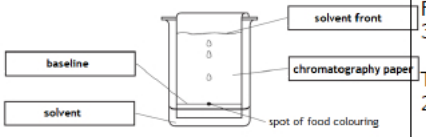
2025 Prediction Paper 2 MARK SCHEME

Q1.

Question number	Answer	Notes	Marks
(a)		Four correct scores 3 Two correct scores 2 One correct scores 1	3
(b)(i)	**C** (R) The only correct answer is C because food colouring R produces one spot so contains only one dye ***A*** *is not correct because food colouring P produces four spots so does not contain only one dye* ***B*** *is not correct because food colouring Q produces three spots so does not contain only one dye* ***D*** *is not correct because food colouring S produces two spots so does not contain only one dye*		1
(ii)	**C** (Q, R and S) The only correct answer is C because food colourings Q, R and S have one dye in common as they all produce one spot which has travelled the same distance ***A*** *is not correct because P, Q and R do not all* produce one spot which has travelled the same distance ***B*** *is not correct because P, R and S do not all* produce one spot which has travelled the same distance ***D*** *is not correct because P, Q, R and S do not all* produce one spot which has travelled the same distance		1

Question number	Answer	Notes	Marks
(b) (iii)	**M1** P **M2** largest number of/four spots (in the chromatogram)	**ALLOW** "four dyes" **ALLOW** blobs / dots / marks / points for spots **M2** DEP on **M1**	2
		Total for Question = 7 marks	

(**Q01 4CH0/1C, June 2018**)

Q2.

Question number	Answer	Notes	Marks
(a)(i)	(it has) gained oxygen / oxygen has been added (to it)	**ACCEPT** oxidation number has increased / changed from −2 to +4 **ALLOW** gained O / O has been added **IGNORE** references to electrons	1
(ii)	Sb_2O_4 + **2** C → **2** Sb + **2** CO_2		1

Question number	Answer	Notes	Marks
(b)(i)	Bi^{3+}		1
(ii)	**M1** strong electrostatic forces/attractions between the (oppositely-charged) ions	**ACCEPT** strong ionic bonding/bonds / many ionic bonds **IGNORE** giant ionic structure / lattice	2
	M2 large amount of (thermal / heat) energy required to overcome these forces/attractions	**ACCEPT** large amount of (thermal/heat) energy required to break the bonds **IGNORE** more energy required **M2** DEP on **M1** or near miss e.g. "strong bonds" If reference to intermolecular forces /metallic/covalent bonding, then score 0 out of 2	
(iii)	Bi_2O_3 + 6 HCl → 2 $BiCl_3$ + 3 H_2O **M1** H_2O as only product not containing Bi **M2** equation fully correct i.e. formula of $BiCl_3$ and balanced	**ACCEPT** multiples and halves **M2** DEP on **M1**	2
			Total for Question = 7 marks

(**Q07 4CH0/1C, June 2018**)

Q3.

Question number	Answer	Notes	Marks
(a)(i)	Any two from: **M1** sodium gets smaller /disappears **M2** sodium moves/darts around **M3** white trail **M4** melts/forms a ball **M5** litmus/solution/liquid turns blue	**ALLOW** dissolves **IGNORE** floats fizzing/bubbles/ effervescence **IGNORE** references to flames / sparks / heat produced / explodes	2
(ii)	**2** $Na(s)$ + **2** $H_2O(l)$ → **2** $NaOH(aq)$ + **(1)** $H_2(g)$ **M1** correct balancing **M2** correct state symbols	**ALLOW** multiples and fractions	2
(b)(i)	(both) contain one electron in the outer(most)/valence shell	**ALLOW** same number of electrons in the outer(most) shell	1
(ii)	(most reactive) potassium/K sodium/Na (least reactive) lithium/Li		1
		Total for Question = 6 marks	

(**Q03 4CH0/1C, June 2018**)

Q4.

