PEARSON EDEXCEL IGCSE CHEMISTRY · 4CH1

CHEMISTRY



MARK SCHEME

SECTION 2: INORGANIC CHEMISTRY (PACK 6)

SCORE	PERCENTAGE
/195	%

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Mark Scheme

Q1.

Question number	Answer	Notes	Marks
(a)	Award 1 mark each for any six of the following: **Method 1** **M1** polystyrene (insulator so) reduces/prevents heat loss (to atmosphere) OWTTE **M2** no lid so heat/thermal energy will be lost (to atmosphere) **M3** stirring will ensure even temperature / more accurate (highest) temperature OWTTE **M4** no lid so possibility of spillage **OR** polystyrene cup (containing thermometer) unstable/may fall over OWTTE **Method 2** **M5** glass bottle poor insulator so heat/thermal energy loss occurs OWTTE **M6** bung helps reduce/prevent heat/thermal energy loss (to atmosphere) **M7** bung so no spillage **M8** cannot stir so cannot ensure even temperature / cannot ensure accurate (highest) temperature OWTTE	**ALLOW** references to heat/thermal energy evenly spread (throughout solution) OWTTE **IGNORE** references to increases rate of reaction **ALLOW** references to heat /thermal energy not evenly spread (throughout solution) OWTTE	6

(b)	**M1** 0.025 mol $CuSO_4$ reacts with 0.025 mol Zn **M2** mass Zn needed = 0.025 x 65 = 1.625 g (3g > 1.625g so having 3g Zn is excess) OR **M1** 0.025 mol $CuSO_4$ reacts with 0.025 mol Zn **M2** 3g Zn = $\frac{3}{65}$ = 0.046 mol (0.046 > 0.025 so having 3g Zn is excess)	**ALLOW** reference to 1:1 molar ratio or (only) 0.025 mol Zn needed **M2** subsumes **M1** **ALLOW** reference to 1:1 molar ratio or (only) 0.025 mol Zn needed	2

Question number	Answer	Notes	Marks
(c) (i)	**M1** calculation of temperature rise **M2** correct substitution into Q = m x 4.2 x temp rise **M3** correct evaluation of Q Example calculation **M1** (40.6 - 21.1) OR 19.5 **M2** Q = 50 x 4.2 x 19.5 **M3** = 4100 (J)	ALLOW 4095 IGNORE sign	3
(ii)	**M1** answer to (i) ÷ 0.025 **M2** correct evaluation in J **M3** correct conversion to kJ and minus sign Example calculation **M1** 4095 ÷ 0.025 **M2** = 163 800 (J) **M3** = −160 kJ	**ACCEPT** use of 4000 **ACCEPT** 160 000/ 164 000 **ACCEPT** −163.8/−164 160/163.8/164 scores 2	3
(d)	**M1** Zn/zinc is oxidised because loses electrons **M2** Cu^{2+}/copper ions reduced because gains electrons		2

Q2.

Question number	Answer	Notes	Marks
(a) (i)	sublimation / subliming		1
(ii)	**M1** (add to/bubble into) limewater		2
	M2 (limewater) turns cloudy/milky	**ACCEPT** forms white precipitate M2 DEP M1	
(b)	An explanation that links the following two points		
	M1 weak forces (of attraction) between molecules / weak intermolecular forces (of attraction)	**ALLOW** weak intermolecular bonds **ALLOW** weak intermolecular attractions	
	M2 little energy needed to overcome the (intermolecular) forces	**IGNORE** less energy **ALLOW** little energy needed to separate the molecules **M2** DEP **M1** correct or missing	2

(c)	Any explanation that links any **three** of the following points for diamond **M1** each (carbon) atom is (covalently) bonded to four other (carbon) atoms **M2** in a (giant) tetrahedral lattice /network / structure **M3** the (covalent) bonds are (very) strong **M4** (therefore) diamond is (very) hard (and so good for cutting tools) Any explanation that links any **three** of the following points for graphite **M5** each (carbon) atom is (covalently) bonded to three other (carbon) atoms **M6** (the structure is) in layers **M7** weak forces (between layers) **M8** (the layers can) slide over each other/ rub off **M9** this makes graphite soft (so it can make marks on paper)	**ALLOW** each carbon has four bonds **ALLOW** 3D/rigid in place of tetrahedral **ALLOW** reference to lot of energy needed to break the (covalent) bonds **ALLOW** there are lots of/many (covalent) bonds **ALLOW** diamond is (very) strong If mention of intermolecular forces in diamond MAX 2 for diamond If mention of ions in diamond only M4 can be scored **ALLOW** sheets **ALLOW** slippery If mention of intermolecular forces in graphite MAX 2 for graphite If mention of ions in graphite only M9 can be scored	6 **Total 11**

