1 The table gives information about some of the elements in Group 7 of the Periodic Table.

Element	Colour	Melting point in °C	Boiling point in °C
fluorine	yellow	–220	–188
chlorine		–101	–35
bromine	red-brown	–7	59
iodine	grey	114	

(a) What is the colour of chlorine at room temperature?

(1)

☒ **A** black

☒ **B** blue

☒ **C** green

☒ **D** orange

(b) The trend in the boiling points for these elements is similar to the trend in their melting points.

Predict a value for the boiling point of iodine.

(1)

..... °C

(c) Astatine is another element in Group 7.

Predict its colour and physical state at room temperature.

(2)

colour .....

physical state .....

(d) The elements in Group 7 have similar chemical reactions because they have the same number of

(1)

☒ **A** electrons

☒ **B** electron shells

☒ **C** outer electrons

☒ **D** protons

(e) A student wrote these statements about the reactions of the Group 7 elements.

- The reactivity of the elements decreases down the group.
- The elements form ions with a single positive charge.
- The formula of an astatine molecule is At_2
- The equation for the reaction between chlorine and potassium bromide solution is $Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$
- In the reaction between bromine and potassium iodide, bromine acts as a reducing agent.

Three of the statements contain **one** incorrect word.

Complete the table to show each incorrect word and the correct word that should be used to replace it.

(3)

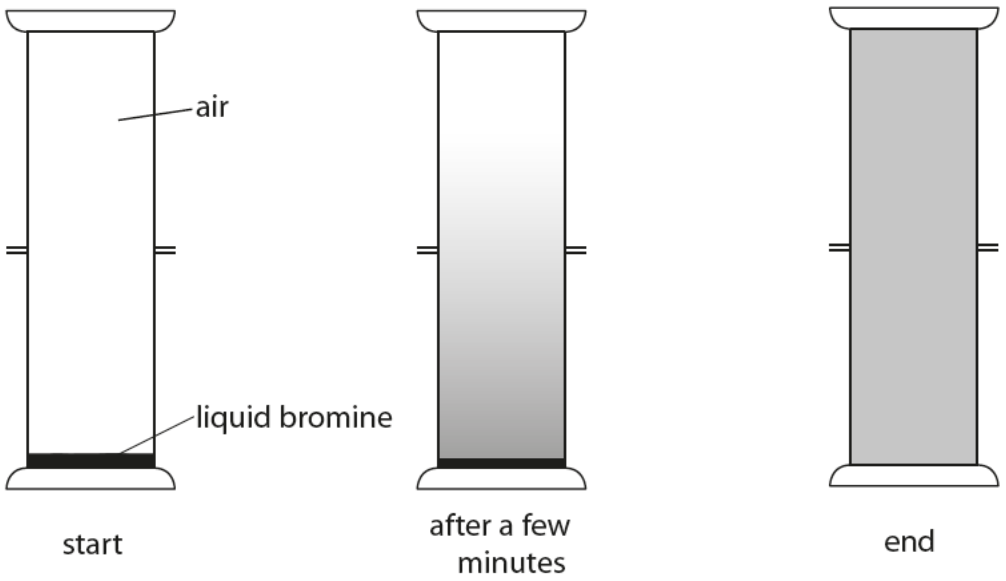
Incorrect word	Correct word

(Total for Question1 = 8 marks)

2 A teacher demonstrates, in a fume cupboard, two experiments to show the movement of particles.

(a) In the first experiment she places some liquid bromine at the bottom of a gas jar. She then places another gas jar containing air on top of it, as shown in the diagram.

The diagram shows the apparatus at the start, after a few minutes and at the end of the experiment.



Place crosses (☒) in **two** boxes to show which statements are correct about this experiment.

(2)

☒ **A** All the air particles in the upper gas jar stay there.

☒ **B** Bromine and air react to form bromine oxide.

☒ **C** Bromine has a darker colour than air.

☒ **D** Bromine vapour diffuses upwards.

☒ **E** Liquid bromine sublimes during the experiment.

☒ **F** The concentration of bromine in the lower gas jar does not change.

(b) In the second experiment, she soaks two pieces of cotton wool in different liquids and places them at opposite ends of a glass tube. She immediately seals the tube with bungs.