Question number	Answer	Additional guidance	Marks
(a)	An explanation that links together the following two points: **M1** reaction is taking place in both directions (at same time) **M2** at equal rate	 **ACCEPT** both forward and backward reactions are taking place (at same time) **IGNORE** it is a reversible reaction **M2 DEP M1** rate of the forward reaction is equal to the rate of the backward reaction scores 2 marks **REJECT** both forward and backward reactions occur at constant rate for **M2** **ALLOW** the concentrations of the reactants and products remains constant scores 1 mark independently of **M1** but **REJECT** concentrations of the reactants and products are equal/the same	2

(b) (i)	An explanation that links together the following two points: **M1** (the position of) equilibrium has moved to the left	 **ALLOW** (position of) equilibrium has shifted in backwards direction **ALLOW** (position of) equilibrium has shifted towards the N_2O_4 /reactants (side) **ALLOW** increasing pressure shifts (position of) equilibrium in direction that produces fewer moles (of gas) **IGNORE** references to Le Chatelier's Principle eg increasing pressure favours the side that has fewer moles of gas / increasing pressure favours the backwards reaction	2
	M2 because there are fewer moles/molecules (of gas) on the left	**ALLOW** particles **REJECT** atoms **ALLOW** because there are fewer moles of N_2O_4 (than NO_2) **ALLOW** because there are fewer moles of reactant (than product) **ACCEPT** reverse argument	
(ii)	the concentration of NO_2 has increased	**ALLOW** molecules/particles of NO_2 are closer together **ALLOW** molecules/particles of NO_2 are in a smaller volume **REJECT** more NO_2 produced	1

Question number	Answer	Additional guidance	Marks
(c) (i)	nitrogen/N_2 reacts with oxygen/O_2 (both from the air)	**IGNORE** nitrogen burns/combusts in oxygen **IGNORE** nitrogen is oxidised	1
(ii)	(they form) acid rain	**ACCEPT** references to respiratory problems **ALLOW** a specified harmful effect of acid rain **ALLOW** references to smog **ALLOW** references to greenhouse gases/global warming/climate change	1
(iii)	$2NO + 2CO \rightarrow N_2 + 2CO_2$	**ACCEPT** multiples and fractions	1

(**Q07 4CH1/2C, June 2019**)

Q5.

Question number	Answer	Notes	Marks
(a) (i)	pipette		1
(ii)	red wine would mask the colour of the indicator / difficult to see colour change (at end point)	**ACCEPT** indicator and red wine are a similar colour OWTTE	1
(iii)	to mix the contents (of the flask so that they can react) OWTTE	**ACCEPT** to ensure the colour change is permanent OWTTE **ALLOW** to speed up the reaction/ to ensure lete reaction	1
(iv)	so as not to add more wine than is needed (for lete reaction)/ so as not to overshoot the end point OWTTE	**ACCEPT** to find the act/precise point of neutralisation **IGNORE** to obtain an accurate reading	1

(b)					
	M1	final burette reading in cm^3	22.70	**MAX 2** if final and initial burette readings are reversed. **MAX 2** if readings not given to 2 decimal places. **ALLOW** ECF for **M3** on correct subtraction of **M1 – M2**	3
	M2	initial burette reading in cm^3	2.15		
	M3	volume of wine added in cm^3	20.55		

Question number	Answer	Notes	Marks
(c) (i) ip	Ticks in boxes 1, 3 and 4		1
(ii) ip	• setting out of calculation • answer **M1** $\frac{20.40 + 20.35 + 20.45}{3}$ **M2** 20.40	20.40 without working scores 2 20.4 with or without working scores 1 If no results ticked then only use of 2 or 3 concordant titres can score both marks in (ii) If only one result ticked then **M2** can be scored for averaging two or more titre values correctly **M1** CQ on results ticked **M2** CQ on correct calculation from M1 Answer to **M2** must be correct to 2dp	2

