	Mark
9(d)(i)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. method - react each salt solution with each halogen solution (relevant 6 mixtures, or all 9) - no need to add halogen to its own sodium salt reaction of sodium chloride with halogen solutions - bromine and iodine do not react - because chlorine is the most reactive halogen reaction of sodium bromide with halogen solutions - iodine will not react - because iodine is less reactive than bromine - chlorine will react - because chlorine is more reactive than bromine - sodium bromide + chlorine will turn orange/yell - bromine is displaced $\text{Cl}_2 + 2\text{NaBr} \rightarrow 2\text{NaCl} + \text{Br}_2$ / word equation reaction of sodium iodide with halogen solutions - chlorine and bromine solutions both react - because chlorine and bromine are more reactive than iodine - solutions turn brown/ yellow/ black-grey solid	(6) AO2 2 AO3 1

	Cl_2	Br_2	I_2
$\text{NaCl}_{(\text{aq})}$		x No reaction $\therefore \text{Cl}_2 > \text{Br}_2$	x No reaction $\therefore \text{Cl}_2 > \text{I}_2$
$\text{NaBr}_{(\text{aq})}$	✓ orange solution $\therefore \text{Cl}_2 > \text{Br}_2$ $2\text{NaBr} + \text{Cl}_2 \rightarrow 2\text{NaCl} + \text{Br}_2$		x No reaction $\therefore \text{Br}_2 > \text{I}_2$
$\text{NaI}_{(\text{aq})}$	✓ brown solution $\therefore \text{Cl}_2 > \text{I}_2$ $2\text{NaI} + \text{Cl}_2 \rightarrow 2\text{NaCl} + \text{I}_2$	✓ brown solution $\therefore \text{Br}_2 > \text{I}_2$ $2\text{NaI} + \text{Br}_2 \rightarrow 2\text{NaBr} + \text{I}_2$	

		- iodine is displaced $\text{Cl}_2 + 2\text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$ / word equation $\text{Br}_2 + 2\text{NaI} \rightarrow 2\text{NaBr} + \text{I}_2$ / word equation order of reactivity - chlorine > bromine > iodine / less reactive down group	
Level	Mark	Descriptor	
	0	No rewardable material.	
Level 1	1–2	The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. Lines of reasoning are unsupported or unclear. (AO2) Analyses the scientific information but understanding and connections are flawed. (AO3) An incomplete plan that provides limited synthesis of understanding. (AO3)	
Level 2	3–4	The explanation is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. Lines of reasoning mostly supported through the application of relevant evidence. (AO2) Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. (AO3) A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3)	
Level 3	5–6	The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made	



		between elements in the context of the question. Lines of reasoning are supported by sustained application of relevant evidence. (AO2) Analyses the scientific information and provide logical connections between scientific enquiry, techniques and procedures throughout. (AO3) A well-developed plan that synthesises relevant understanding coherently. (AO3)
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Level	Mark	Descriptor Discard all incorrect material (<u>including additional observations</u>) and reject contradictory material. Allow potassium salts instead of sodium salts. Ignore explanations of reactivity.
	0	No awardable content
Level 1	1-2 Additional Guidance describes at least one suitable experiment AND one result/ at least 2 halogens put in order	• add chlorine to sodium bromide and reaction occurs (2) • add chlorine to sodium bromide and orange colour seen (2) • add chlorine, bromine and iodine to each of the three solutions (1) • $\text{Cl}_2 + 2\text{NaI} \rightarrow 2\text{NaCl} + \text{I}_2$ (2) • bromine + sodium iodide = sodium bromide + iodine (2) • order of reactivity is chlorine > bromine > iodine (1) • table with the 9 combinations with no/ no correct results (1)
Level 2	3-4 Additional Guidance describes sufficient experiments that the order of reactivity can be determined with results	• mix every halogen with every salt. Chlorine with bromide goes orange, chlorine with iodide goes brown, bromine with iodide goes brown. (4) • table with the 9 combinations and correct ticks/ colours (4) • mix every halogen with every salt. Chlorine with bromide goes orange (3) • table with the 9 combinations and one correct tick/ colour (3)



Question number	Answer	Additional guidance	Mark
9(d)(ii)	an explanation linking • halide (ions) {lose electrons / are oxidised} (1) • halogen (atoms/ molecules) {gain electrons / are reduced} (1)	half-equations can score MP1 and/or MP2 ignore halogens lose electrons reject the {halogen in the salt/ halogen being displaced} is reduced/ gains electrons	(2) AO1 1

Total for question 9 = 13 marks