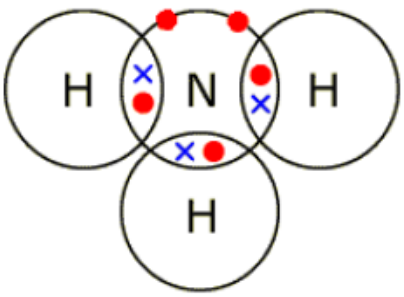
Q3.

Question number	Answer	Notes	Marks
a	• calculate moles of methane • calculate mass of oxygen Example calculation **M1** $n[CH_4]$ = 32 ÷ 16 OR 2 (mol) **M2** mass of O_2 = 128 (g) **OR** answer to **M1** x 2 x 32 **OR** **M1** 16 g (of methane) require 64 g (of oxygen) **M2** 32 g require 128 (g)	correct answer scores 2	**2**

b i	An explanation that links together the following two points: **M1** the water vapour/steam condenses **M2** because it is cooled (by the mixture of ice and water)	 **ACCEPT** because (mixture of ice and water) is at a low temperature/ is cold **ALLOW** (the mixture of ice and water) is below the boiling point of water/below 100 °C	**2**
ii	A description that links together the following two points: **M1** white (anhydrous copper(II) sulfate) **M2** turns blue (in the presence of water)		**2**
iii	An explanation that links together the following three points: **M1** the limewater turns milky **M2** (because) carbon dioxide /CO_2 (is present) **M3** (and) calcium carbonate/$CaCO_3$/ an insoluble substance is formed	 **ACCEPT** cloudy **ALLOW** white precipitate forms A word or chemical equation scores **M2** and **M3**	**3**

Q4.

Question number	Answer	Notes	Marks
(a)	A description which refers to the following six points Test for ammonium ions: **M1** add sodium hydroxide (solution) (and warm) **M2** test the gas with (damp) (red) litmus paper/(damp) universal indicator paper **M3** (litmus) turns blue /(universal indicator) turns blue/purple (if ammonium ions are present) Test for sulfate ions: **M4** add (dilute hydrochloric/nitric) acid **M5** add barium chloride (solution) /barium nitrate (solution) **M6** white precipitate (if sulfate ions are present)	 **ALLOW** other alkalis No **M2** or **M3** if solution tested with litmus/ universal indicator paper **M4** and **M5** can be in either order No **M4** or **M6** if sulfuric acid added **M6** dep on **M5**	6

(b) (i)	neutralisation	**ALLOW** acid-base OR acid-alkali	1
(ii)	$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$	**ALLOW** multiples	1
(iii)	**M1** 3 bonding pairs correct **M2** rest of molecule correct  	 **M2** dep on **M1** **ALLOW** any combination of dots and crosses	2
			Total 10

Q5.

Question number	Answer	Notes	Marks
a	<table><tr><th>Test</th><th>Observation</th></tr><tr><td>addition of acidified barium chloride solution</td><td>white precipitate</td></tr><tr><td>addition of sodium hydroxide solution</td><td>brown precipitate</td></tr><tr><td>Addition of sodium hydroxide and gas tested with universal indicator paper</td><td>(universal indicator) turns blue/indigo/purple</td></tr></table>	1 mark for each correct observation **ALLOW** red-brown /foxy brown /orange-brown **IGNORE** red or orange alone **ALLOW** litmus turns blue Penalise effervescence once only in tests 1 and 2	**3**

b i	6.65 (g)		**1**
ii	5.4(0) (g)		**1**
iii	• calculate moles of $(NH_4)_2SO_4.Fe_2(SO_4)_3$ • calculate moles of H_2O • divide moles of water by moles of $(NH_4)_2SO_4.Fe_2(SO_4)_3$ • give the value of x to the nearest whole number Example calculation **M1** $n[(NH_4)_2SO_4.Fe_2(SO_4)_3]$ = 6.65 ÷ 532 **OR** 0.0125 (mol) **M2** $n[H_2O]$ = 5.4(0) ÷ 18 **OR** 0.3(00) (mol) **M3** x = 0.3(00) ÷ 0.0125 **M4** x = 24 **OR** **M2** ÷ **M1** evaluated correctly and quoted to the nearest whole number	correct answer without working scores 4	**4**

Q6.

