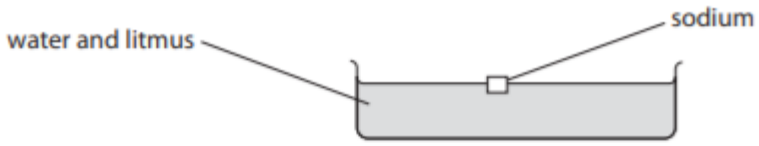
Group one Alkali metals Past Paper Questions IGCSE Edexcel

1.

A teacher investigates the reaction between sodium and water.

The teacher fills a trough with water.

She adds a few drops of litmus solution to the water, and then adds a piece of sodium.



(a) The sodium floats on the water. It reacts with the water and produces bubbles of hydrogen gas.

(i) State two other observations that are made during the reaction.

(2)

1 .....

.....

2 .....

.....

(ii) Balance the equation for the reaction between sodium and water.

Include the state symbols.

(2)

..... Na(.....) + ... H_2O(.....) → ..... NaOH(.....) + ... H_2(.....)

(b) Lithium and potassium react in a similar way to sodium when added to water.

(i) State why they have a similar reaction in terms of the electronic configurations of their atoms.

(1)

.....

.....

(ii) Place the elements lithium, potassium and sodium in order of reactivity.

(1)

most reactive .....

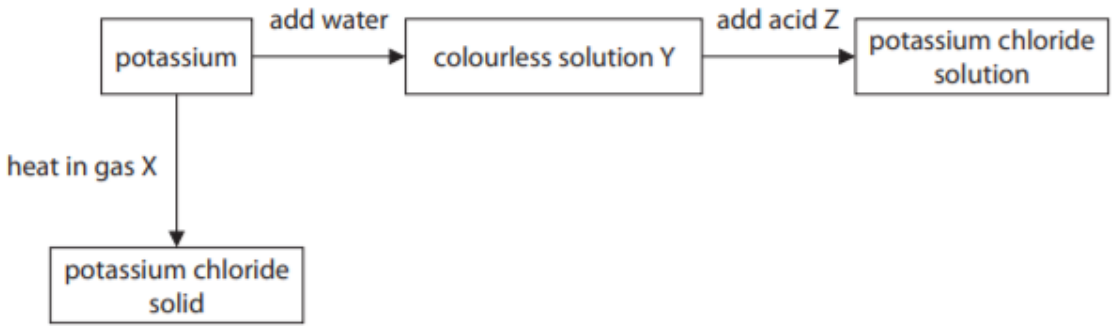
.....

least reactive .....

2.

6 This question is about elements in Groups 1 and 7 of the Periodic Table.

(a) The diagram shows two ways in which potassium can be converted into potassium chloride.



Give the names of gas X, colourless solution Y and acid Z.

(3)

gas X .....

colourless solution Y .....

acid Z .....

(b) When sodium is burned in iodine gas, sodium iodide is formed.

(i) Write a chemical equation for the reaction between sodium and iodine.

(1)

.....

(ii) Give a test to show that an aqueous solution of sodium iodide contains iodide ions.

(3)

test for iodide ions .....

.....

.....

observation .....

3.

Lithium is an element in Group 1 of the Periodic Table.

Lithium is stored in oil to prevent it from coming into contact with air and water.

(a) When a piece of lithium is removed from the oil, dried and cut, the exposed surface

(1)

- ☐ **A** bubbles and fizzes
- ☐ **B** changes from shiny to dull
- ☐ **C** bursts into flame
- ☐ **D** does not change

(b) When lithium is added to cold water in a beaker, hydrogen forms.

(i) State the test for hydrogen.

(1)

.....

.....

(ii) A few drops of phenolphthalein indicator are added to the solution in the beaker.

Explain why the phenolphthalein turns pink.

(2)

.....

.....

.....

.....

(c) The table shows some information about lithium oxide and lithium carbonate.

Complete the table by giving the two missing formulae.