(d)	(i)	• setting out of calculation • final answer **M1** $\frac{25.0 \times 0.05(00)}{1000}$ **M2** 0.00125	 If no division by 1000 giving an answer of 1.25 award 1 mark Correct answer without working scores 2	2
	(ii)	0.00125 **OR** answer to (i)		1
	(iii)	• setting out of calculation • final answer **M1** $\frac{0.00125 \times 1000}{19.50}$ **OR** $\frac{\text{answer to (ii)} \times 1000}{19.5}$ **M2** 0.0641 **OR** answer to **M1**	 **ACCEPT** any number of sig fig cept 1 Correct answer without working scores 2 $\frac{\text{answer to (ii)}}{19.5}$ correctly evaluated to 2 or more sig figs. scores 1 Do not penalise not multiplying by 1000 in (iii) if they have not divided by 1000 in (i)	2
				Total 15

(Q06 4CH1/2CR, June 2019)

Q6.

Question number	Answer	Mark
(a)	• (mass of solid) 5.3 (g) (1) • (mass of water) 20.9 (g) (1)	**2**

Question number	Answer	Mark
(b)	• (10.5 ÷ 16.8) × 100 (1) • 62.5 (grams of solid per 100 g of water) (1)	**2**

Question number	Answer	Mark
(c)	An explanation that links together the following three points: • the gas will escape (1) • the mass of solid remaining will be less (than it should be) (1) • the value of the calculated solubility will be lower (than it should be) (1)	**3**

(Total for question = 7 marks)
(Q02 4CH1/2C, SAM 0)

Q7.

Question number	Answer	Additional guidance	Marks
(a)	**C** (electrostatic attraction between positively charged particles and delocalised electrons) is correct as it describes metallic bonding A is incorrect since it describes ionic bonding not metallic bonding B is incorrect since it describes covalent bonding not metallic bonding D is incorrect since it describes interatomic or intermolecular forces not metallic bonding		1
(b)	Any two from the following: **M1** good conductor of heat/thermal energy **M2** does not react with food/affect flavour of food **M3** resistant to corrosion **M4** high melting point **M5** low density/lightweight/strong	 **IGNORE** non-toxic **ALLOW** does not corrode/rust **IGNORE** unreactive/inert **IGNORE** references to recycling **IGNORE** light	2

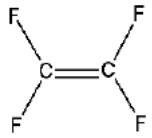
Question number		Answer	Additional guidance	Marks
(c)	(i)	a mixture of (two or more) elements, one of which is a metal	**ACCEPT** a mixture of (two or more) metals **ALLOW** combination for mixture **REJECT** compound or references to chemical bonding	1
	(ii)	An explanation that links together the following three points: **M1** the regular arrangement of atoms is distorted/disrupted OWTTE **M2** because magnesium atoms are larger than aluminium atoms **M3** and therefore it is more difficult for the layers to slide over one another	 **ALLOW** lattice/layers/rows of atoms are disrupted/distorted **ALLOW** lattice/layers/rows of atoms less regular **ALLOW** magnesium and aluminium atoms are of different sizes **ALLOW** layers cannot (as easily) slide over one another **IGNORE** references to strength of metallic bonds	3

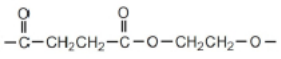
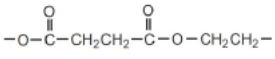
(**Q04 4CH1/2C, June 2019**)

Q8.

Question number	Answer	Additional guidance	Mark
(a)(i)	Chloroethene	accept vinyl chloride	1

Question number	Answer	Additional guidance	Mark
(a)(ii)	Poly(chloroethene)	accept polyvinyl chloride ignore PVC	1

Question number	Answer	Additional guidance	Mark
(b)		ignore bond angles	1

Question number	Answer	Additional guidance	Mark
(c)(i)	• Correct ester link (1) • Rest of unit correct (1) Example: 	accept: 	2

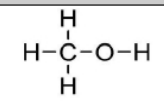
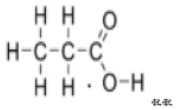
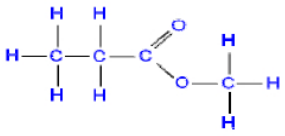
Question number	Answer	Additional guidance	Mark
(c)(ii)	Water/H_2O	if both name and formula given, both must be correct	1

(Total for question = 6 marks)

(**Q08 4CH1/2C, SAM 0**)

Q9.