Question number	Answer	Additional guidance	Marks
(a) (i)	**B** 3 **A** is incorrect as there are not only 2 different elements **C** is incorrect as there are not 4 different elements **D** is incorrect as 6 is the total number of atoms in the formula, not the number of different elements		1
(ii)	**M1** 56 **and** 32 **and** 16 used in calculation **M2** 152	152 without working scores both marks 104 without working scores 1	2

(b) (i)	to increase the rate of reaction / to speed up the reaction	**ALLOW** make the reaction quicker/faster **ALLOW** reference to more particles having the necessary activation energy **IGNORE** reference to dissolving	1
(ii)	bubbles / fizzing / effervescence		1
(iii)	(squeaky) pop with burning /lit/lighted splint	**IGNORE** squeaky pop test without mention of burning/lit splint **ALLOW** burns with a pop	1
(c) (i)	all of the (sulfuric) acid has reacted / the (sulfuric) acid has been used up / the acid is the limiting reagent	**REJECT** any reference to reactants used up or iron (filings) used up	1
(ii)	$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$	**ACCEPT** multiples and fractions **IGNORE** state symbols, even if incorrect	1
		Total	**8**

Q7.

Question number	Answer	Additional guidance	Mark
(a)	• 35 (1) • 41 (1)	final answer consequential on syringe readings	**2**

Question number	Answer	Additional guidance	Mark
(b)	• Calculation of volume of oxygen used • Calculation of original volume of air • Calculation of percentage Example calculation: 80 − 43 = 37 (cm^3) (1) 100 + 10 + 80 = 190 (cm^3) (1) (37 × 100) ÷ 190 (= 19.47%) = 19% (1)	accept 19.47% or 19.5%	3

Question number	Answer	Mark
(c)	• Decreased (1) • Decreased (1) • No effect (1)	3

Q8.

Question number	Answer	Additional guidance	Mark
(a)(i)	A description that makes reference to any two of the following points: • sodium floats/moves across the water (1) • sodium melts/forms a ball (1) • sodium disappears/gets smaller (1) • effervescence/fizzing/bubbles/gas given off (1) • white trail (1)	accept sodium dissolves ignore name of gas	2

Question number	Answer	Additional guidance	Mark
(a)(ii)	An explanation that makes reference to the following two points: • (final colour is) purple/blue (1) • because the solution is alkaline (1)	accept sodium hydroxide forms/solution has high pH	2

Question number	Answer	Mark
(a)(iii)	D	1

Question number	Answer	Additional guidance	Mark
(b)	Potassium catches fire	accept lilac/purple/violet flame	1

Question number	Answer	Additional guidance	Mark
(c)	$2Rb + 2H_2O \rightarrow 2RbOH + H_2$ (1)	accept multiples and fractions	1

Q9.

Question number	Answer	Notes	Marks
(a) (i)	$PbO(s) + H_2(g) \rightarrow Pb(s) + H_2O(l$ **OR** $g)$	**ALLOW** upper case letters for state symbols	1
(ii)	**D** 2+ A is incorrect as the charge on the lead ion is not 1- B is incorrect as the charge on the lead ion is not 1+ C is incorrect as the charge on the lead ion is not 2-		1
(iii)	An explanation that links either pair of the two points		2
	M1 lead oxide is reduced **and** hydrogen is oxidised	**ACCEPT** lead oxide is the oxidising agent and hydrogen is the reducing agent	
	M2 lead oxide loses oxygen **and** hydrogen gains oxygen **OR**	**ACCEPT** lead ions gain electrons and hydrogen loses electrons	
	M1 lead oxide loses oxygen so is reduced	**ACCEPT** lead ions gain electrons so are reduced	
	M2 hydrogen gains oxygen so is oxidised	**ACCEPT** hydrogen loses electrons so is oxidised **ALLOW** oxidation number of lead / Pb^{2+} decreases from +2 to 0 so is reduced for M1 Oxidation number of hydrogen increases from 0 to +1 so is oxidised for M2	
(iv)	A description that refers to the following two points:		2
	M1 measure the boiling point (of the water)	**ALLOW** boil it / measure the freezing point / freeze it	
	M2 (boiling point is) 100 °C	**ACCEPT** (freezing point is) 0 °C	