The diagram shows the apparatus at the start of the experiment.



During the experiment a white ring appears in the tube.

(i) State whether the white ring appears at A, B or C.

(1)

.....

(ii) Explain your choice.

(2)

.....

.....

.....

.....

(Total for Question 2 = 5 marks)

3 A sample of a chlorofluorocarbon (CFC) contains 0.24 g of carbon, 0.38 g of fluorine and 1.42 g of chlorine.

(a) (i) Show, by calculation, that the empirical formula of the CFC is $CFCl_2$

(3)

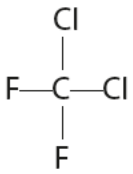
(ii) The relative formula mass of the CFC is 204.

Deduce the molecular formula of the CFC.

(2)

molecular formula .....

(b) The displayed formula of another CFC is



Draw a dot and cross diagram of this CFC.

Show only the outer electrons.

(2)

(Total for Question 3 = 7 marks)

4 This question is about elements in Group 7 of the Periodic Table.

(a) Complete the table to show the physical state at room temperature of fluorine and astatine, and the colour of liquid bromine.

(2)

Element	Colour	Physical state at room temperature
fluorine	pale yellow	
chlorine	pale green	gas
bromine		liquid
iodine	dark grey	solid
astatine	black	

(b) Chlorine reacts with hydrogen to form hydrogen chloride.

A piece of magnesium ribbon is added to hydrogen chloride in three separate experiments under different conditions.

The table below shows the observations made under these different conditions.

Experiment	Conditions	Observations
1	Hydrogen chloride gas	No visible change
2	Hydrogen chloride dissolved in water	The magnesium ribbon gets smaller and bubbles are seen
3	Hydrogen chloride dissolved in methylbenzene	No visible change

(i) Write the formulae of two ions formed in the solution produced in experiment 2.

(2)

Positive ion.....

Negative ion.....

(ii) Identify the gas formed in experiment 2 and give a test for it.

(2)

gas .....

test .....

.....

(iii) Silver nitrate solution and dilute nitric acid are added to the solution produced in experiment 2.

State what is observed and name the substance responsible for this observation.

Explain why dilute nitric acid is added.

(3)

observation .....

.....

substance responsible .....

explanation .....

.....

(iv) Explain why there is no reaction in experiment 3.

(1)

.....

.....

(Total for Question 4 = 10 marks)

5 The halogens are elements in Group 7 of the Periodic Table.

The halogens react with metals to form compounds called halides.

Table 1 shows information about some halogens and their halides.

Halogen	Appearance at room temperature	Halide	Melting point in °C
chlorine	green gas	lithium chloride	605
bromine	red-brown liquid	sodium bromide	747
iodine	grey solid	potassium iodide	681

Table 1

(a) (i) Predict the physical state of fluorine at room temperature.

(1)

.....

(ii) Predict how the colour of astatine at room temperature compares with the colour of iodine.

(1)

.....

(b) Each of the halides in table 1 was dissolved in water to form a solution.

A sample of each of the halogens was then added to some of the halide solutions.

Table 2 shows the results.

Halide	Halogen added		
	Chlorine	Bromine	Iodine
lithium chloride	not done	no reaction	no reaction
sodium bromide	orange solution	not done	no reaction
potassium iodide	brown solution	brown solution	not done

Table 2

(i) Suggest why there is no reason to add chlorine to lithium chloride solution.

(1)

.....

.....

(ii) Why was there no reaction when iodine was added to sodium bromide solution?

(1)

.....

.....

(iii) Name the substance with the brown colour that formed when chlorine was added to potassium iodide solution.

(1)

.....

(iv) The reaction between bromine and potassium iodide solution is a displacement reaction.

What is the correct description of this reaction?

(1)

- ☒ **A** bromide displaces iodide
- ☒ **B** bromine displaces iodide
- ☒ **C** bromide displaces iodine
- ☒ **D** bromine displaces iodine

(v) Complete the chemical equation for the reaction between chlorine and potassium bromide solution.

(1)

$Cl_2 + 2KBr \rightarrow$ ..... + ...

(Total for Question 5 = 7 marks)