PEARSON EDEXCEL IGCSE CHEMISTRY · 4CH1

CHEMISTRY



MARK SCHEME

SECTION 1: PRINCIPLES OF CHEMISTRY (PACK 6)

SCORE	PERCENTAGE
/188	%

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Mark Scheme

Q1.

Question number		Answer	Notes	Marks
(a)	(i)	M	**ALLOW** F	1 Clerical
	(ii)	T	**ALLOW** Rb	1 Clerical
	(iii)	LM_2	**ALLOW** BeF_2 **ALLOW** LM_2 / BeF_2 as the product of an equation, even if unbalanced	1 Grad
	(iv)	L and Q have the same number of outer shell electrons / two outer shell electrons	**ALLOW** L and Q form ions with the same charge / +2 charge **ALLOW** both in the same Group / Group 2	1 Exp
(b)	(i)	isotopes		1 Clerical
	(ii)	**M1** ((24 x 79.0) + (25 x 10.0)+(26 x 11.0)) ÷100		2 Exp
		M2 24.3 COMMENT: ECF only on slips in data, not on incorrect expressions	Correct answer to 1 decimal place with or without working scores 2 marks **IGNORE** any units An answer of 24 without any working scores 0.	
			Total for question	7

Q2.

Question number	Answer	Additional guidance	Mark
(a)(i)	An explanation that makes reference to the following two points: • boxes 1 and 2 (1) • because they both have only one type of atom/molecule (1)	accept other indications, e.g. only He and only H-H accept species in place of atom/molecule second mark can be awarded if only box 1 or box 2 identified	2

Question number	Answer	Additional guidance	Mark
(a)(ii)	An explanation that makes reference to the following two points: • boxes 3 and 5 (1) • box 3 contains a mixture of helium and hydrogen and box 5 contains a mixture of hydrogen and water (1)	second mark can be awarded if only box 3 or box 5 identified	2

Question number	Answer	Mark
(b)(i)	Simple distillation	1

Question number	Answer	Mark
(b)(ii)	Chromatography	1

Question number	Answer	Mark
(b)(iii)	Crystallisation	1

Q3.

Question number	Answer	Additional guidance	Mark
(a)(i)	An explanation that makes reference to the following two points: • boxes 1 and 2 (1) • because they both have only one type of atom/molecule (1)	accept other indications, e.g. only He and only H-H accept species in place of atom/molecule second mark can be awarded if only box 1 or box 2 identified	2

Question number	Answer	Additional guidance	Mark
(a)(ii)	An explanation that makes reference to the following two points: • boxes 3 and 5 (1) • because they both have two different molecules (1)	second mark can be awarded if only box 3 or box 5 identified	2

Question number	Answer	Mark
(b)(i)	Simple distillation	1

Question number	Answer	Mark
(b)(ii)	Chromatography	1

Question number	Answer	Mark
(b)(iii)	Crystallisation	1

(Total for question = 7 marks)

Q4.

Question number	Answer	Notes	Marks
(a) (i)	zinc + copper(II) sulfate → **zinc sulfate + copper**	**REJECT** copper(II) as a product **ACCEPT** zinc(II) sulfate	1
(ii)	polystyrene is an insulator / prevents heat loss	**ALLOW** to prevent the cup falling over	1
(iii)	zinc is more reactive / higher in the reactivity series than copper	**ALLOW** reverse argument	1
(iv)	M1 temperature rise = 28.6 °C M2 (75 × 4.2 × 28.6 =) 9009	correct answer without working scores 2 ALLOW 9010/9000 **IGNORE** any sign **ALLOW** ECF from M1	2
(b) (i)	M1 800÷1000 OR 0.8 (kJ) M2 0.65÷65 OR 0.01 (mol) M3 0.8÷0.01 = −80 (kJ/mol) OR M1 0.65÷65 OR 0.01 (mol) M2 800÷0.01 OR 80 000 (J/mol) M3 −80 (kJ/mol)	correct answer without working scores 3 **ALLOW** ECF but answer must have a − sign 80/+80 scores 2	3
(ii)	M1 zinc/Zn is oxidised because loses electrons M2 silver ion(s)/Ag^+ reduced because gain electrons OR M1 zinc/Zn is oxidised **and** silver ion(s)/Ag^+ reduced M2 zinc/Zn loses electrons **and** silver ion(s)/Ag^+ gain electrons		2
		Total for question = 10 marks	

Q5.

