

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+ for relative mass of electron: anything smaller than 1/1500/0.00067 (almost) 0/negligible/very small for relative charge on neutron: none/no charge/neutral for position of electron in an atom: in orbits / orbitals / energy levels / around the nucleus /outside the nucleus ignore rings ignore inner/outer	
	proton	1	(+1)	in nucleus		
	neutron	(1)	0	(in nucleus)		
	electron	1/1837	-1	in shells		
	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)

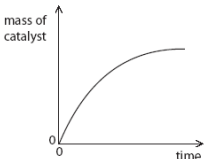
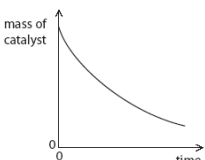
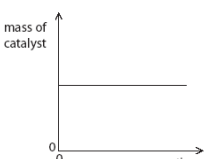
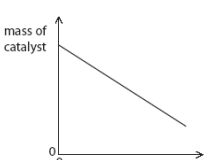
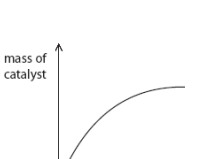
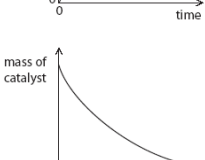
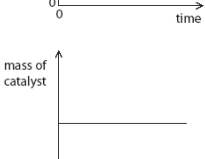
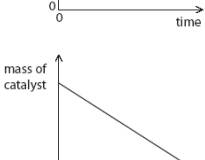
Question Number	Answers	Acceptable Answers	Mark
1 (d)(i)	13	Allow correct working even if wrong answer	(1)

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

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	<p>C</p> <p><input type="checkbox"/> A </p> <p><input type="checkbox"/> B </p> <p><input type="checkbox"/> C </p> <p><input type="checkbox"/> D </p> <p><input type="checkbox"/> A </p> <p><input type="checkbox"/> B </p> <p><input type="checkbox"/> C </p> <p><input type="checkbox"/> D </p>		(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)	<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
3(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)

(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)	<p>An explanation linking two of the following</p> <p>strong (forces of / electrostatic) attraction (1)</p> <p>(between) oppositely charged <u>ions</u> (1)</p> <p>requires lot of heat/energy {to separate ions/overcome forces/break bonds} (1)</p>	<p>Any reference to molecules/molecular/intermolecular/covalent scores 0 marks overall</p> <p>strong bonds ignore "between atoms" for this mark ignore strong lattice / giant structure</p> <p>positive and negative <u>ions</u> reject between bonds reject charged atoms for this mark</p> <p>{ high / more } { heat / energy }</p> <p>ignore hard to melt/high temperature needed</p>	(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)	<p>BaSO₄ + 2KCl (2)</p> <p>OR</p> <p>BaSO₄ + KCl (1)</p>	<p>SO₄Ba / ClK</p> <p>Ignore incorrect use of case, or use of superscript or large number 4</p>	(2)

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

Question Number	Answers	Acceptable Answers	Mark
4 (d)(ii)	<p>A description linking three of the following</p> <p>(sequence has to be correct for full marks)</p> <p>M1 add/mix/react only sodium carbonate (solution) and lead nitrate (solution) (1)</p> <p>M2 filter (off precipitate) (1)</p> <p>M3 dep on M2</p> <p>M3 wash/rinse (solid/residue with distilled water)</p> <p>OR</p> <p>dry using {filter paper/paper towel/in a (warm/drying) oven} (1)</p>	<p>add/mix/react the (two) solutions/them</p> <p>for M1 ignore warm/heat mixture</p> <p>if any indication of heating to evaporate anywhere only M1 can be scored</p> <p>if any other reagent added eg acid can score max 2 for question</p> <p>decant (off the solution)</p> <p>reject if wash with acid or other reagent</p> <p>leave to dry / in the sun / on a radiator / near a window reject heat/hot oven</p>	(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)		(2)	
	the 18 and 20 (1)			

