

Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE in Chemistry
(5CH2H) Paper 01

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Question Number	Answers				Acceptable Answers	Mark
1 (a)		relative mass	relative charge	position in atom	ignore units reject relative mass of proton: +1/1+	
	proton	1	(+1)	in nucleus	for relative mass of electron: anything smaller than 1/1500/0.00067 (almost) 0/negligible/very small	
	neutron	(1)	0	(in nucleus)	for relative charge on neutron: none/no charge/neutral	
	electron	1/1837	-1	in shells	for position of electron in an atom: in orbits / orbitals / energy levels / around the nucleus /outside the nucleus ignore rings ignore inner/outer	
	all 6 correct (3) 4 or 5 correct (2) 2 or 3 correct (1)					

Question Number	Answers	Acceptable Answers	Mark
1 (b)	D equal numbers of protons and electrons		(1)

Question Number	Answers	Acceptable Answers	Mark
1 (c)(i)	Ca	Reject CA / ca /cA ignore calcium	(1)

Question Number	Answers	Acceptable Answers	Mark
1 (c)(ii)	O	ignore any negative charge on the O ignore oxygen reject: oxide/O ₂	(1)

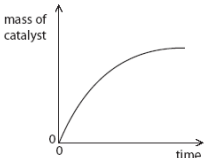
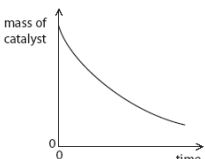
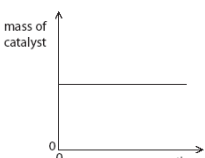
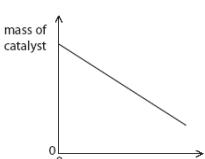
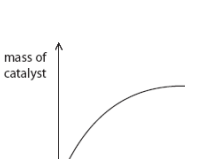
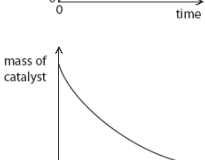
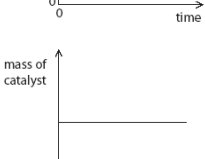
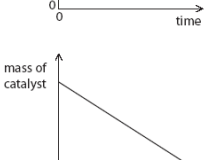
Question Number	Answers	Acceptable Answers	Mark
1 (d)(i)	13	Allow correct working even if wrong answer	(1)

Question Number	Answers	Acceptable Answers	Mark
1 (d)(ii)	D AIN		(1)

(total for Question 1 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)	A use hydrochloric acid which is more dilute		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)	An explanation linking two of M1 {particles/reactants/collisions} have more energy (1) M2 more frequent collisions (1) M3 more {productive/successful/effective} collisions (1)	atoms/ions/molecules as alternatives to particles reject electrons particles move faster more collisions per unit time ignore collisions are more likely/greater chance/probability of collisions/faster collisions more particles have required activation energy	(2)

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	C ☐ A  ☐ B  ☐ C  ☐ D  ☐ A  ☐ B  ☐ C  ☐ D 		(1)

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	$2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$ (2) all formulae correct (1) balancing correct formulae (1)	multiples or halves reject other reactants or products ignore heat on arrow or elsewhere ignore state symbols ignore use of lower case h, lower case o, or use of superscripts or large numbers inside the formulae	(2)

Question Number	Answer	Acceptable answers	Mark
2(d)	An explanation linking M1 energy needed to break bonds / energy released when bonds formed (1) M2 more heat / energy is released than needed (1) M2 dependent on scoring M1	bond breaking is endothermic / bond making is exothermic if any contradictory statements made in M1, the mark cannot be awarded (and so M2 cannot be awarded either) ignore numbers of bonds eg more bonds formed than broken "more energy is released forming bonds than needed to break bonds" (2)	(2)

(total for Question 2 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
3(a)	B potassium and caesium, copper and iron		(1)

Question Number	Answer	Acceptable answers	Mark
3(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
3(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
3(c)(i)	A description including any two from floats (1) moves (around) (1) effervescence / fizzing / bubbles (1) melts/changes to a ball shape (1) becomes smaller /disappears (1)	moves (around) on the surface (2) white smoke formed ignore gas/hydrogen given off dissolves / explodes Ignore: burns/catches fire/ignites/flame/sparks ignore addition of indicators	(2)

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

(total for Question 3 = 10 marks)

Question Number	Answers	Acceptable Answers	Mark
4 (a)	A aluminium nitrate and lead sulfate		(1)