Question number	Answer	Notes	Marks
a	to increase the rate of reaction	**ACCEPT** to make the reaction faster/ to speed up the reaction **REJECT** any reference to increasing the solubility of copper(II) oxide	**1**
b	(the copper(II) oxide/it) stops disappearing **OR** mixture turns cloudy (black) **OR** (black) solid settles (at the bottom of the beaker)	**ALLOW** stops dissolving **REJECT** any other colour **REJECT** any other colour **ALLOW** copper(II) oxide/ it settles (at the bottom of the beaker) **IGNORE** precipitate	**1**
c	to remove excess/unreacted copper(II) oxide/solid/base (from the mixture)	**ACCEPT** to separate the copper(II) sulfate solution (from the copper(II) oxide/unreacted solid/excess solid)	**1**
d	blue		**1**

Question number	Answer	Notes	Marks
e	**M1** heat/boil the filtrate	**NOTE:** If the solution is heated to remove all the water then only **M1** can be awarded **NOTE** If the solution is left to evaporate all the water without heating only 1 mark can be awarded	**5**
	M2 until crystals form in a cooled sample/ on a glass rod	**ACCEPT** to crystallisation point /to form a saturated solution /until crystals start to form /to remove some of the water **M2** dep on **M1**	
	M3 leave the solution to cool/crystallise	**NOTE:** If the solution is left to completely evaporate after heating then award MAX 3	
	M4 filter (to remove the crystals)	**ACCEPT** decant the (excess) solution **IGNORE** references to washing the crystals	
	M5 dry the crystals on filter paper/on paper towel/in a warm oven /in a desiccator /leave to dry	**REJECT** hot oven or any method of direct heating e.g. Bunsen burner No **M5** if crystals washed after drying	

Question number	Answer	Notes	Marks
f i	• calculate the moles of CuO • calculate the mass of $CuSO_4.5H_2O$ • give the answer to an appropriate number of significant figures Example calculation **M1** *n*[CuO] = 9.54 ÷ 79.5 OR 0.120 (mol) **M2** mass of $CuSO_4.5H_2O$ = 0.120 × 249.5 **OR** 29.94 (g) **M3** = 29.9 **OR** **M1** 79.5 (g) → 249.5 (g) **M2** 9.94 (g) → (249.5 ÷ 79.5) × 9.54 (g) **OR** 29.94 (g) **M3** = 29.9	Final answer must be to 3 sig figs Final answer must be to 3 sig figs 29.94 with no working scores 2 29.9 with no working scores 3	**3**
ii	**M1** (23.92 ÷ 29.9) × 100 OR (23.92 ÷ **M3** from (i)) × 100 **M2** = 80(%)	**ALLOW** use of **M2** from (i) 29.94 gives 79.89% **ALLOW** any number of sig figs **ACCEPT** answer of 79.7(3)% using 30g Correct answer without working scores 2	**2**

Q6.

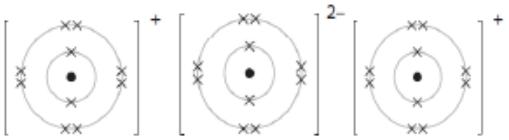
Question number	Answer	Notes	Marks
a	Explanations that link together the following two pairs of points: **M1** baseline has been drawn in ink **M2** and therefore it will interfere with /contaminate the results **M3** the water level is above the ink spots **M4** and therefore the inks will mix with the water	 **ACCEPT** not drawn in pencil **ACCEPT** will produce other colours/will move up the paper/will get mixed up with the ink samples **ALLOW** pencil will not interfere with the results/ pencil will not dissolve **ACCEPT** too high/above the baseline **ACCEPT** the spots are under water **ACCEPT** the inks will dissolve in the water / the inks will wash off the paper	**4**

b	(i)	3		**1**
	(ii)	A **AND** B		**1**
	(iii)	An explanation that links together the following two points: **M1** C **M2** because the spot/ink did not move (up)	 **ACCEPT** did not spread/stayed on the baseline **M2** DEP on **M1**	**2**

Q7.

Question number	Answer	Notes	Marks
(a) (i)	diffusion		1
(ii)	Any two from M1 stir (the mixture) M2 heat (the mixture) M3 grind the sugar or break into smaller pieces or increase its surface area	**ALLOW** shake/swirl **ALLOW** any description of heating	2
(b) (i)	(simple) distillation	**REJECT** fractional distillation **ALLOW** distilling OWTTE	1
(ii)	An explanation that links the following two points M1 (water/ vapour/ steam / gas) is cooled M2 and condenses **OR** in the condenser		2
			Total 6

Q8.