(b)	(i)	An explanation that links the following two points: **M1** heat the crucible **M2** repeat until constant mass is obtained	 **ALLOW** repeat the experiment heat to constant mass scores 2	2
	(ii)	**M1** (moles of Pb_3O_4 =) 5.48 ÷ 685 **OR** 0.008(00) **M2** (moles of PbO =) 0.008(00) x 3 **OR** 0.024(0) **M3** (mass of PbO =) 0.024 x 223 = 5.352 (g)	correct final answer without working scores 3 **ALLOW** ecf as long as an attempt has been made to find moles **ALLOW** answer to M1(if no **M2**) or **M2** x 223 **ALLOW** any number of sig figs except 1	3 **Total 11**

Q10.

Question number		Answer	Notes	Marks
(a)	(i)	sulfur	**ALLOW** S	1
	(ii)	boron	**ALLOW** B	1
	(iii)	bromine	**ALLOW** Br/Br_2 **ALLOW** mercury/Hg	1
(b)	(i)	20 /twenty		1
	(ii)	S^{2-}	**ALLOW** S^{-2}	1
	(iii)	MgF_2	**ACCEPT** $Mg^{2+}(F^-)_2$	1
				Total 6

Q11.

Question number	Answer	Mark
(a)	1 mark for each box completed correctly Reactants: (zinc + hydrochloric acid) | Name of salt formed: zinc chloride | Other product(s): hydrogen Reactants: (calcium carbonate + nitric acid) | Name of salt formed: calcium nitrate | Other product(s): water + carbon dioxide	4

Question number	Answer	Mark
(b)(i)	• Use excess aluminium hydroxide (1) • Stir (thoroughly) (1)	2

Question number	Answer	Mark
(b)(ii)	To remove unreacted aluminium hydroxide/solid	1

Question number	Answer	Mark
(b)(iii)	Any one of: • leave in a warm place (1) • use filter paper or paper towel (1)	1

Question number	Answer	Mark
(c)	• Calculation of M_r of aluminium hydroxide • Calculation of amount of aluminium hydroxide • Reference to 2 : 3 ratio in equation AND statement that sulfuric acid is in excess Example calculation: 27 + (3 × 17) = 78 (1) 3.9 ÷ 78 = 0.05 mol (1) This is more than 3/2 times amount of aluminium hydroxide, so sulfuric acid is in excess (1) (accept other valid methods of calculation)	3

Question number	Answer	Mark
(d)	Calculation of M_r of aluminium sulfate setting out calculation of mass final answer Example calculation: (27 × 2) + (32 × 3) + (16 × 12) = 342 (1) mass = 342 x 0.25 (1) 85.5 g (1)	3

Question number	Answer	Additional guidance	Mark
(e)	• Calculation of amount of lead(II) nitrate • Percentage method • Percentage answer Example calculation: 209 ÷ 331 = 0.631 mol (1) $\frac{0.631 \times 100}{0.75}$ (1) = 84% (1)	allow full credit for calculations using masses	3

(Total for question = 17 marks)

Q12.

Question number	Answer	Notes	Marks
a	**C** (it has a low density) A is not correct as the colour of the gas is irrelevant B is not correct as the solubility of the gas is irrelevant D is not correct as the smell of the gas is irrelevant		**1**
b	**M1** helium is inert / helium does not react (with air/oxygen) **M2** hydrogen is flammable/explosive (in air/oxygen)	**ALLOW** helium is unreactive **ALLOW** helium is not flammable/ not explosive	**2**
c i	$N_2 + 3H_2 \rightarrow 2NH_3$	**ACCEPT** reversible arrow **IGNORE** Fe if added to both sides of the equation	**1**
ii	to increase the rate of reaction / to speed up the reaction / to produce a reaction pathway that has a lower activation energy	**ALLOW** to lower the activation energy / to make it easier to break the (covalent) bonds (in the molecules)	**1**

Q13.

