**1** (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)**

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**(Total for Question 1 = 12 marks)**

**2** The elements chlorine, bromine and iodine are part of group 7 in the periodic table.

(a) The appearances of chlorine, bromine and iodine at room temperature are shown in Figure 10.

| halogen | appearance |
|---|---|
| chlorine | green gas |
| bromine | red-brown liquid |
| iodine | grey solid |

**Figure 10**

Astatine is the element below iodine in group 7.

Predict the appearance of astatine.

**(1)**

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*(b) The order of reactivity of chlorine, bromine and iodine can be determined by carrying out displacement reactions.

Explain how displacement reactions can be used to show the reactivity of these three elements.

**(6)**

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(c) When iron wool is heated in bromine vapour, it reacts to form iron bromide.

(i) In an experiment, 5.60 g of iron reacted exactly with 24.0 g of bromine, $Br_2$.

[relative atomic masses: Fe = 56.0, Br = 80.0]

Determine, using this information, the balanced equation for the reaction between iron and bromine.
You must show your working.

**(4)**

(ii) When iron reacts with bromine, bromide ions are formed.

Explain the type of reaction bromine atoms undergo when they are converted to bromide ions.

**(2)**

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**(Total for Question 2 = 13 marks)**