Question number	Answer	Notes	Marks
(a) (i)	<table><tr><th></th><th>Mg^{2+}</th><th>Al^{3+}</th><th>NH_4^+</th></tr><tr><td>S^{2-}</td><td>MgS</td><td>Al_2S_3</td><td>$(NH_4)_2S$</td></tr><tr><td>NO_3^-</td><td>$Mg(NO_3)_2$</td><td>$Al(NO_3)_3$</td><td>NH_4NO_3</td></tr><tr><td>CO_3^{2-}</td><td>$MgCO_3$</td><td>$Al_2(CO_3)_3$</td><td>$(NH_4)_2CO_3$</td></tr></table>	1 mark for each correct formula	3
(ii)	ammonium nitrate		1
(b) (i)	**M1** electrostatic (force of) attraction **M2** between oppositely charged ions	**ALLOW** electrostatic force **ACCEPT** between positive and negative ions **ACCEPT** between cations and anions	2
(ii)	 **M1** correct electron arrangement of both sodium ions **M2** correct electron arrangement of the oxide ion **M3** correct charges on all ions (with or without brackets)	If only outer shells shown correctly scores 1 mark **ACCEPT** dots in place of crosses or any combination of dots and crosses for **M1** and **M2**	3
			Total 9

Q9.

Question number	Answer	Notes	Marks
(a) (i)	C_7H_{16}	Penalise incorrect use of case and subscripts	1
(ii)	(surfacing) roads/roofs	**ALLOW** other correct uses	1
(iii)	A description that makes reference to the following three points		3
	M1 gasoline has a **lighter** colour /ORA	**ACCEPT** reference to specific colours e.g. gasoline is colourless/ bitumen is black	
	M2 gasoline has a **lower** boiling point /ORA	statements must be comparisons	
	M3 gasoline has a **lower** viscosity /ORA		
(b) (i)	An explanation that links the following four points		4
	M1 water vapour/steam condenses	**ALLOW** turns to liquid	
	M2 (because) the ice (and water) is below 100°C/ the boiling point of water	**ALLOW** (because) the ice (and water) are cold /at a low temperature/ at 0 °C	
	M3 carbon dioxide is still a gas/ does not condense (in the U-tube)		
	M4 (because) the ice (and water) is above - 78 °C/ the sublimation point of carbon dioxide		
(ii)	A description including the following two points		2
	M1 anhydrous copper(II) sulfate is white		
	M2 (when water is present) it turns blue		
			Total 11

Q10.

Question number	Answer	Notes	Marks
(a) (i)	Any one from: to increase the rate of reaction to give the particles enough energy to react	 ALLOW because copper does not react with oxygen when copper is cold ALLOW so that copper will react with oxygen	1
(ii)	because Ar does not (readily) gain / lose / share electrons	ACCEPT argon has a full outer shell / valence shell of electrons	1
(iii)	copper(II) oxide	ALLOW copper oxide REJECT copper(I) oxide	1
(b) (i)	results are the same (at the end)	ALLOW results stop decreasing	1
(ii)	M1 volume oxygen = 20 cm^3 M2 total volume = 253 cm^3 M3 (20÷253)×100 = 7.9%	 ALLOW correct evaluation from M1 and M2 ALLOW any number of significant figures REJECT incorrect rounding Correct answer of 7.9% with or without working scores 3	3
(iii)	Any one from: there is a leak in the apparatus temperature was not the same for all readings the apparatus was not left to cool (to room temperature)	 IGNORE not all oxygen reacted	1
			Total for question = 8 marks

Q11.