(2)

Name of compound	Formula of compound	Formula of cation in compound	Formula of anion in compound
lithium oxide		Li^+	O^{2-}
lithium carbonate	Li_2CO_3	Li^+	

(d) Caesium is another element in Group 1 of the Periodic Table.

(i) The table below lists some statements about the reaction of caesium with cold water compared to the reaction of lithium with cold water.

Place ticks (✓) in the boxes to show the two correct statements.

(2)

the reaction with caesium is more vigorous	
the reaction with caesium produces a different gas	
the reaction with caesium produces an acidic solution	
the reaction with caesium produces a different compound	
the reaction of caesium is endothermic	

(ii) Write a chemical equation for the reaction of caesium with water.

(2)

4.

Potassium and lithium are Group 1 metals that exist as isotopes.

(a) (i) Complete the table of information about two isotopes of potassium.

(3)

Atomic number	Mass number	Number of protons	Number of neutrons
19	39		
		19	22

(ii) A sample of lithium has this percentage composition by mass.

$^{6}Li = 7.4\%$ $^{7}Li = 92.6\%$

Use this information to calculate the relative atomic mass of lithium.
Give your answer to one decimal place.

(2)

relative atomic mass of lithium = ...

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

State two observations that could be made during the reaction.

(2)

.....

.....

.....

.....

(c) A few drops of phenolphthalein are added to the liquid in the trough at the end of the reaction. A colour change occurs.

(i) State the final colour of the liquid in the trough.

(1)

.....

(ii) Give the formula of the ion formed during the reaction that causes this colour change.

(1)

(d) The electronic configurations of lithium and potassium are

Li 2,1 K 2,8,8,1

Explain why potassium is more reactive than lithium.

(2)

5.

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

(a) Which statement is correct about lithium?

(1)

- ☐ **A** lithium is a non-metal
- ☐ **B** lithium forms a sulfate with the formula $LiSO_4$
- ☐ **C** lithium reacts with water to form an alkali
- ☐ **D** lithium reacts with water to form a white precipitate

(b) Lithium and potassium have similar chemical properties because their atoms

(1)

- ☐ **A** have the same number of electrons in the outer shell
- ☐ **B** have the same number of protons
- ☐ **C** have two electrons in the first shell
- ☐ **D** form positive ions

(c) Small pieces of lithium and potassium are added to separate large troughs of water.

State one observation that would be similar for each element, and one that would be different for each element.

(2)

similar .....

.....

different .....

.....

(d) Suggest the formula of the compound formed when potassium reacts with oxygen, and when potassium reacts with chlorine.

(2)

oxygen .....

chlorine .....

(e) Complete the equation for the reaction between rubidium and water by inserting state symbols.

(1)

$2Rb(\quad\quad) + 2H_2O(\quad\quad) \rightarrow 2RbOH(\quad\quad) + H_2(\quad\quad)$

(f) The table shows information about the isotopes in a sample of rubidium.

Isotope	Number of protons	Number of neutrons	Percentage of isotope in sample
1	37	48	72
2	37	50	28

Use information from the table to calculate the relative atomic mass of this sample of rubidium. Give your answer to one decimal place.

(2)

relative atomic mass = ...

6.

Lithium, potassium and caesium are three metals in Group 1 of the Periodic Table.

(a) A small piece of each metal is placed on water in separate large troughs.

Complete the table by giving the correct metal, lithium, potassium or caesium, for each description.

(2)

Description of reaction	Metal
explodes on contact with water	
fizzes gently	
reacts violently and forms a lilac flame	

(b) (i) Give the name and formula of the gas formed when potassium reacts with water.

(2)

name .....

formula .....

(ii) Give the name and formula of the compound formed when lithium reacts with water.

(2)

name .....

formula .....

(iii) Describe how you could show that an alkaline solution is formed when caesium reacts with water.

(2)

.....

.....

.....

.....

7.

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

(a) Which statement is correct about lithium?

