Name: _____

2.1 Inorganic chemistry

Group 1 and 7

Date:

Time:

Total marks available:

Total marks achieved: _____

Questions

Q1.

The table gives some information about the halogens, chlorine, bromine and iodine.

Halogen	Physical state at room temperature	Colour
chlorine	gas	pale green
bromine		red-brown
iodine	solid	

(a) Complete the table.

(2)

(b) Chlorine has two isotopes of mass numbers 35 and 37

The relative percentage of each isotope in a sample of chlorine is

chlorine-35 77.78% chlorine-37 22.22%

Calculate the relative atomic mass of this sample of chlorine.

Give your answer to one decimal place.

(3)

relative atomic mass = ...

(c) A student is given an aqueous solution of chlorine and an aqueous solution of potassium bromide.

Explain how he can use these two solutions to compare the reactivity of chlorine with the reactivity of bromine.

(4)

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(Total for question = 9 marks)

Q2.

This question is about the elements in Group 1 of the Periodic Table and their reactions with water.

(a) State why sodium and potassium are in Group 1 of the Periodic Table.

(1)

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(b) A reaction occurs when a small piece of sodium is added to a large volume of water in a trough.

(i) Give **two** observations that you would make during this reaction.

(2)

1 .....

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2 .....

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(ii) After the reaction has finished, a few drops of universal indicator are added to the solution in the trough.

Explain the final colour of the universal indicator.

(2)

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(iii) What is the most likely pH value of the solution in the trough after the reaction is complete?

(1)

☒ **A** 2

☒ **B** 5

☒ **C** 8

☒ **D** 12

(c) Give the name of a Group 1 metal that is less reactive than sodium.

(1)

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(d) A small piece of potassium is added to a large volume of water in a trough.

Give **one** observation that is made when potassium is added to water that is **not** made when sodium is added to water.

(1)

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(e) Complete the equation for the reaction of rubidium with water.

State symbols are not required.

(1)

..... Rb + ... H_2O → ..... RbOH + ... H_2

(Total for question = 9 marks)

Q3.

This question is about some of the Group 1 elements and their compounds.

(a) A teacher adds a small piece of lithium to water in a trough.

(i) Give three observations that are made when lithium reacts with water.

(3)

1 .....

2 .....

3 .....

(ii) After the reaction has finished, the teacher adds a few drops of universal indicator to the solution in the trough.

Explain the colour of the universal indicator after it is added to the solution.

(2)

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(iii) Write a chemical equation for the reaction of lithium with water.

(2)

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(b) A student does a flame test to see if a white solid contains sodium ions.

She cleans a platinum wire before using it for the flame test.

(i) Explain why the student needs to clean the platinum wire.

(2)

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(ii) Which of these is the colour of the flame if the solid contains sodium ions?

(1)

☒ **A** green

☒ **B** lilac

☒ **C** red

☒ **D** yellow

(c) Potassium sulfate (K_2SO_4) is an ionic compound.

(i) Give the formula of each ion in potassium sulfate.

(1)

potassium ion ..... sulfate ion
.....

(ii) The melting point of potassium sulfate is 1069 °C.

Explain why potassium sulfate has a high melting point.

Refer to structure and bonding in your answer.

(4)

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(Total for question = 15 marks)

Q4.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

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

(a) (i) State the name given to Group 7.

(1)

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(ii) Which element is a liquid at room temperature?

(1)

☒ **A** astatine

☒ **B** bromine

☒ **C** fluorine

☒ **D** iodine

(iii) What is the colour of chlorine gas?

(1)

☒ **A** brown

☒ **B** colourless

☒ **C** green

☒ **D** red

(iv) Describe a test for chlorine gas.

(2)

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(b) Iron reacts with chlorine to form iron(III) chloride, $FeCl_3$

(i) Use information from the Periodic Table to calculate the relative formula mass (M_r) of iron(III) chloride.

(2)

M_r = ...

(ii) Complete the chemical equation for the reaction of iron with chlorine.

(1)

..... Fe + ... Cl_2 → ..... $FeCl_3$

(Total for question = 8 marks)

Q5.