Question number	Answer	Notes	Marks
(a) (i)	Any one of the following M1 bright/white light **OR** bright/white flame M2 white solid/powder/ash	 **ALLOW** grey solid/powder /ash **ALLOW** white smoke	1
(ii)	$2Mg + O_2 \rightarrow 2MgO$	**REJECT** charges on Mg and/or O_2 **ACCEPT** $2Mg^{2+}O^{2-}$ **ALLOW** multiples and fractions **IGNORE** state symbols even if incorrect	1
(b)	M1 (volume of oxygen =) 100 – 28 **OR** 72 (cm^3) M2 (volume of air at start =) 275 + 100 **OR** 375 (cm^3) M3 72 ÷ 375 x 100 **OR** 19.2 (%) M4 19 (%)	Correct answer without working scores 4 **ALLOW** ECF throughout Use of 275 gives an answer of 26 scores 3 Alternative method M1 (volume of air left=) 275 + 28 **OR** 303 (cm^3) M2 303 ÷ 375 x 100 **OR** 80.8 (%) M3 100 – 80.8 **OR** 19.2 M4 19 (%)	4

(c)	(i)	M1 bubble/pass/add carbon dioxide/gas into limewater M2 (limewater) turns cloudy/milky	 **ALLOW** white precipitate M2 dependent on mention of limewater **REJECT** addition of extra reagent for both marks	2
	(ii)	An explanation that links two of the following three points M1 carbon dioxide is a greenhouse gas M2 (that causes) climate change/ global warming M3 oceans becoming more acidic	 **ACCEPT** description of greenhouse effect **REJECT** reference to the ozone layer for M1 **ACCEPT** a result of climate change (e.g. melting of polar icecaps/flooding /wildfires) **IGNORE** reference to acid rain	2
				Total 10

Q12.

Question number	Answer	Notes	Marks
(a) (i)	argon / helium	**ACCEPT** Ar / He	1
(ii)	nitrogen	**ACCEPT** N_2	1
(iii)	carbon dioxide	**ACCEPT** CO_2	1
(iv)	carbon dioxide	**ACCEPT** CO_2	1
(b) (i)	$S + O_2 \rightarrow SO_2$		1
(ii)	acid rain	**ACCEPT** an adverse effect of acid rain e.g. kills fish, damages plants, corrodes limestone/marble buildings/statues etc. **IGNORE** toxic/pollutant	1 **Total 6**

Q13.

Question number	Answer	Additional guidance	Mark
(a)	The atoms of both elements have one electron in the outer shell	accept highest energy level in place of outer shell	**1**

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

Question number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to the following 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
(b)(iii)	D (12)	1

Question number	Answer	Mark
(c)	Lithium	1

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

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

(Total for question = 9 marks)

Q14.

Question number	Answer	Notes	Marks
(a) (i)	Any 3 from **M1** effervescence/bubbles/fizzing **M2** moves **M3** floats **M4** disappears/gets smaller **M5** vapour trail/steam	 moves on surface scores **M2** and **M3** **ALLOW** dissolves **IGNORE** melts/heat produced **IGNORE** any reference to indicators	3
(ii)	An explanation that links the following two points **M1** the universal indicator turns purple/blue **M2** (because) OH^-/hydroxide ions are present	 **ALLOW** an alkaline solution /an alkali is produced / a solution of high pH is formed	2
(iii)	$2Li + 2H_2O \rightarrow 2LiOH + H_2$ **M1** all formulae correct **M2** balancing of correct formulae	**ALLOW** multiples and fractions **M2** dep on **M1**	2

(b)	(i)	An explanation that links the following two points **M1** to remove any other ions/chemicals/ impurities/ contaminants/ compounds/substances (that may be on the wire) **M2** (so that) they do not interfere with/mask the colour of the flame	 **ALLOW** (so that) they do not affect the result (of the test) **ALLOW** (remove substances) that could colour the flame	2
	(ii)	**D** yellow A is incorrect as sodium ions do not give a green flame B is incorrect as sodium ions do not give a lilac flame C is incorrect as sodium ions do not give a red flame		1

Question number	Answer	Notes	Marks
(c) (i)	K^+ and SO_4^{2-}		1
(ii)	An explanation that links the following four points **M1** (potassium sulfate) has a giant (ionic) structure /lattice **M2** electrostatic attraction between oppositely charged ions **M3** (ionic bonds or forces / attractions between ions) are strong **M4** a large amount of energy is needed to overcome the forces/break the bonds	ionic bonds are strong scores M3	4
			Total 15

Q15.