(1)

- ☒ **A** lithium is a non-metal
- ☒ **B** lithium forms a sulfate with the formula $LiSO_4$
- ☒ **C** lithium reacts with water to form an alkali
- ☒ **D** lithium reacts with water to form a white precipitate

(b) Lithium and potassium have similar chemical properties because their atoms

(1)

- ☒ **A** have the same number of electrons in the outer shell
- ☒ **B** have the same number of protons
- ☒ **C** have two electrons in the first shell
- ☒ **D** form positive ions

(c) Small pieces of lithium and potassium are added to separate large troughs of water.

State one observation that would be similar for each element, and one that would be different for each element.

(2)

similar .....

.....

different .....

.....

(d) Suggest the formula of the compound formed when potassium reacts with oxygen, and when potassium reacts with chlorine.

(2)

oxygen .....

chlorine .....

(e) Complete the equation for the reaction between rubidium and water by inserting state symbols.

(1)

$2Rb(\ldots\ldots) + 2H_2O(\ldots\ldots) \rightarrow 2RbOH(\ldots\ldots) + H_2(\ldots\ldots)$

(f) The table shows information about the isotopes in a sample of rubidium.

Isotope	Number of protons	Number of neutrons	Percentage of isotope in sample
1	37	48	72
2	37	50	28

Use information from the table to calculate the relative atomic mass of this sample of rubidium. Give your answer to one decimal place.

(2)

relative atomic mass = ...

8.

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

(a) Which statement about lithium is correct?

(1)

- ☐ **A** It is a good electrical conductor and forms an acidic oxide
- ☐ **B** It is a poor electrical conductor and forms an acidic oxide
- ☐ **C** It is a good electrical conductor and forms a basic oxide
- ☐ **D** It is a poor electrical conductor and forms a basic oxide

(b) A small piece of sodium is added to a large trough of water.

(i) State two observations that could be made.

(2)

1 .....

.....

2 .....

.....

(ii) Complete the equation for this reaction by inserting the appropriate state symbols.

(2)

$$2Na(s) + 2H_2O(\quad\quad) \rightarrow 2NaOH(\quad\quad) + H_2(\quad\quad)$$

(c) Potassium reacts in a similar way to sodium, but is more reactive.

State one observation that could be made when a small piece of potassium is added to a large trough of water, but would not be observed with sodium.

(1)

.....

.....

(d) Explain why elements in Group 1 have similar reactions.

(1)

.....

.....

9.

The table gives information about the first three elements in Group 1 of the Periodic Table.

Element	Atomic number	Relative atomic mass	Electronic configuration	Density in g / cm³	Melting point in °C
lithium	3	7	2.1	0.53	180
sodium	11	23	2.8.1	0.97	98
potassium	19	39	2.8.8.1	0.86	64

(a) Which information shows that the elements have similar chemical properties?

Give a reason for your choice.

(2)

Information .....

Reason .....

.....

(b) The elements in Group 1 show a clear trend (regular pattern) in some of their **physical** properties.

Identify the physical property that shows a clear trend.

(1)

.....

.....

(c) The elements also show a clear trend in their **chemical** properties, such as their reaction with water.

When a small piece of lithium is added to water it fizzes gently and eventually disappears to form a solution.

(i) Describe a test to show that the gas given off is hydrogen.

(1)

.....

.....

(ii) Complete the equation for the reaction by inserting the state symbols.

(1)

$2Li(\quad) + 2H_2O(\quad) \rightarrow 2LiOH(\quad) + H_2(\quad)$

(iii) State and explain the effect that the solution formed has on red litmus paper.

(2)

(d) State two similarities and two differences between the reactions of lithium and potassium with water.

(4)

Similarities

Differences

(e) When lithium burns in oxygen it forms lithium oxide (Li_2O).

(i) Write a chemical equation for the reaction between lithium and oxygen.

(2)

(ii) When sodium burns in oxygen, one of the products is sodium peroxide (Na_2O_2).

Balance the equation to show the formation of sodium peroxide.

(1)

..... Na + ... O_2 → ..... Na_2O_2