

Group 1

Total marks : 19

Q1.

This question is about elements in group 1 of the periodic table.

The elements in group 1 react very vigorously with water.

A student suggests this method to see what happens when sodium reacts with water.

step 1 put on safety glasses and a laboratory coat

step 2 cut a 2 cm × 2 cm × 2 cm cube of sodium

step 3 put a few drops of water in the container shown in Figure 4

step 4 add the sodium to the water in the container and observe the reaction

(i) Figure 4 shows a diagram of the container the student suggested for step 3.



Figure 4

Give the name of the container shown in Figure 4.

(1)

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(ii) A teacher says that the method is not safe because the reaction is too vigorous.

Explain changes that could be made to step 2 and to step 3 that would make the method safer.

(3)

step 2: change and explanation

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.....
.....

step 3: change and explanation

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.....

(Total for question = 4 marks)

Q2.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

Explain, in terms of electronic configurations, the increase in reactivity from lithium to sodium to potassium.

(2)

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.....

(Total for question = 2 marks)

Q3.

This question is about elements in group 1 of the periodic table.

Figure 3 shows the symbols of the first three elements in group 1 of the periodic table and their melting points.

symbol	melting point in °C
Li	181
Na	98
K	64

Figure 3

Use the periodic table to answer these questions.

(i) Give the symbol of **another** element in group 1.

(1)

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(ii) Give the atomic number of lithium.

(1)

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(iii) Describe the trend in the melting points of the elements in Figure 3.

(2)

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(Total for question = 4 marks)

Q4.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

In an experiment equal-sized pieces of lithium, sodium and potassium are added to separate samples of water.

A flame is produced only with potassium because potassium

- A is the softest metal
- B has the lowest melting point
- C is the most reactive
- D is the only flammable metal

(1)

(Total for question = 1 mark)

Q5.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

Sodium reacts with water to form sodium hydroxide in solution and hydrogen.

Complete the balancing of the equation for this reaction and add the state symbols for each substance.



(3)

(Total for question = 3 marks)

Q6.

Some of the elements in the periodic table are metals.

Lithium, potassium and rubidium are alkali metals.

(i) Describe what you would see when a small piece of rubidium is dropped on to water.

(2)

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(ii) The electronic configuration of lithium is 2.1
The electronic configuration of potassium is 2.8.8.1
Lithium is less reactive than potassium.

Explain, in terms of their electronic configurations, why lithium is less reactive than potassium.

(3)

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(Total for question = 5 marks)

Mark Schemes :

Q1.

Question number	Answer	Additional guidance	Mark
(i)	test tube / boiling tube	ignore just 'tube', testing tube	(1) A02 2

Question number	Answer	Additional guidance	Mark
(ii)	<p>An explanation to include any three from:</p> <p>Step 2</p> <ul style="list-style-type: none"> cut a <u>smaller</u> piece of sodium (1) <p>Step 3</p> <ul style="list-style-type: none"> use a larger {container / trough} (of water) (1) there is more water so more heat is absorbed (1) 	<p>reject use powdered sodium for MP1 and MP2</p> <p>MP2 is dependent on MP1</p> <p>allow less sodium / smaller volume of sodium / $1(\text{cm}^3) \times 1(\text{cm}^3) \times 1(\text{cm}^3)$ cube / smaller mass of sodium</p> <p>ignore use less cubes</p> <p>allow smaller reaction / it is less reactive ignore so reaction is less vigorous</p> <p>MP4 is dependent on MP3</p> <p>allow name of larger container: beaker/ flask ignore use larger test tube / boiling tube ignore change container ignore add more water</p> <p>ignore add a safety screen / observe from a distance</p>	(3) A03 3a

Q2.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation linking</p> <ul style="list-style-type: none">atoms become larger/outer electron becomes further from the nucleus / ORA (1)so outer electron more easily lost / less energy needed to lose outer electron / ORA (1)	<p>allow atomic radius increases / increased shielding effect (by inner complete(electron) shells)/ more (inner) shells/ decreased force of attraction between outer shell electron and nucleus / correct electronic configurations (at least two)</p> <p>reject 'more outer shells' / incorrect forces such as intermolecular</p>	<p>(2) AO 1 1</p>

Q3.

Question number	Answer	Additional guidance	Mark
(i)	Rb / Cs / Fr	symbols must have uppercase letter then lowercase letter reject answers with any other symbols ignore any names	(1) AO2 1

Question number	Answer	Mark
(ii)	3 / three	(1) AO2 1

Question number	Answer	Additional guidance	Mark
(iii)	<p>A description including</p> <ul style="list-style-type: none"> (the melting points) decrease (1) as the atomic number increases/ as you go down {the group / the alkali metals / group 1} (1) 	<p>allow (melting points) {go down / get smaller} ignore less heat needed to melt it</p> <p>MP2 depends on MP1</p> <p>allow (going) down (the table / list) allow down the periodic table</p> <p>ignore references to boiling point</p> <p>higher the atomic number, lower the melting point (2) ORA</p> <p>higher in {group/ table} the higher the melting point (2) ORA</p>	(2) AO3 1

Q4.

Question Number	Answer	Mark
	<p>C is the most reactive</p> <p>The only correct answer is C</p> <p><i>A is not correct because this is irrelevant</i></p> <p><i>B is not correct because this is irrelevant</i></p> <p><i>D is not correct because this is irrelevant</i></p>	<p>(1) AO 2 1</p>

Q5.

Question Number	Answer	Additional guidance	Mark
	<p>$2\text{Na}(s) + 2\text{H}_2\text{O}(l) \rightarrow 2\text{NaOH}(aq) + \text{H}_2(g)$</p> <p>2Na (1) 2NaOH (1) s, l, aq, g (1)</p>	<p>allow S, L, AQ, G ignore words</p>	<p>(3) AO 2 1</p>

Q6.

Question number	Answer	Additional guidance	Mark
(i)	<p>A description to include from</p> <ul style="list-style-type: none"> effervescence / bubbles / fizz (1) disappears / gets smaller (1) explodes / flame / ignites / sparks (1) 	<p>ignore gas / smoke ignore hydrogen given off</p> <p>allow dissolves</p> <p>allow moves around very fast</p> <p>allow forms a ball / melts</p> <p>ignore floats /sinks</p> <p>ignore 'pops' / hydrogen</p>	(2)

Question number	Answer	Additional guidance	Mark
(ii)	<p>an explanation linking</p> <p>outer (electron /shell) closer to nucleus (1)</p> <p>so more attraction for (electron/shell) (1)</p> <p>(therefore) electron is harder to lose (1)</p>	<p>allow smaller atomic radius / fewer shells reject less outer shells for MP1</p> <p>allow less shielding</p> <p>allow more energy to lose electron</p> <p>ORA for potassium</p>	(3)