Question number		Answer	Notes	Marks
(a)	(i)	$2CH_3COOH + K_2CO_3 \rightarrow 2CH_3COOK + CO_2 + H_2O$ **M1** $2CH_3COOK$ **M2** $CO_2 + H_2O$	**ALLOW** multiples **ACCEPT** $2CH_3COO^-K^+$ **ALLOW** $2KCH_3COO$ If **M1** not awarded any numbers before $CO_2 + H_2O$ can be ignored and **M2** can be awarded. For both marks to be awarded the equation must be correctly balanced	2
	(ii)	effervescence / fizzing / bubbles	**IGNORE** carbon dioxide/gas given off/evolved/ formed /produced **IGNORE** mention of incorrect gas	1
(b)	(i)	(acts as a) catalyst	**ACCEPT** increases the rate of the reaction/speeds up the reaction	1
	(ii)	ethanol is flammable / might catch fire / might ignite	**ACCEPT** ethyl ethanoate /the mixture /it is flammable /might catch fire /might ignite	1
	(iii)	(ester has) sweet / fruity / distinctive smell	**ALLOW** liquid (ester) floats on top of mixture OWTTE	

Question number		Answer	Notes	Marks
(c)	(i)	  	Penalise missing bond between O and H once only If incorrect number of carbon atoms in alcohol and or acid allow ECF for structure of ester formed from their alcohol and acid	3
	(ii)	water	**ACCEPT** H_2O	1
(d)		food flavourings / perfumes	**ACCEPT** any correct use e.g. in cosmetics / making soaps / making detergents /solvents (for paints / varnishes)	1 **Total 11**

(**Q05 4CH1/2CR, June 2019**)

Q10.

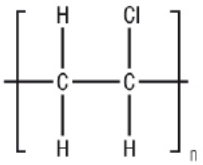
Question number	Answer	Notes	Marks
(a)(i)	Yeast	**ALLOW** zymase **IGNORE** enzyme(s)	1
(ii)	($C_{12}H_{22}O_{11}$ + H_2O →) 2 $C_6H_{12}O_6$	**ACCEPT** multiples and fractions **IGNORE** state symbols even if incorrect	1
(iii)	$C_6H_{12}O_6$ → 2 C_2H_5OH + 2 CO_2	**ACCEPT** multiples and fractions **IGNORE** state symbols even if incorrect **ALLOW** C_2H_6O for ethanol	1
(iv)	**C** (fractional distillation) A is incorrect as you could not obtain ethanol by crystallisation B is incorrect as you could not obtain ethanol by filtration D is incorrect as simple distillation is not the most effective way to obtain ethanol		1

Question number	Answer	Notes	Marks
(b)(i)	phosphoric acid	**ACCEPT** H_3PO_4 If both name and formula given, mark name only **REJECT** phosphorus acid **IGNORE** reference to concentration	1
(ii)	**M1** 300 (ºC)	**ACCEPT** any temperature, or range of temperatures, between 250 and 350 inclusive **ACCEPT** temperatures in other units provided unit is given	2
	M2 60—70 (atm)	**ACCEPT** any pressure or range of pressures between 60 and 70 inclusive **ACCEPT** pressures in other units provided unit is given e.g. 6 x 10^6 Pa to 7 x 10^6 Pa	

Question number	Answer	Notes	Marks
(c)(i)	dehydration	**ACCEPT** (thermal) decomposition/elimination	1
(ii)	(to act as a) catalyst	**ACCEPT** to increase the rate of reaction **IGNORE** to lower the activation energy **IGNORE** references to increased surface area	1
(d)(i)	(contains a carbon to carbon) double bond / C=C	**ALLOW** multiple bond	1
(ii)	**M1** (from) orange	**ACCEPT** brown/yellow or any combination of orange/brown/yellow e.g. orange-brown **REJECT** red	2
	M2 (to) colourless	**IGNORE** clear **ALLOW** decolourised **REJECT** discoloured Award 1 mark for two correct answers in wrong order	
			Total for Question = 12

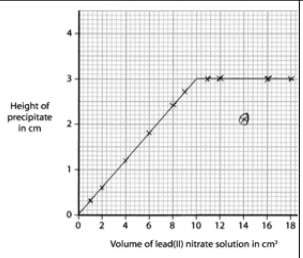
(**Q05 4CH0/2C, June 2018**)

Q11.

