| Question Number | Answer | | Mark |
|---|---|---|---|
| **1(a)** | D | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **1(b)** | An explanation linking two of the following<br><br>• reaction produces heat/exothermic (1)<br><br>• (sodium) has low melting point (1)<br><br>• (sodium) has low density/density less than water (1) | <br><br><br><br><br><br>ignore sodium floats on water | **(2)** |

| Question Number | Answer | | Mark |
|---|---|---|---|
| **1(c)** | $2Na + 2H_2O \rightarrow 2NaOH + H_2$<br><br>LHS formulae (1)<br>RHS formulae (1)<br>balancing correct formulae (1) | ensure that 2 is subscript at most half the size of H and cases are correct | **(3)** |

| Question Number | | Indicative content | Mark |
|---|---|---|---|
| **QWC** | ***1(d)** | **similarities**<br>• both in the same group/group 1/alkali metal<br>• react in a similar way<br>• same number of outer electrons/one outer electron<br>• both produce hydrogen/fizz (when reacted with water)<br>• both produce hydroxide/alkaline solution (when reacted with water)<br><br>**differences**<br>• potassium more reactive<br>• potassium catches on fire/lilac flame<br>• potassium outer electron further from nucleus<br>• potassium has more shells<br>• potassium has more shielding<br>• potassium has less attraction of outer electron by nucleus<br>• potassium outer electron more easily lost | **(6)** |
| **Level** | **0** | No rewardable content | |
| **1** | **1-** | • a limited explanation e.g. both in group 1 because one electron in outer shell<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, puncuation and grammar are used with limited accuracy | |
| **2** | **3-** | • a simple explanation e.g. sodium and potassium have similar reactions because they are in the same group but potassium is more reactive.<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, puncuation and grammar are used with some accuracy | |
| **3** | **5-** | • a detailed explanation e.g. sodium and potassium have similar reactions because they are both have one outer electron but potassium is more reactive because its outer electron is more easily lost because it has an extra shell of electrons causing the attraction of the nucleus to be reduced<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, puncuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(a)(i)** | soft / low melting point / low boiling point | **easily** cut with a knife = soft<br>low density<br>malleable<br>solid at room temp.<br><br>ignore float on water<br>reject chemical properties | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(a)(ii)** | An explanation linking<br><br>(all have) one electron in outer shell (2) | <br><br>one outer electron = 2 marks<br><br>group number shows number of electrons in outer shell = 2 marks<br><br>same number of electrons in outer shell = 1 mark<br><br>incorrect number of electrons in the outer shell = 1 mark<br><br>accept outer orbit / highest energy level in place of outer shell | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(i)** | A description including any two of<br><br>effervescence / fizzing / bubbles (1)<br>potassium floats (1)<br>moves (on surface) (1)<br>potassium forms ball / melts (1)<br>potassium decreases in size / disappears / dissolves (1)<br>(lilac) flame / catches fire (1)<br>spits / explodes / sparks (1) | <br><br><br><br><br><br>ignore ignites<br><br>ignore smoke | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(b)(ii)** | D : $2K + 2\ H_2O \rightarrow 2KOH + H_2$ | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **2(c)** | An explanation linking any two of<br><br>increasing {size /radius (of atom) / number of shells} (1)<br>increased shielding (of outer electron) (1)<br>less attraction for (outer) electron (1) | <br><br><br><br>easier to remove (outer) electron | **(2)** |

| Question Number | Answers | Acceptable Answers | Mark |
|---|---|---|---|
| **3 (a)** | **D** is inert | | **(1)** |

| Question Number | Answers | Acceptable Answers | Mark |
|---|---|---|---|
| **3(b)** | An explanation linking<br><br>• {atoms/cations/ions} are in {layers /sheets} **(1)**<br><br>• { layers/sheets} can {slide/slip/ move/roll} (over each other) (1) | Any mention of intermolecular forces/covalent bonds/ionic bonds (0)<br><br>Accept a diagram showing layers with labelled {atoms/cations/ions}<br>Ignore rows /lines/ lattice<br><br>Do not allow electrons can slide/slip/move over each other<br>Ignore references to delocalised electrons | **(2)** |