Question number	Answer	Notes	Marks
(a)	heat (energy) is given out OWTTE	**ACCEPT** thermal energy is given out **ACCEPT** thermal energy store of mixture decreases	1
(b) (i)	**C** displacement A is incorrect as it is not a combustion reaction B is incorrect as it is not a decomposition reaction D is incorrect as it is not a neutralisation reaction		1
(ii)	**M1** the (blue) colour fades/ solution turns (from blue) to colourless **M2** pink-brown/pink coating (on zinc)	 **ALLOW** any combination of pink, orange, brown	2
(iii)	silver is less reactive/ lower in the reactivity series than copper ORA	**ALLOW** silver cannot displace copper	1
(c)	**M1** temperature change = 37.0 – 20.5 **OR** 16.5 (°C) **M2** $Q = 50.0 \times 4.2 \times 16.5$ **M3** 3465 (J) **M4** 3.465 (kJ)	correct answer without working scores 4 **ALLOW** ECF on **M1** **ALLOW** ECF on **M3** **ALLOW** any number of sig figs except 1	4
			Total 9

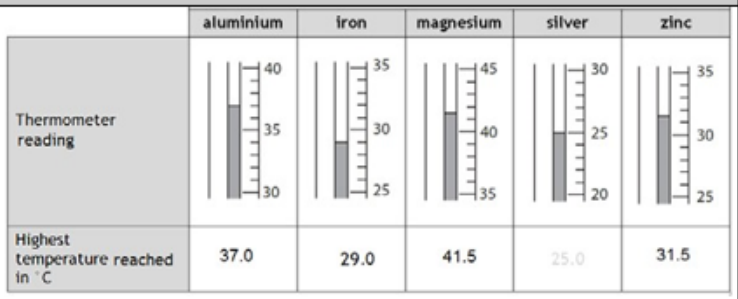
Q14.

Question number	Answer	Notes	Marks
(a) (i)	displacement	**ALLOW** redox	1
(ii)	(manganese) chromium cadmium tin		1

(b)	(copper and magnesium sulfate) M1 no colour change M2 copper is less reactive than magnesium ORA /copper cannot displace magnesium (zinc and iron sulfate) M3 zinc turns (from light grey to) dark grey M4 solution turns (from green to) colourless M5 zinc is more reactive than iron ORA/ zinc displaces iron	 **ALLOW** copper is below magnesium in the reactivity series ORA **IGNORE** copper and magnesium sulfate do not react **M2** dep on **M1** **ALLOW** zinc becomes coated in a dark grey metal **ALLOW** zinc is above iron in the reactivity series ORA **ALLOW** zinc reduces iron ions (ignore charge given as long as the charge is positive)	5

(c) (i)	Any two from M1 concentration of dilute sulfuric acid M2 temperature M3 surface area of the metal	 **ALLOW** size of piece of metal	2
(ii)	calcium sulfate forms a layer / coating around the calcium metal	**ALLOW** calcium sulfate prevents the sulfuric acid coming into contact with calcium.	1
(d)	M1 (moles of aluminium =) 1÷27 **OR** 0.0370 moles M2 (moles of sulfuric acid required = $\frac{0.0370 \times 3}{2}$ =) 0.0556 moles (and there is more moles of sulfuric acid) **OR** M1 (moles of aluminium required =) 0.0400 M2 (mass of aluminium required = 27 × 0.0400 =) 1.08 g (and there is less than 1.08 g)	**ALLOW** any number of significant figures except 1 **ALLOW** 0.0555 if candidate has used rounded value of 0.0370 moles	2
			12

Q15.

