1 Lithium, sodium and potassium all react with cold water.

(a) Lithium, sodium and potassium are in group 1 of the periodic table.

Complete the sentence by putting a cross (☒) in the box next to your answer.

These elements are

(1)

- ☐ **A** halogens
- ☐ **B** noble gases
- ☐ **C** transition metals
- ☐ **D** alkali metals

(b) When sodium is added to cold water, it forms a molten ball which floats on the surface of the water.

Explain why this happens.

(2)

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(c) Write the balanced equation for the reaction of sodium with water.

(3)

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*(d) Sodium and potassium react with cold water to give similar products.

The electronic configuration of sodium is 2.8.1.
The electronic configuration of potassium is 2.8.8.1.

Explain the similarities and differences in the way sodium and potassium react with cold water by considering their reactions and their electronic configurations.

(6)

(Total for Question 1 = 12 marks)

2 Lithium, sodium and potassium are metals in group 1 of the periodic table.
They are good conductors of heat and electricity.
The freshly-cut metals are shiny.

(a) (i) Give another physical property of all three of these metals.

(1)

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(ii) Explain, in terms of electrons in their atoms, why lithium, sodium and potassium are in group 1 of the periodic table.

(2)

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(b) A small piece of potassium is added to water.

(i) Describe what you would **see** in this reaction.

(2)

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(ii) Which of these is the balanced equation for this reaction?

Put a cross (☒) in the box next to your answer.

(1)

☐ **A** $2K + 2H_2O \rightarrow K_2O + 2H_2$

☐ **B** $2K + H_2O \rightarrow K_2O + H_2$

☐ **C** $4K + 3H_2O \rightarrow 4KOH + H_2$

☐ **D** $2K + 2H_2O \rightarrow 2KOH + H_2$

(c) There is an increase in reactivity of these group 1 metals from lithium to potassium.

Explain this increase in reactivity.

(2)

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(Total for Question 2 = 8 marks)

3 (a) Argon is an element in Group 0 of the periodic table.
It is used as the gas in filament lamps.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Argon is used in filament lamps because it

(1)

- ☐ **A** has a low density
- ☐ **B** is a good conductor of electricity
- ☐ **C** is flammable
- ☐ **D** is inert

(b) Metals are malleable.

Explain, in terms of their structures, why metals are malleable.

(2)

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(c) In an experiment, 3.1 g of phosphorus reacted with 24 g of bromine to form phosphorus bromide.

Calculate the empirical formula of the phosphorus bromide.

You must show your working.

(relative atomic masses: P = 31, Br = 80)

(3)

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empirical formula .....

*(d) Group 1 of the periodic table contains the alkali metals lithium, sodium and potassium.
The alkali metals show a pattern in their reactivity with water.
This pattern is shown when small pieces of lithium, sodium and potassium are added separately to water.

Describe the reactions and what would be seen and explain the pattern in reactivity.

You may include equations as part of your answer.

(6)

(Total for Question 3 = 12 marks)

4 There are many metallic elements in the periodic table.

(a) Which row of the table correctly shows two metals that are in group 1 and two metals that are transition metals?

Put a cross (☒) in the box next to your answer.

(1)

	group 1	transition metals
☒ **A**	lithium and zinc	calcium and copper
☒ **B**	potassium and caesium	copper and iron
☒ **C**	sodium and potassium	copper and magnesium
☒ **D**	sodium and magnesium	manganese and nickel

(b) (i) Describe the structure of metals in terms of the particles present in their structures.

(2)

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(ii) Explain how metals conduct electricity.

(2)

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(c) (i) Describe what you would **see** when a small piece of sodium is added to water.

(2)

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(ii) Write the balanced equation for the reaction of sodium with water to form sodium hydroxide and hydrogen.

(3)

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(Total for Question 4 = 10 marks)