Question number	Answer	Notes	Marks
(a)	to keep out of contact/prevent reaction with air/oxygen/water/moisture	ALLOW they react with air/oxygen/water/moisture	1
(b) (i)	similarity: both fizz/move on surface/ produce flame	ALLOW both melt/form a ball/produce a gas/ produce hydrogen/form an alkaline solution	2
	difference caesium: faster/more violent reaction	ACCEPT reverse argument for potassium ALLOW caesium explodes	
(ii)	$2Cs + 2H_2O \rightarrow 2CsOH + H_2$ M1 all symbols/formulae correct M2 correctly balanced	ACCEPT fractions and multiples M2 DEP M1	2

(c) (i)	a lid/cover		1
(ii)	explanation linking either M1 stir solution M2 to obtain more accurate (maximum) temperature OR M1 measure temperature of sodium hydroxide M2 to check if different to/same as temperature of (hydrochloric) acid	ALLOW reference to even temperature throughout/ heat evenly distributed OWTTE ALLOW take an average of temperature of sodium hydroxide and temperature of (hydrochloric) acid for 2 marks	2

Question number	Answer	Notes	Marks
(d) (i)	M1 correct temperature change/△T M2 correct substitution into Q = m x c x △T M3 correct evaluation Example calculation: M1 △T = (26.5 – 19.9) OR 6.6 M2 Q = 100 x 4.2 x 6.6 M3 = 2800 (J)	 M2 ECF M1 M3 ECF M2 IGNORE any sign ALLOW 2770, 2772 correct answer without working scores 3	3
(ii)	M1 answer to M3 from (i) ÷ 0.05 M2 correct evaluation in kJ/mol with negative sign expected answer M1 2800 ÷ 0.05 OR 56000 (J) M2 - 56 (kJ/mol)	 2770 gives 55400 2772 gives 55440 negative sign required ACCEPT -55.4 ACCEPT -55.44 ACCEPT -55 correct answer without working scores 2	2
		(Total for Question = 13)	

Q16.

Question number	Answer	Notes	Marks
(a)	alkali metals		1
(b) (i)	**D** potassium sinks A is incorrect as a colourless solution forms B is incorrect as a lilac flame is seen C is incorrect as effervescence occurs		1
(ii)	may explode /break the trough/ cause a fire	**ALLOW** (too) dangerous	1
(iii)	OH^-	**ALLOW** HO^- /OH^{1-} /OH^{-1}	1
(iv)	$2K + 2H_2O \rightarrow 2KOH + H_2$ **M1** correct formulae **M2** balancing of correct formulae	**ALLOW** multiples and fractions **IGNORE** state symbols even if incorrect **M2** dep on **M1**	2
(c)	An explanation that links the following four points **M1** giant structure/lattice **M2** strong electrostatic attraction **M3** between (oppositely charged) ions **M4** large amount of energy needed to overcome the forces of attraction/break the bonds	 **ALLOW** strong (ionic) bonds No **M2** or **M3** if mention of covalent or metallic bonds /intermolecular forces	4
			Total 10

Q17.

Question number	Answer	Notes	Marks
(a) (i)	**B** 5 A is incorrect as 1 is the pH of a strong acid C is incorrect as 7 is the pH of a neutral solution D is incorrect as 9 is the pH of a weak alkali		1
(ii)	**D** acids are proton donors A is incorrect as alkalis contain OH^- ions not acids B is incorrect as acids do not donate electrons C is incorrect as bases are proton acceptors not acids		1
(b) (i)	(thermal) decomposition		1
(ii)	$PbCO_3 \rightarrow PbO + CO_2$	**ALLOW** multiples	1

Question number	Answer	Notes	Marks
(c) (i)	liquid (shown in table)	**ALLOW** if liquid written in space under question **ALLOW** l or L	1
(ii)	An explanation which links any six of the following points **M1** silicon dioxide has a giant (covalent) structure **M2** covalent bonds are (very) strong **M3** (in silicon dioxide) many/all the covalent bonds need to be broken **M4** a large amount of / more energy is required to break the bonds (in silicon dioxide) **M5** silicon(IV) chloride has a simple molecular structure **M6** the forces between the molecules/intermolecular forces (in silicon(IV) chloride) are weak **M7** little / less energy is needed to overcome the forces in silicon(IV) chloride	No **M3 or M4** if reference to overcoming / breaking intermolecular forces in silicon dioxide No **M6 or M7** if any reference to weak covalent bonds or breaking of covalent bonds in silicon(IV) chloride A statement such as 'more energy is needed to break the bonds in silicon dioxide than to overcome the forces in silicon(IV) chloride' scores **M4** and **M7**	6 **Total 11**

Q18.