Question number	Answer	Additional guidance	Marks
(a)	 all 4 correct 2 marks 2 or 3 correct 1 mark	Penalise missing 0 once only	2
(b) (i)	magnesium is the most reactive (metal/element used) OR magnesium is higher in the reactivity series /more reactive than the other metals (used)	**ALLOW** references to generates more thermal energy/heat (energy)	1
(ii)	An explanation that links together **two** of the following points: **M1** silver/it does not react (with copper(II) sulfate solution) **M2** silver/it is less reactive than copper / silver/it is below copper in the reactivity series **M3** (and therefore silver/it) does not displace copper	**ALLOW** silver is the least reactive (metal /element used) **ACCEPT** does not reduce copper(II) ions	2

Question number			
(c)	An explanation that links together the following two points: **M1** the temperature rise will be smaller (than with 25 cm^3) **M2** because the same amount of thermal energy/heat (energy) is being used to heat a larger volume of solution	 **ACCEPT** less than 16.5 (°C) **ACCEPT** lower than the value given in the table in (a) **ALLOW** as there is a larger volume of /a larger amount of /more solution to heat up	2

(d)	**M1** $Q = mc\Delta T$ **M2** $45 \times 4.2 \times 15.0$ **M3** = 2835 (J)	 **M2** subsumes **M1** **ALLOW** ECF for **M3** and **M4** on incorrect values in **M2**	4
	M4 = 2.8(35) (kJ)	**ACCEPT** answers correctly rounded to two or more significant figures Correct answer without working scores 4 2835, 2840, 2800 all score 3 **ALLOW** use of 4.18 which gives an answer of 2.8(215)	
		Total	**11**

Q16.

Question number	Answer	Notes	Marks
(a) (i)	oxygen	**IGNORE** air **ACCEPT** O_2	1
(ii)	(hydrated) iron (III) oxide	**ALLOW** iron oxide /ferric oxide **REJECT** incorrect oxidation states of iron	1
(b) (i)	M1 plastic acts as a barrier M2 therefore stops oxygen / water getting to the iron	**ALLOW** forms a protective layer **ALLOW** air in place of oxygen	2
(ii)	galvanising	**ALLOW** sacrificial protection **IGNORE** sacrificial method	1
(iii)	M1 zinc is more reactive than iron /higher in the reactivity series than iron M2 therefore reacts / oxidises / corrodes in preference to iron	**IGNORE** references to rates of reaction **REJECT** references to zinc rusting	2
			7

Q17.

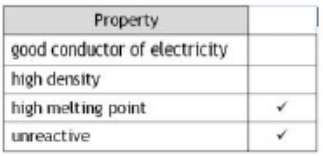
Question number	Answer	Notes	Marks
(a) (i)	hydroxide/OH^-	ALLOW HO^- REJECT OH	1 grad
(ii)	**C** 11 is correct because 11 is a possible pH for ammonia solution **A** is not correct because 3 is not a possible pH for ammonia solution **B** is not correct because 6 is not a possible pH for ammonia solution **D** is not correct because 14 is not a possible pH for ammonia solution		1 comp
(b) (i)	**C** a proton donor is correct because an acid acts as a proton donor **A** is not correct because an acid does not act as a neutron donor **B** is not correct because an acid does not act as a neutron acceptor **D** is not correct because an acid does not act as a proton acceptor		1 comp
(ii)	**C** is correct because phenolphthalein is pink in alkali and colourless in acid **A** is not correct because phenolphthalein is not orange in alkali and red in acid **B** is not correct because phenolphthalein is not yellow in alkali and red in acid **D** is not correct because phenolphthalein is not colourless in alkali and pink in acid		1 comp

Question number	Answer	Notes	Marks
(c) (i)	M1 ammonium ion is charged 1^+ / NH_4^+ AND sulfate ion is charged 2^- / SO_4^{2-}		2 grad
	M2 so charges balance/cancel (each other) OWTTE	ALLOW so that ammonium sulfate has no overall charge M2 not dep on M1	
(ii)	[[2x(14+4) + 32 + (4x16)] =] 132		1 exp
(iii)	Example calculation	mark CQ from (i) 212 without working scores 3 marks	3 exp
	M1 132(g) ammonium sulfate contains 28(g) nitrogen / 1(g) ammonium sulfate contains (28÷132) (g) nitrogen M2 1000(g) ammonium sulfate contains 1000 x (28÷132) (g) nitrogen M3 = 212(.12) (g) **OR** M1 (moles of ammonium sulfate =) 1000 ÷ 132 **OR** 7.58 M2 (mass of nitrogen =) 28 x 1000 ÷ 132 **OR** 7.58 x 28 M3 = 212 (g)	If 7.58 used in calculation answer is 212.24 If 14 used instead of 28 answer of 106.(06) scores 2 marks with or without working ALLOW any number of sig figs except 1	
		Total for Q = 10	

Q18.

