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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE in Chemistry (5CH3H) Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

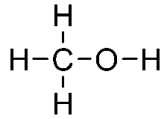
Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Acceptable answers	Mark
1(a)	**B** add yeast, temperature of 35°C		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	C_2H_4 (1) + H_2O (1) → C_2H_5OH award one mark max if incorrectly balanced	allow correct molecular formula C_2H_6O allow H_4C_2 correct multiples ignore state symbols	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	A description linking any two from • same **general** formula (1) • same functional group (1) • (consecutive) compounds differ by CH_2 (1) • gradual variation in physical properties (1) • {similar / same} chemical {properties / reactions} (1)	 allow $C_nH_{2n+1}OH$ (2) allow C_nH_{2n} or any correct general formula (2) ignore same properties/physical properties allow a correct trend, e.g. bp increases with number of carbon atoms (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)		allow –OH allow correct dot and cross diagram	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(d)(i)	oxidation		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(d)(ii)	A description including any two from • effervescence/fizzing/bubbling (1) • solid disappears (1) • colourless solution (1)	ignore incorrectly named gases ignore gas given off/evolved allow magnesium floats on surface of acid allow solid dissolves (1) ignore solution <u>turns</u> colourless ignore clear	**(2)**

(Total for Question 1 = 9 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	A description linking • add dil nitric acid then silver nitrate solution (1) • yellow precipitate/solid (1)	 allow silver nitrate solution alone(1) reject if wrong reagent / acid mentioned colour and form both required reject cream reject yellow-orange	 **(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	A description linking • add to sodium hydroxide (solution) and warm (1) • test gases with (moist) (red) litmus paper (1) • (litmus paper) turns blue (1)	 allow sodium hydroxide (solution) alone (1) allow heat solid alone (1) allow Universal Indicator paper/ pH paper(1) allow correct colour change for named indicator	 **(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	**C** iron(III), Fe^{3+}		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	A description to include • **white** {precipitate/solid} with calcium (ions) (1) • **white** {precipitate/solid} with aluminium (ions) (1) • (precipitate/solid) dissolves in **excess** for aluminium ions / (precipitate/solid) remains in **excess** for calcium ions (1) 3rd mark dependent on first and/or second mark being awarded	 <u>both</u> (ions) form a **white** (1) {precipitate/solid} (1) allow 'both will turn white' for 1 mark allow 'more' for 'excess' ignore clear	**(3)**

(Total for Question 2 = 9 marks)

Question Number	Answer	Acceptable answers	Mark
3(a)	**D** the liquid oil is changed into a solid		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	**B** sodium hydroxide		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	An explanation linking any two of • tail / {hydrophobic / hydrocarbon } end into grease (1) • head / {anion / hydrophilic} end into water (1) • allows grease to mix with water when surrounded by soap (anions) / grease is surrounded by soap (1) • surface tension lowered (1)	allow correctly labelled diagram (2) head is soluble in water (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	propanoic (acid)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5$ (1) + H_2O (1) award one mark if incorrectly balanced	correct products but no / incorrect reactants shown (1) allow correct molecular formulae allow correct multiples ignore state symbols	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(d)	(making) fibres/fleece/clothing/ fabrics/bedding/computer mouse mats/yarns/ropes/safety belts/filters/insulating tape/wood finishes/(plastic) carrier bags	allow any named item of clothing	**(1)**

(Total for Question 3 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
4(a)	**D** aq l		**(1)**

Question Number	Answer	acceptable answers	Mark
4(b)	H^+ + OH^- (1) → H_2O (1)	LHS (1) RHS (1) ignore state symbols, even if incorrect. allow inclusion of spectator ions, Na^+ and Cl^-, if shown on both sides for one mark max	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	suitable acid-base indicator eg methyl orange, phenolphthalein	litmus reject universal indicator allow recognisable phonetic spelling	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	correct colour change for suitable indicator in 4(c)(i): methyl orange : yellow → orange/pink/red phenolphthalein : magenta/pink → colourless	 litmus : blue → red ignore clear	**(1)**

Link 4ci and 4cii together on e-Pen

Question Number	Answer	Acceptable answers	Mark
4(d)	rel mass NaOH = 23.0 + 16.0 + 1.00 (1) concentration = $\frac{20.0}{\text{formula mass}}$ x 1 (1)	(= 40.0) (1) 0.5 (mol dm^{-3}) without working (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(e)	moles of NaOH = $\frac{25.0 \times 1.50}{1000}$ (1) (= 0.0375 moles) ratio 1 : 1 / moles NaOH = moles HCl (1) conc of HCl = $\frac{0.0375 \times 1000}{30.0}$ (1) (= 1.25 (mol dm^{-3})) OR 25.0 x 1.50 = 30.0 x conc acid (2) conc of HCl = $\frac{25.0 \times 1.50}{30.0}$ (1) (=1.25 (mol dm^{-3}))	0.0375 (1) – without working shown conc of HCl = 1.25 (mol dm^{-3})(3) without any working shown allow ecf conc = $\frac{30.0 \times 1.50}{25.0}$ = 1.80 (2) (mol dm^{-3}) allow 0.00125 /0.125 / 12.5 max 2	**(3)**