Question number		Answer	Notes	Marks
(a)	(i)	halogens		1
	(ii)	**B** bromine A is incorrect as astatine is a solid at room temperature C is incorrect as fluorine is a gas at room temperature D is incorrect as iodine is a solid at room temperature		1
	(iii)	**C** green A is incorrect as chlorine is not brown B is incorrect as chlorine is not colourless C is incorrect as chlorine is not red		1
	(iv)	M1 (damp) litmus paper M2 bleached	**ALLOW** universal indicator paper/ pH paper **ALLOW** turns white **ACCEPT** (damp) blue litmus paper turns red and then bleached for both marks.	2
(b)	(i)	M1 use of 56 and 35.5 in calculation M2 162.5	 91.5 without working scores 1 correct answer without working scores 2	2
	(ii)	$2\,Fe + 3\,Cl_2 \rightarrow 2\,FeCl_3$	**ALLOW** multiples and fractions	1
				Total 8

Q19.

Question number	Answer	Notes	Marks
(a) (i)	fluorine has the fewest number of shells / energy levels	**ALLOW** fluorine has the fewest number of electrons **IGNORE** references to protons, neutrons, atomic number and mass number	1
(ii)	**C** **C** is the correct answer because iodine is in period 5 therefore has 5 shells and group 7 therefore has 7 electrons in its outer shell. A is incorrect because arsenic has 5 shells and 4 electrons in its outer shell. B is incorrect because selenium has 4 shells and 6 electrons in its outer shell. D is incorrect because the number of shells and number of electrons in the outer shell in iodine have been reversed.		1
(b) (i)	M1 does not need heating M2 reacts very quickly	 must imply quicker reaction than chlorine	2
(ii)	M1 as the atoms get bigger M2 the reactivity decreases	 **ACCEPT** reverse argument	2
			6

Q20.

Question number	Answer	Marks
(a) (i)	**B** bromine A is incorrect as astatine is a solid C is incorrect as chlorine is a gas D is incorrect as iodine is a solid	1
(ii)	**C** chlorine (as it is pale green) A is incorrect as astatine is black B is incorrect as bromine is brown C is incorrect as iodine is dark grey	1
(iii)	**A** astatine B is incorrect as bromine is more reactive than astatine C is incorrect as chlorine is more reactive than astatine D is incorrect as iodine is more reactive than astatine	1

(b) (i)	**M1** (colourless solution turns) brown **M2** (solution stays) brown / no change	 **ALLOW** no reaction	2
(ii)	bromine would not react with (sodium) bromide / bromine cannot displace itself OWTTE	**ALLOW** bromine cannot react with itself **ALLOW** both contain bromine/same element/same halogen **ALLOW** because no reaction would occur **REJECT** bromine cannot displace bromide	1
(iii)	$Br_2 + 2NaI \rightarrow 2NaBr + I_2$	**ACCEPT** correct ionic equation $Br_2 + 2I^- \rightarrow 2Br^- + I_2$ **ALLOW** multiples and fractions	1

Question number	Answer	Notes	Marks
(c)	A description that makes reference to the following 6 points Test for cation **M1** add sodium hydroxide (solution) **M2** if blue precipitate forms solution contains copper(II) ion(s) / contains Cu^{2+} / is a copper compound **M3** if green precipitate forms solution contains iron(II) ion(s) / contains Fe^{2+} / is an iron compound	 **ALLOW** ammonia solution **IGNORE** qualifiers **REJECT** other colours **IGNORE** qualifiers **REJECT** other colours If no reagent or incorrect reagent but correct M2 and M3 score 1 **ALLOW** **M1** flame test or description of flame test	

		M2 if blue-green (flame) solution contains copper(II) ion(s) / contains Cu^{2+} / is a copper compound No **M3** for this test **ALLOW** **M1** addition of suitable metal above Cu in reactivity series **M2** brown/pink/pink-brown solid forms No **M3** for this test	6

	Test for anion **M4** add silver nitrate (solution) **M5** if white precipitate forms solution contains chloride ion(s) / contains Cl^- / is a chloride **M6** if cream precipitate forms solution contains bromide ion(s) / contains Br^- / is a bromide	**IGNORE** addition of nitric acid **REJECT** addition of hydrochloric acid for **M4** If no reagent or incorrect reagent but correct M5 and M6 score 1 **ALLOW** **M4** add chlorine water (to solution) **M5** if turns orange/yellow/brown solution contains bromide ion(s) / contains Br^- / is a bromide No **M6** for this test	**Total 13**