Astatine, bromine, chlorine, fluorine and iodine are all halogens.
They are found in Group 7 of the Periodic Table.

(a) Predict which halogen has the lightest colour.

(1)

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(b) Name a halogen that is a solid at room temperature.

(1)

.....

(c) Bromine can be obtained from the bromide ions in sea water.

Chlorine is bubbled into sea water.
The chlorine oxidises the bromide ions to bromine atoms.
The bromine atoms then form bromine molecules.

(i) Complete the equation to show how bromine **atoms** are formed from bromide ions.

(1)

$$Cl_2 + \ldots\ldots\ldots\ldots Br^- \rightarrow 2Cl^- + \ldots\ldots\ldots\ldots Br$$

(ii) State why this reaction is described as the oxidation of bromide ions.

(1)

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(iii) Write an equation to show how bromine atoms form bromine molecules.

(1)

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(d) Boron and fluorine form a covalent compound that has the molecular formula BF_3

Draw a dot-and-cross diagram to show the arrangement of the outer electrons in a molecule of BF_3

Use crosses (✕) to represent the outer electrons of boron. Use dots (•) to represent the outer

electrons of fluorine.

(2)

(Total for question = 7 marks)

Q6.

This question is about metals in Group 1 of the Periodic Table.

When these metals are added to water, they form hydrogen gas and an alkaline solution.

(a) A teacher adds a small piece of lithium to a trough of water to form a solution.

She dips a piece of platinum wire into the solution. She then places the wire into a hot Bunsen flame and the flame changes colour.

(i) State the new colour of the flame.

(1)

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(ii) Give the formula of the ion responsible for the new colour.

(1)

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(iii) The teacher adds a few drops of litmus indicator to the solution.

Explain the colour of the litmus indicator after it is added to the solution.

(2)

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(b) The teacher adds a small piece of sodium to a second trough of water.

The sodium floats and moves around the surface of the water as it reacts.

(i) Give two other observations that are made as sodium reacts with water.

(2)

1 .....

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2 .....

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(ii) Complete the chemical equation for the reaction of sodium with water.

(1)

..... Na + ... H_2O → ..... NaOH + ... H_2

(c) The teacher adds a small piece of potassium to a third trough of water.

(i) Give one observation that is different when using potassium instead of sodium.

(1)

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(ii) Give a possible pH value for the solution that forms when potassium reacts with water.

(1)

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(d) Explain why the reaction of rubidium with water is more vigorous than the reaction of potassium with water.

(2)

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(Total for question = 11 marks)

Q7.

This question is about sodium and potassium.

A trough is filled with water and a few drops of phenolphthalein indicator are added.

(a) A small piece of sodium is dropped into the water. One of the products of the reaction is an alkali.

(i) Complete the chemical equation for the reaction of sodium with water.

(2)

_____Na(.....) + _____$H_2O(l)$ → _____NaOH(.....) + $H_2(g)$

(ii) Identify the ion that causes the solution to become alkaline.

(1)

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(iii) Give three observations that would be made when sodium reacts with water.

(3)

1 .....

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2 .....

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3 .....

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(b) Explain why potassium is more reactive than sodium.

Refer to the electronic configurations of the atoms in your answer.

(3)

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(Total for question = 9 marks)

Q8.

This question is about the elements in Group 1 of the Periodic Table and their reactions with water.

(a) A reaction occurs when a small piece of sodium is added to a large volume of water in a trough.

(i) Give **two** observations that you would make during this reaction.

(2)

1 .....

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2 .....

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(ii) After the reaction has finished, a few drops of universal indicator are added to the solution in the trough.

Explain the final colour of the universal indicator.

(2)

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(iii) What is the most likely pH value of the solution in the trough after the reaction is complete?

(1)

☒ **A** 2

☒ **B** 5

☒ **C** 8

☒ **D** 12

(b) A small piece of potassium is added to a large volume of water in a trough.

Give **one** observation that is made when potassium is added to water that is **not** made when sodium is added to water.

(1)

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(c) Complete the equation for the reaction of rubidium with water.

State symbols are not required.

(1)

..... Rb + ... H_2O → ..... RbOH + ... H_2

(Total for question = 7 marks)