

Question Number	Answer		Mark
1(a)	D		(1)

Question Number	Answer	Acceptable answers	Mark
1(b)	<p>An explanation linking two of the following</p> <ul style="list-style-type: none"> • reaction produces heat/exothermic (1) • (sodium) has low melting point (1) • (sodium) has low density/density less than water (1) 	ignore sodium floats on water	(2)

Question Number	Answer		Mark
1(c)	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$ LHS formulae (1) RHS formulae (1) 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)	<p>similarities</p> <ul style="list-style-type: none"> • both in the same group/group 1/alkali metal • react in a similar way • same number of outer electrons/one outer electron • both produce hydrogen/fizz (when reacted with water) • both produce hydroxide/alkaline solution (when reacted with water) <p>differences</p> <ul style="list-style-type: none"> • potassium more reactive • potassium catches on fire/lilac flame • potassium outer electron further from nucleus • potassium has more shells • potassium has more shielding • potassium has less attraction of outer electron by nucleus • potassium outer electron more easily lost 	(6)
Level	0	No rewardable content	
1	1-	<ul style="list-style-type: none"> • a limited explanation e.g. both in group 1 because one electron in outer shell • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	3-	<ul style="list-style-type: none"> • a simple explanation e.g. sodium and potassium have similar reactions because they are in the same group but potassium is more reactive. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	5-	<ul style="list-style-type: none"> • 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 • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation 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 low density malleable solid at room temp. ignore float on water reject chemical properties	(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	An explanation linking (all have) one electron in outer shell (2)	one outer electron = 2 marks group number shows number of electrons in outer shell = 2 marks same number of electrons in outer shell = 1 mark incorrect number of electrons in the outer shell = 1 mark 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 effervescence / fizzing / bubbles (1) potassium floats (1) moves (on surface) (1) potassium forms ball / melts (1) potassium decreases in size / disappears / dissolves (1) (lilac) flame / catches fire (1) spits / explodes / sparks (1)	ignore ignites 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 increasing {size / radius (of atom) / number of shells} (1) increased shielding (of outer electron) (1) less attraction for (outer) electron (1)	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)	<p>An explanation linking</p> <ul style="list-style-type: none"> • {atoms/cations/ions} are in {layers /sheets} (1) • { layers/sheets} can {slide/slip/ move/roll} (over each other) (1) 	<p>Any mention of intermolecular forces/covalent bonds/ionic bonds (0)</p> <p>Accept a diagram showing layers with labelled {atoms/cations/ions} Ignore rows /lines/ lattice</p> <p>Do not allow electrons can slide/slip/move over each other Ignore references to delocalised electrons</p>	(2)

Question Number	Answers	Acceptable Answers	Mark
3 (c)	<p>P Br</p> <p><u>mass</u> 3.1/31(= 0.1) 24/80 (=0.3) (1)</p> <p><u>A_r</u> ratio 1 3 (1)</p> <p>formula PBr₃ (1)</p>	<p>Allow PBr₃ with no working or incorrect working (1)</p> <p>PBr₃ with some correct working (3) Accept Br₃P</p> <p>Allow TE for second and third marks e.g. P Br</p> <p>31/3.1(= 10) 80/24 (= 3.33) (0)</p> <p>3 1 (1)</p> <p>P₃Br (1)</p> <p>P₃Br with no working (0)</p>	(3)

Question Number	Indicative content	Mark
QWC 3(d)	<p>A description / explanation including some of the following points</p> <p>Description</p> <ul style="list-style-type: none"> • effervescence / fizzing / bubbles • float /on surface • move • produce hydrogen (may be shown in word or balanced equation) • {an alkaline/metal hydroxide} solution (may be shown in word or balanced equation) • gets smaller / disappears / dissolves • reactivity increases with {increasing atomic number/ down the group} / potassium effervesces more than sodium and lithium / potassium moves faster than sodium or lithium • sodium and potassium melt/form a (silver-coloured) ball • hydrogen burns when potassium/ sodium react • potassium gives a lilac flame/sodium gives a yellow flame • Universal Indicator added to water turns blue/purple <p>Explanation</p> <ul style="list-style-type: none"> • (group 1 metals) react by losing one electron • electron is more easily lost with {increasing atomic number/ down the group} • {electron/ outer shell} is further away from nucleus/ atomic radius increases/ there are more electron shells with {increasing atomic number/ down the group} • {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	<ul style="list-style-type: none"> • a limited description of one or two points describing the reactions or explaining them e.g. reactivity increases down the group. • the answer communicates ideas using simple language and uses limited scientific terminology. • spelling, punctuation and grammar are used with limited accuracy.
2	3-4	<ul style="list-style-type: none"> • 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. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately. • spelling, punctuation and grammar are used with some accuracy.
3	5-6	<ul style="list-style-type: none"> • 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. • the answer communicates ideas clearly and coherently and uses scientific terminology accurately. • 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 (regular arrangement of) positive ions /cations (1) (surrounded by) {delocalised/sea of} electrons (1)	Any reference to molecules/molecular/intermolecular/covalent scores 0 marks overall metal ions reject "negative and positive particles" / positive atoms / protons ignore descriptions of atoms in rows/ layers of particles etc cloud of electrons ignore free	(2)

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

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

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	<p>$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$</p> <p>LHS (1)</p> <p>RHS (1)</p> <p>balancing of correct formulae(1)</p>	<p>NaHO</p> <p>ignore brackets around OH</p> <p>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</p> <p>ignore state symbols</p>	(3)