Question Number	Answers	Acceptable Answers	Mark
4 (b)	An explanation linking two of the following strong (forces of / electrostatic) attraction (1) (between) oppositely charged <u>ions</u> (1) requires lot of heat/energy {to separate ions/overcome forces/break bonds} (1)	Any reference to molecules/molecular/intermolecular/covalent scores 0 marks overall strong bonds ignore "between atoms" for this mark ignore strong lattice / giant structure positive and negative <u>ions</u> reject between bonds reject charged atoms for this mark {high / more} {heat / energy} ignore hard to melt/high temperature needed	(2)

Question Number	Answers	Acceptable Answers	Mark
4 (c)(i)	white {precipitate /solid}	white powder	(1)

Question Number	Answers	Acceptable Answers	Mark
4 (c)(ii)	BaSO₄ + 2KCl (2) OR BaSO₄ + KCl (1)	SO₄Ba / ClK Ignore incorrect use of case, or use of superscript or large number 4	(2)

Question Number	Answers	Acceptable Answers	Mark
4(d)(i)	C K ⁺		(1)

Question Number	Answers	Acceptable Answers	Mark
4 (d)(ii)	A description linking three of the following (sequence has to be correct for full marks) M1 add/mix/react only sodium carbonate (solution) and lead nitrate (solution) (1) M2 filter (off precipitate) (1) M3 dep on M2 M3 wash/rinse (solid/residue with distilled water) OR dry using {filter paper/paper towel/in a (warm/drying) oven} (1)	add/mix/react the (two) solutions/them for M1 ignore warm/heat mixture if any indication of heating to evaporate anywhere only M1 can be scored if any other reagent added eg acid can score max 2 for question decant (off the solution) reject if wash with acid or other reagent leave to dry / in the sun / on a radiator / near a window reject heat/hot oven	(3)

(total for Question 4 = 10 marks)

Question Number	Answers			Acceptable Answers	Mark
5 (a)(i)		chlorine-35	chlorine-37		
	number of protons	17	17		
	number of neutrons	18	20		
	number of electrons	17	17		
	the four 17s (1)				
the 18 and 20 (1)				(2)	

Question Number	Answers	Acceptable Answers	Mark
5 (a)(ii)	An explanation linking M1 average (mass of atoms/isotopes present) (1) M2 more chlorine-35 than chlorine-37 / higher {percentage / abundance} of Cl-35 / lower {percentage / abundance} of Cl-37 / (1)	mean ignore weight 75% chlorine-35 / 25% chlorine-37 / chlorine-35 and chlorine-37 in ratio 3:1 / correct calculation to obtain 35.5 (2) eg$[(75 \times 35) + (25 \times 37)]/100$	(2)

Question Number	Answers	Acceptable Answers	Mark
5 (b)	Diagram showing one carbon and four chlorines four pairs of electrons shared between the carbon and chlorine atoms (1) fully correct (1)	use of dots or crosses or mixture of both ignore inner shells even if incorrect ignore symbols	(2)

Question Number	Indicative Content	Mark
QWC	*5(c) A response including some of the following points Note: (carbon to carbon) strong bonds is given in question Diamond: Uses and Properties • in cutting tools/engraving • drill bit • jewellery • diamond very hard/strong • attractive/lustrous • high melting point Explanations • giant molecular/covalent • each carbon atom bonded to four other carbon atoms • three dimensional structure • to break it lots of bonds would need to be broken • would need lot of energy/force Graphite: Uses and Properties • to make electrodes • a lubricant • sporting equipment • in pencils/drawing • graphite conducts electricity • soft Explanations • giant molecular/covalent • each carbon atom bonded to three other carbon atoms • each carbon atom has a free electron • delocalised electrons • (delocalised) electrons move to carry current • layers of carbon atoms • weak forces/bonds between layers/sheets • so layers/sheets can slide/rub off or over each other	(6)

(total for Question 5 = 12 marks)