Question number	Answer	Notes	Marks
(a) (i)	M1 oxidation is loss of electrons M2 chloride ions/Cl^- lose electrons (so oxidised)	 REJECT chlorine/Cl/Cl_2 loses electrons ALLOW chloride loses electrons	2
(ii)	$2H_2O + 2e^- \rightarrow 2OH^- + H_2$ M1 all correct species M2 correctly balancing M2 dep on M1	ACCEPT multiples	2
(b)	$Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$	ACCEPT multiples	1
(c) (i)	M1 monomers join together/ double bonds broken (in monomers) M2 to form a long chain (molecule)/large molecule	ALLOW link/add in place of join	2
(ii)	 M1 correct repeat structure M2 brackets and continuation bonds and n	 No M1 if more than 1 repeat unit shown ACCEPT n anywhere after the brackets but not before REJECT any structure with a double bond for both marks	2

(**Q07 4CH0/2C, Jan 2018**)

Q12.

Question number	Answer	Notes	Marks
(a)(i)	$Pb(NO_3)_2$ (**aq**) + K_2CrO_4 (**aq**) → $PbCrO_4$ (**s**) + $2KNO_3$ (**aq**)		1
(ii)	$2-/CrO_4^{2-}$	ACCEPT $-2/CrO_4^{-2}$	1
(b)(i)		**M1**& **M2** all eleven points plotted to nearest gridline Deduct 1 mark for each error	2
(ii)	anomalous point (at 2.1, 14) circled		1
(iii)	**M1** best fit straight line through first 6 points drawn with aid of a ruler **M2** best fit straight line through last 5 points drawn with aid of a ruler	 No penalty if lines do not cross or if the two straight lines are joined by a curve Penalise lack of use of a ruler once only	2

Question number	Answer	Notes	Marks
(b)(iv)	volume from candidate's graph to ± 0.2 cm^3	Do not award mark if lines do not cross.	1
(v)	Any 2 from M1 started with less than 5cm^3 potassium chromate **M2** added too little lead(II) nitrate **M3** precipitate not left for long enough to settle	 If no other mark scored allow 1 mark for misread volume/misread height	2
(c)(i)	**M1** filter (off the precipitate) **M2** wash precipitate/solid/lead(II) chromate (with distilled/deionised/pure water) **M3** dry in a (warm) oven / leave to dry / dry with filter paper	ALLOW 'decant' REJECT refs to crystallisation for **M2** and **M3** REJECT any direct method of heating with a flame, eg Bunsen burner	3
(ii)	**M1** flame test **M2** lilac	ACCEPT description of flame test IGNORE burn ALLOW purple/pink	2

Question number	Answer	Notes	Marks
(d)	**M1** $n[KI]$ = 5.0 x 0.90/1000 = 0.0045 (mol) **M2** $n[(Pb(NO_3)_2]$ = ½ x **M1** = 0.00225 (mol) **M3** $conc^n[Pb(NO_3)_2]$ = **M2** x1000/8 = 0.28 (mol/dm^3)	Correct answer without working scores 3 marks ACCEPT any number of sig figs, correctly rounded, except 1 Calculator value is 0.28125 0.56(25) and 1.1(25) both score 2 marks	3
		Total for Question = 18	

(**Q11 4CH0/1CR, June 2018**)

Q13.