Question number	Answer	Notes	Marks
(a)	M1 breaking up/down of a compound/substance OWTTE M2 by heat(ing)	**REJECT** elements **REJECT** any references to heat being given out/exothermic	2
(b)	examples of calculation of maximum mass of K_2CO_3 **M1** M_r of $KHCO_3$ = 100 AND M_r of K_2CO_3 = 138 **M2** 200 g $KHCO_3$ produces 138 g K_2CO_3 **M3** 2.50 g $KHCO_3$ produces $\frac{138 \times 2.50}{200}$ = **M4** 1.725 (g K_2CO_3) OR **M1** M_r of $KHCO_3$ = 100 AND M_r of K_2CO_3 = 138 **M2** amount $KHCO_3 = \frac{2.50}{100}$ = 0.025 (mol) **M3** amount $K_2CO_3 = \frac{0.025}{2}$ = 0.0125 (mol) **M4** mass K_2CO_3 (= 0.0125 x 138) = 1.725 (g)	**ALLOW** 2 or more SF **M2 M3 M4 ECF M1** correct answer with or without working scores 4 **ALLOW** 2 or more SF **M2 M3 M4 ECF M1** correct answer with or without working scores 4 3.45/3.46/3.5/6.9 scores 3	4

Q19.

Question number	Answer	Notes	Marks
a	Li^+	**ALLOW** Sr^{2+}	**1**
b	silver bromide / AgBr	If correct name given ignore incorrect formula	**1**
c	lithium bromide / LiBr	Mark CSQ on (a) and (b) If both name and formula given both must be correct	**1**
d i	Impurities/ other ions/ other substances could alter/interfere with the colour of the flame /with the results of the test OWTTE	**ALLOW** impurities/other ions/ other substances contaminate the flame/the test /the wire /it	**1**
ii			**2**

Q20.

Question number	Answer	Notes	Marks
(a) (i)	Na/K	**ACCEPT** sodium/potassium	1
(ii)	He	**ACCEPT** helium	1
(iii)	Br	**ACCEPT** bromine **REJECT** bromide	1
(iv)	Na **and** Cl	**ACCEPT** sodium and chlorine **REJECT** chloride	1
(b)	2.8.1	**ACCEPT** 2,8,1 or 2 8 1 **ALLOW** diagram of atom showing correct electron configuration.	1 **Total 5**

Q21.

Question number	Answer	Notes	Marks
(a)	zinc + hydrochloric acid → zinc chloride + hydrogen	**ACCEPT** fully correct chemical equation	1
(b)	<table><tr><td>**temperature in °C after adding zinc**</td><td>22.4</td></tr><tr><td>**temperature in °C before adding zinc**</td><td>17.7</td></tr><tr><td>**temperature change in °C**</td><td>4.7</td></tr></table> **M1** 22.4 **M2** 17.7 **M3** (+)4.7	If readings are correct but in wrong order award 1 mark for **M1** and **M2** **ALLOW** ECF for **M3** if **M1** and/or **M2** incorrect If answers not given to nearest 0.1°C penalise once only	3

(c) (i)	An explanation that links any **two** of the following points		
	M1 polystyrene is an insulator	**ALLOW** is not a (good) conductor of heat **ALLOW** is a poor conductor of heat	
	M2 (so) reduces heat loss	**ALLOW** prevents heat loss **ALLOW** keeps heat in	
	M3 temperature rise/change/reading will be closer to true value OWTTE	**ALLOW** temperature rise/change/reading will be more accurate/valid	2
(ii)	Any **three** from		
	M1 amount/mass of metal	**ALLOW** size / surface area of metal	
	M2 concentration of acid		
	M3 volume of acid	**ALLOW** amount of acid	
	M4 (speed/time of) stirring		
	M5 external / room temperature	**ALLOW** initial /starting temperature	3

Question number	Answer	Notes	Marks
(d) (i)	no reaction (occurred between copper and hydrochloric acid)	**IGNORE** copper is unreactive **ALLOW** copper is less reactive than hydrogen	1
(ii)	Any value between 1.5 and 5.0 °C inclusive		1
(iii)	most reactive magnesium zinc iron tin copper	**ACCEPT** symbols	1
			Total 12