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[(75x35) + (25x37)]/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	<p data-bbox="277 184 375 216">*5(c)</p> <p data-bbox="402 184 1092 216">A response including some of the following points</p> <p data-bbox="402 247 1222 279">Note: (carbon to carbon) strong bonds is given in question</p> <p data-bbox="402 310 540 342">Diamond:</p> <p data-bbox="402 373 683 405">Uses and Properties</p> <ul data-bbox="451 447 862 646" style="list-style-type: none"> • in cutting tools/engraving • drill bit • jewellery • diamond very hard/strong • attractive/lustrous • high melting point <p data-bbox="402 709 581 741">Explanations</p> <ul data-bbox="451 783 1243 940" style="list-style-type: none"> • 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 <p data-bbox="402 1014 537 1045">Graphite:</p> <p data-bbox="402 1077 691 1108">Uses and Properties</p> <ul data-bbox="451 1150 889 1350" style="list-style-type: none"> • to make electrodes • a lubricant • sporting equipment • in pencils/drawing • graphite conducts electricity • soft <p data-bbox="402 1381 581 1413">Explanations</p> <ul data-bbox="451 1455 1260 1717" style="list-style-type: none"> • 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 	<p data-bbox="1369 1749 1417 1780">(6)</p>

(total for Question 5 = 12 marks)

Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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)	<p>Fe Cl</p> <p>2.8/56 3.55/35.5 (1)</p> <p>0.05 0.1 or</p> <p>1 2 (1)</p> <p>FeCl₂ (1)</p>	<p>Cl₂Fe</p> <p>FeCl₂ with no working (3)</p> <p>Consequential errors:</p> <p>if "upside down" ie</p> <p>56 / 2.8 and 35.5 / 3.55</p> <p>ratio 20 : 10 or 2 : 1 (1)</p> <p>empirical formula Fe₂Cl (1)</p> <p>allow 3 marks for</p> <p>2.8 / 56 and 3.55 / 71</p> <p>ratio 0.05: 0.05 or 1 : 1</p> <p>empirical formula FeCl₂</p> <p>allow 2 marks for</p> <p>2.8 / 56 and 3.55 / 71</p> <p>ratio 0.05: 0.05 or 1 : 1</p> <p>empirical formula FeCl</p> <p>allow 2 marks for</p> <p>Fe Cl</p> <p>2.8/56 3.55/35.5 (1)</p> <p>0.5 0.1 (0)</p> <p>Fe₅Cl (1) - ECF</p>	(3)

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

Question Number	Indicative Content	Mark
	<p>*6(c) A description, comparison and explanation including some of the following points</p> <p>Order of reactivity: chlorine > bromine > iodine</p> <p>Experiment</p> <ul style="list-style-type: none"> • add (aqueous) chlorine to a solution of potassium bromide • the solution turns orange/yellow • bromine is produced <p>Conclusion/Explanation and equation:</p> <p>(so) chlorine is more reactive than / displaces bromine</p> $\text{Cl}_2 + 2\text{KBr} \rightarrow \text{Br}_2 + 2\text{KCl} / \text{Cl}_2 + 2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{Cl}^-$ <p>Experiment</p> <ul style="list-style-type: none"> • add (aqueous) bromine to a solution of potassium iodide • the solution turns brown • iodine is produced <p>Conclusion/Explanation and equation:</p> <p>(so) bromine is more reactive than / displaces iodine</p> $\text{Br}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KBr} / \text{Br}_2 + 2\text{I}^- \rightarrow \text{I}_2 + 2\text{Br}^-$ <p>Experiment</p> <ul style="list-style-type: none"> • add (aqueous) chlorine to a solution of potassium iodide • the solution turns brown • iodine is produced <p>Conclusion/Explanation and equation:</p> <p>(so) chlorine is more reactive than / displaces iodine</p> $\text{Cl}_2 + 2\text{KI} \rightarrow \text{I}_2 + 2\text{KCl} / \text{Cl}_2 + 2\text{I}^- \rightarrow \text{I}_2 + 2\text{Cl}^-$ <ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> a limited description of at least one experiment in which any halogen solution is added to any halide solution (not of the same halogen) <p>OR describes order of reactivity as $\text{Cl} > \text{Br} > \text{I}$</p> <ul style="list-style-type: none"> 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 two displacement experiments <p>AND</p> <ul style="list-style-type: none"> EITHER at least one correct explanation/conclusion <p>OR</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> a detailed description of at least two displacement experiments <p>AND</p> <ul style="list-style-type: none"> (a total of) at least two correct explanations/conclusions <p>AND</p> <ul style="list-style-type: none"> 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)