Level	0	No rewardable content
1	1 - 2	- a limited description eg for either diamond or graphite states a correct Use or Property - the answer communicates ideas using simple language and uses limited scientific terminology - spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	- a simple description/explanation eg for both diamond and graphite states a correct Use or Property linked with at least one relevant explanation point OR for either diamond or graphite States a correct Use or Property linked to at least two relevant explanation points - 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	- a detailed explanation eg for both diamond and graphite States a correct Use or Property linked to at least three relevant explanation points (in total) OR for either diamond or graphite States a correct Use or Property linked to at least four relevant explanation points (in total) - 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
6(a)	Fe 2.8/56 0.05 1 Cl 3.55/35.5 (1) 0.1 2 or (1) FeCl₂ (1)	Cl₂Fe FeCl₂ with no working (3) Consequential errors: if "upside down" ie 56 / 2.8 and 35.5 / 3.55 ratio 20 : 10 or 2 : 1 (1) empirical formula Fe₂Cl (1) allow 3 marks for 2.8 / 56 and 3.55 / 71 ratio 0.05: 0.05 or 1 : 1 empirical formula FeCl₂ allow 2 marks for 2.8 / 56 and 3.55 / 71 ratio 0.05: 0.05 or 1 : 1 empirical formula FeCl allow 2 marks for Fe 2.8/56 0.5 Cl 3.55/35.5 (1) 0.1 (0) Fe₅Cl (1) - ECF	(3)

Question Number	Answer	Acceptable answers	Mark
6(b)	EITHER 2x23 (1) g Na makes 2x58.5 (1) g NaCl 9.2 g Na makes $\frac{(2 \times 58.5) \times 9.2}{46}$ g NaCl (1) (= 23.4 g) OR 23 g Na makes 58.5 (1) g NaCl 9.2 g Na makes $\frac{58.5 \times 9.2}{23}$ (1) g NaCl 23(1) (1) (= 23.4 g) mark consequentially eg 46 (1) g Na makes (2x23+35.5) (0) g NaCl 9.2 g Na makes $\frac{(2 \times 23 + 35.5) \times 9.2}{46}$ (1) g NaCl (= 16.3 g)	23.4 g with no working (3) 23.4 g from any method (3) do not accept 23(.0) mol Na used = $9.2/23$ (1) (= 0.4) mol NaCl = 0.4 (1) mass NaCl = 0.4×58.5 (1) (= 23.4 g) Ignore units throughout unless incorrect mark consequentially awarding 2 marks for 46.8 g, 11.7 g and 16.3 g (see last example opposite).	(3)

Question Number	Indicative Content	Mark
	*6(c) A description, comparison and explanation including some of the following points Order of reactivity: chlorine > bromine > iodine Experiment • add (aqueous) chlorine to a solution of potassium bromide • the solution turns orange/yellow • bromine is produced Conclusion/Explanation and equation: (so) chlorine is more reactive than / displaces bromine $\text{Cl}_2 + 2\text{KBr} \rightarrow \text{Br}_2 + 2\text{KCl} / \text{Cl}_2 + 2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{Cl}^-$ Experiment • add (aqueous) bromine to a solution of potassium iodide • the solution turns brown • iodine is produced Conclusion/Explanation and equation: (so) bromine is more reactive than / displaces iodine $\text{Br}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KBr} / \text{Br}_2 + 2\text{I}^- \rightarrow \text{I}_2 + 2\text{Br}^-$ Experiment • add (aqueous) chlorine to a solution of potassium iodide • the solution turns brown • iodine is produced Conclusion/Explanation and equation: (so) chlorine is more reactive than / displaces iodine $\text{Cl}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KCl} / \text{Cl}_2 + 2\text{I}^- \rightarrow \text{I}_2 + 2\text{Cl}^-$ ▪ Allow use of organic solvents to identify halogens ▪ Allow use of suggested reactions which do not produce a displacement reaction eg add (aqueous) bromine to a solution of a potassium chloride with suitable conclusion/explanation ▪ Allow use of table of suggested experiments	(6)

Level	0	No rewardable content
1	1 - 2	- a limited description of at least one experiment in which any halogen solution is added to any halide solution (not of the same halogen) OR describes order of reactivity as $\text{Cl} > \text{Br} > \text{I}$ - the answer communicates ideas using simple language and uses limited scientific terminology - spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	- a simple description of at least two displacement experiments AND - EITHER at least one correct explanation/conclusion OR - at least one correct observation of a displacement reaction that works/balanced equation. - 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	- a detailed description of at least two displacement experiments AND (a total of) at least two correct explanations/conclusions AND - at least one correct observation of a displacement reaction that works/ balanced equation - the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately - spelling, punctuation and grammar are used with few errors

(total for Question 6 = 12 marks)