(Total for Question 4 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
5(a)	improves resistance to corrosion	ignore rusting	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	An explanation to include • anode dissolves / half equation given / atoms lose electrons /copper becomes ions/copper (atoms) oxidised (1) • copper ions moving from anode to cathode (1) • copper plated on cathode / half equation given / ions gain electrons/copper ions reduced/copper ions form atoms (1) • {difference/0.2g} is impurities (1) • would expect same decrease in mass (as increase) (1)	ignore references to mass increase of cathode and mass decrease of anode ignore 'impure copper (ions)' for the second marking point allow difference is metal around it eaten away/ impurities/sludge fallen to bottom of container /under anode (1) (there needs to be a reference to the difference in electrode masses for this point)	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(c)	$2O^{2-} \rightarrow O_2 + 4e^{(-)}$ (2) OR $O^{2-} \rightarrow O + 2e^{(-)}$ (1) $2O \rightarrow O_2$ (1)	Unbalanced equation (1)	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(d)**	A description including some of the following points • sodium chloride is melted and ions are free to move at cathode • {sodium / positive} ions move to cathode • (sodium) metal forms at cathode • sodium ions gain electrons ... • to form atoms • this is reduction • $Na^+ + e^- \rightarrow Na$ at anode • {chloride / negative} ions move to anode • (chlorine) gas forms at anode • chloride ions lose electrons ... • to form atoms • this is oxidation • two chlorine atoms combine to form a chlorine molecule / share electrons • $Cl^- \rightarrow Cl + e^-$ / $2Cl^- \rightarrow Cl_2 + 2e^-$ • $2\,Cl \rightarrow Cl_2$	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description e.g. gives at least one relevant description or explanation • 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 e.g. for anode or cathode gives at least three descriptions or relevant explanations • 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 e.g. for both anode and cathode gives a total of at least five descriptions or relevant explanations • 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 5 = 12 marks)

Question Number	Answer	Acceptable answers	Mark
6(a)	**B** 200 cm^3		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)	65.0 g Zn produces 24 dm^3 H_2 (1) 13.0 g Zn produces $\frac{13.0}{65.0}$ x 24 (1) (= 4.8 dm^3 H_2)	$\frac{13.0}{65.0}$ mol Zn produces $\frac{13.0}{65.0}$ mol H_2 Vol of H_2 = $\frac{13.0}{65.0}$ x 24 (2) (= 4.8dm^3) 4.8 dm^3 (2) without working allow 65/13 x 24 (1) = 120dm^3 13/65 (1) x (1/24) = 0.00833 dm^3 0.2 anywhere 1 mark x 24 anywhere 1 mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(c)(i)	**D** natural gas		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(c)(ii)	An explanation linking forward and back reactions take place / reversible / dynamic (1) at the same rate / equilibrium (1)	dynamic equilibrium = 2 marks	 **(2)**

Question Number		Indicative Content	Mark
QWC	***6(d)**	A description including some of the following points Higher pressure: • higher pressure gives increased yield • equilibrium shifts to right hand side • because decrease in number of molecules going from left to right • therefore decrease in volume • favoured by increase in pressure • reaches equilibrium faster • because molecules closer together • so get more frequent collisions Higher temperature • higher temperature reaches equilibrium faster • because molecules move faster • therefore more frequent collisions • molecules have more energy • therefore more collisions have required energy • but yield will be lower • because higher temperature favours endothermic reaction • equilibrium shifts to left hand side • which is decomposition of ammonia / ammonia reforms elements Use of catalyst • catalyst causes reaction to reach equilibrium faster / catalyst increases rates (of both forward and back reactions) • *lowers the activation energy (of both forward and back reactions)* • *reaction follows a new pathway* • does not affect yield • equilibrium position not affected	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description e.g. one valid effect of change OR general comment indicating improved yield or faster rate • 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 e.g. at least two valid effects of change with one point of explanation OR at least three valid effects of change • 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 e.g. at least three valid effects of change with two points of explanation OR at least two valid effects with three points of explanation (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

(Total for Question 6 = 12 marks)