Question number	Answer	Notes	Marks
(a) (i)	(24 + 16) = 40		1
(ii)	Li^+ and F^-	both needed	1
(b)	Any four from **M1** strong (electrostatic) forces/attraction **M2** between oppositely charged ions **M3** a large amount of energy needed to overcome attraction / break down lattice/break bonds **M4** (MgO higher melting point as) greater charge on Mg^{2+} (than Li^+) / greater charge on O^{2-} (than F^-) **M5** EITHER so stronger attraction/forces/bonds (in MgO) OR more (thermal/heat) energy required to overcome attraction / break down lattice/break the bonds (in MgO)/ORA	 ACCEPT strong (ionic) bonds Must be a comparison to gain M5 MAX 2 if any reference to intermolecular forces/covalent bonding/electron sharing/molecules/metallic bonding	4
(c)	**M1** (when) solid ions in fixed positions/don't move/only vibrate **M2** (when) molten or in solution ions can move/mobile	IGNORE electrons ALLOW atoms REJECT electrons/atoms MAX 1 if mention of sharing of electrons/covalent bonding	2

(**Q06 4CH0/2C, Jan 2018**)

Q14.

Question number	Answer	Notes	Marks
(a) (i)	**M1** volume of water **M2** temperature of water before and after burning	**ALLOW** mass of water **ALLOW** temperature change	2
(ii)	**M1** *n*[heptanol] = 0.75 ÷ Mr **OR** evaluated correctly and quoted to at least two significant figures **M2** 19 ÷ **M1** **M3** evaluated correctly and quoted to at least two significant figures	calculator answer from 114 is 0.0065789473684 (mol) calculator answer from 116 is 0.0064655172 calculator answer from 114 is 2888 (kJ/mol) = 2900 (kJ/mol) to 2 sig fig calculator answer from 116 is 2938.66 (kJ/mol) = 2900 (kJ/mol) to 2 sig fig **IGNORE** sign in final answer	3
	OR **M1** (0.75g produces 19kJ) so 1g produces 19 ÷ 0.75 = 25.33... (kJ) **M2** so 114g produces 114 x 25.33... **M3** evaluated correctly and quoted to at least two significant figures	 from 114 calculator the answer is 2888 (kJ/mol) = 2900 (kJ/mol) to 2 sig fig **IGNORE** sign in final answer correct answer with no working scores 3	

Question number	Answer	Notes	Marks
(b) (i)	**M1** Σ(bonds broken) = [(2 × 436) + 498] **OR** 1370 (kJ) **M2** Σ(bonds formed) = 4 × 464 **OR** 1856 (kJ) **M3** Δ*H* = – 486 (kJ) **OR** if M1 and/or M2 incorrect: **M3** numerical difference between M1 and M2 If M2 greater than M1 answer must be negative If M2 less than M1 answer must be positive	**IGNORE** sign **IGNORE** sign negative sign is required -486 with or without working scores 3 (+)486 with or without working scores 2 unless a clear statement is made that reaction is exothermic then sign can be negative	3

Question number	Answer	Notes	Marks
(b) (ii)	**M1** for $2H_2 + O_2$ and $2H_2O$ in correct positions **M2** ΔH correctly placed and labelled	**ALLOW** hydrogen and oxygen and water **ALLOW** reactants and products Mark CQ on sign in (i) **ACCEPT** ΔH label on vertical line/double arrow/arrow pointing from reactants level to product level **REJECT** arrow pointing from products level to reactants level **IGNORE** activation energy attempts	2
			Total for Question = 10

(**Q06 4CH0/2CR, June 2018**)

Q15.

Question number	Answer	Notes	Marks
(a)	**M1** (Cu) $\frac{34.60}{63.5}$ (Fe) $\frac{30.52}{56}$ (S) $\frac{34.88}{32}$ **M2** 0.545 0.545 1.09 **M3** (divide by the smallest number) 1 1 2 **OR** **M1** Calculation of Mr of $CuFeS_2$ = 183.5/184 **M2** expression for percentage of <u>each</u> element e.g. Cu = 63.5 ÷ 183.5 x 100 **M3** evaluation to show these equal 34.60% Cu, 30.52% Fe and 34.88% S	Division by atomic numbers or other inappropriate numbers scores 0/3 Fractions upside down scores 0/3 ACCEPT use of 64 for Cu With 63.5 = (0.54488 0.545 1.09) With 64 = 0.5406 0.545 1.09 ALLOW any number of sig figs greater than one, rounded correctly ALLOW ECF from minor error in M1 ALLOW M3 to score from 0.5:0.5:1 or other incorrect rounding in M2	3