| Question Number | Answers | Acceptable Answers | Mark |
|---|---|---|---|
| **3 (c)** | P Br<br><br>mass 3.1/31(= 0.1) 24/80 (=0.3) **(1)**<br>$A_r$<br>ratio 1 3<br>**(1)**<br><br>formula $PBr_3$<br>**(1)** | Allow $PBr_3$ with no working or incorrect working **(1)**<br><br>$PBr_3$ with some correct working **(3)**<br>Accept $Br_3P$<br><br>Allow TE for second and third marks<br>e.g. P Br<br><br>31/3.1(= 10) 80/24 (= 3.33)<br>**(0)**<br><br>3 1 **(1)**<br><br>$P_3Br$ **(1)**<br><br>$P_3Br$ with no working **(0)** | **(3)** |

| Question Number | | Indicative content | Mark |
|---|---|---|---|
| **QWC** | **3(d)** | A description / explanation including some of the following points<br><br>**Description**<br>• effervescence / fizzing / bubbles<br>• float /on surface<br>• move<br>• produce hydrogen (may be shown in word or balanced equation)<br>• {an alkaline/metal hydroxide} solution (may be shown in word or balanced equation)<br>• gets smaller / disappears / dissolves<br>• reactivity increases with {increasing atomic number/ down the group} / potassium effervesces more than sodium and lithium / potassium moves faster than sodium or lithium<br>• sodium and potassium melt/form a (silver-coloured) ball<br>• hydrogen burns when potassium/ sodium react<br>• potassium gives a lilac flame/sodium gives a yellow flame<br>• Universal Indicator added to water turns blue/purple<br><br>**Explanation**<br>• (group 1 metals) react by losing one electron<br>• electron is more easily lost with {increasing atomic number/ down the group}<br>• {electron/ outer shell} is further away from nucleus/ atomic radius increases/ there are more electron shells with {increasing atomic number/ down the group}<br>• {more shielding (of outer electron)/ less attraction between nucleus and outer electron/ more shells between outer electron and nucleus} with {increasing atomic number/down the group} | **(6)** |
| Level | 0 | No rewardable material | |
| **1** | **1-2** | • a limited description of one or two points describing the reactions or explaining them e.g. reactivity increases down the group.<br>• the answer communicates ideas using simple language and uses limited scientific terminology.<br>• spelling, punctuation and grammar are used with limited accuracy. | |
| **2** | **3-4** | • a simple description of at least three points describing the reactions OR a combination of three points from the description and explanation e.g. they all float on water, fizz and potassium gives a lilac flame.<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately.<br>• spelling, punctuation and grammar are used with some accuracy. | |
| **3** | **5-6** | • a detailed description and explanation of at least five points describing the reactions **and** explaining the pattern of reactivity e.g. the metals all fizz, float and produce hydrogen, the reactivity increases down the group because the outer electron is more easily lost.<br>• the answer communicates ideas clearly and coherently and uses scientific terminology accurately.<br>• spelling, punctuation and grammar are used with few errors. | |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(a)** | B potassium and caesium, copper and iron | | **(1)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(i)** | A description linking<br><br>(regular arrangement of) positive ions /cations (1)<br><br>(surrounded by) {delocalised/sea of} electrons (1) | Any reference to molecules/molecular/intermolecular/covalent scores 0 marks overall<br><br>metal ions<br><br>reject "negative and positive particles" / positive atoms / protons<br><br>ignore descriptions of atoms in rows/ layers of particles etc<br><br>cloud of electrons<br>ignore free | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(b)(ii)** | An explanation linking<br><br>M1 electrons (1)<br><br>M2 move/flow (1)<br><br>M2 dep on M1 | <br><br><br>pass through / travel<br><br>For M2:<br>ignore free/delocalised (electrons)<br>ignore electricity flows<br>ignore (electrons) vibrate<br>ignore carry/pass the current/charge | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(c)(i)** | A description including any two from<br><br>floats (1)<br><br>moves (around) (1)<br><br>effervescence / fizzing / bubbles (1)<br><br>melts/changes to a ball shape (1)<br><br>becomes smaller /disappears (1) | moves (around) on the surface (2)<br><br>white smoke formed<br>ignore gas/hydrogen given off<br><br>dissolves / explodes<br>Ignore: burns/catches fire/ignites/flame/sparks<br>ignore addition of indicators | **(2)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **4(c)(ii)** | $2Na + 2H_2O \rightarrow 2NaOH + H_2$<br><br>LHS (1)<br>RHS (1)<br>balancing of correct formulae(1) | NaHO<br><br>ignore brackets around OH<br><br>Use of lower case h, upper case A, lower case o, or use of superscripts or large numbers inside the formulae loses 1 mark only<br><br>ignore state symbols | **(3)** |