(b)	(i)	(sulfur) gained oxygen	ALLOW combined with oxygen ALLOW had oxygen added ALLOW gained O/O_2 IGNORE formed sulfur dioxide/SO_2 IGNORE reacted/mixed with oxygen ACCEPT oxidation state/number increases ACCEPT oxidation state/number changes from -2 to (+)4 IGNORE references to electron loss	1
	(ii)	$CuS + O_2 \rightarrow Cu + SO_2$	ACCEPT multiples and halves	1
(c)	(i)	hydrogen (ion) / H^+	ACCEPT hydronium (ion) / H_3O^+ If both name and formula given, both must be correct	1
	(ii)	(blue/purple/neutral litmus (paper)) turns/goes red		1
	(iii)	M1 effervescence/bubbles/fizzing	ACCEPT gas given off/formed/produced IGNORE name of gas IGNORE hydrogen/H_2	2
		M2 magnesium/solid/ribbon disappears	ACCEPT magnesium/solid/ribbon dissolves ACCEPT magnesium/ solid/ribbon gets smaller IGNORE mass decreases IGNORE reference to movement IGNORE references to temperature change/heat evolved/exothermic REJECT extra incorrect observations e.g. white flame	

(**Q07 4CH0/1C, Jan 2018**)

Q16.

Question number			Answer	Notes	Marks
	a		gas escapes / gas is lost (from the crucible)	Accept gas is given off / gas is evolved / gas is released / gas is given off Allow carbon dioxide/CO_2 for gas Ignore copper(II) carbonate decomposes Reject incorrect name of gas	1
	b		($CuCO_3$(s)) green	Ignore qualifiers such as pale / dark Reject any other colours	1
			(CuO(s)) black	Ignore qualifiers such as pale / dark Reject any other colours Allow 1/2 for two correct colours in wrong order	1
	c	i	1		1
		ii	the last two masses are not the same OR no two masses are the same	Part (ii) DEP on correct or missing answer to part (i) Accept mass still changing / mass not constant / mass is still decreasing Accept results / readings in place of mass Accept reverse argument eg the others are to constant mass	1
		iii	D (...spirit burner instead of Bunsen burner)		1
	d		$\frac{3.4 \times 100}{3.7}$		1
			92 %	Accept 3 or more sf, eg 91.9 / 91.89 / 91.892 Correct answer with no working scores 2 Allow 1 mark for 0.92	1
					Total 8 marks

(**Q02 4CH0/2C, June 2015**)

Q17.

Question number	Answer	Accept	Marks
(a)	$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$	multiples and fractions	1
(b)	**M1** 32 (of S) → 80 (of SO_3) (tonnes or g) **M2** mass of $SO_3 = \frac{80}{32} \times 80$ **M3** = 200 (tonnes) **M2 csq on M1** **M3 csq on M2** Correct answer with no working scores 3	**M1** $n(S) = (n(SO_3)) = \frac{80 \times 10^6}{32}$ (mol) (= 2 500 000 (mol)) **M2** mass of SO_3 = **M1 x 80** **(= 200 000 000 (g))** **M3** = **M2** ÷ 10^6 / 200 (tonnes)	3
(c)	**M1** 64 (g) (of SO_2) reacts with 12 (dm^3) (of O_2) **M2** (64 tonnes) reacts 12 x 10^6 (dm^3) OR 1.2 x 10^7 (dm^3) **M2** csq on **M1** Correct answer with no working scores 2	**M1** $n(SO_2) = \frac{64 \times 10^6}{64}$ (mol) (= 10^6 mol) **M2** $\frac{M1}{2}$ x 24 / 1.2 x 10^7 (dm^3) OR **M1** mass of oxygen accept 1.2 x 10^{10} $\underline{cm^3}$	2

(**Q07 4CH0/2C, Jan 2015**)