Mark Scheme (Results)

January 2019

Pearson Edexcel International
Advanced Subsidiary Level
In Chemistry (WCH03)
Paper 01 Chemistry Laboratory Skills I

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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.
- 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.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Question Number	Acceptable Answers	Reject	Mark
1(a)	Ammonia/NH_3 (1) NH_4^+ (1) IGNORE Ammonium	Ammonium / NH_4 NH_4	2

Question Number	Acceptable Answers	Reject	Mark
1(b)(i)	Silver bromide / AgBr If name and formula are given both must be correct		1

Question Number	Acceptable Answers	Reject	Mark
1(b)(ii)	$Ag^+(aq) + Br^-(aq) \rightarrow AgBr(s)$ All formulae correct (1) TE on halide in (b)(i) All state symbols correct (1) State symbols dependent on correct equation or very near miss.		2

Question Number	Acceptable Answers	Reject	Mark
1(b)(iii)	**Route 1** Precipitate does not dissolve / disappear in **dilute** (aqueous)ammonia / **dilute** NH_3((aq)) (1) Dissolves/disappears/soluble in **conc** ammonia / NH_3 ALLOW Partially dissolves (1) TE on wrong halide in (b)(i) If chloride: for soluble in dilute ammonia (1) If iodide: not soluble in dilute ammonia (1) not soluble in conc ammonia/ NH_3 (1) **Route 2** **MP1** Addition of **concentrated** sulfuric acid (1) **MP2** Brown/orange **and** fumes/gas given off (1) **MP2** depends on the use of sulfuric acid. Penalise missing concentrated or use of dilute sulfuric only in **MP1** TE on wrong halide in (b)(i)	Solution is soluble	2

(Total for Question 1 = 7 marks)

Question Number	Correct Answer	Reject	Mark
2(a)	B = Sulfuric acid / H_2SO_4 C = Sodium carbonate / Na_2CO_3 D = Hydrochloric acid / HCl ((aq)) E = Barium nitrate / $Ba(NO_3)_2$ 1 correct 1 mark 2 correct 2 mark All 4 correct 3 marks Penalise incorrect formulae only once($BaNO_3$ etc) Ignore state symbols even if incorrect		**3**

Question Number	Acceptable Answers	Reject	Mark
2(b)(i)	**MP1** (Dip clean) nichrome / platinum wire ALLOW NiCr for nichrome loop / rod for wire OR Silica rod (1) IGNORE inoculating / flame-test (wire) **MP2 (Mark independent of MP1)** in (concentrated) hydrochloric acid / HCl(aq) ALLOW any mention of HCl(aq) e.g. cleaning or mixing solid and acid or making a paste/solution HCl for HCl(aq) (1) IGNORE Dilute **MP3** then dipped in solid **and** placed in (hot / roaring / colourless / blue-cone) (Bunsen) **flame** ALLOW salt / compound / substance / paste /sample / solution for 'solid' On / over / under / near / show / above for 'in' (1)	Nickel / chrome / Chromium Spatula Splint Other acids Just 'Bunsen' Metal	**3**

Question Number	Acceptable Answers	Reject	Mark
2(b)(ii)	Barium nitrate: (pale / apple) Green (1) Sodium carbonate: (persistent) Yellow (1) ALLOW Orange or yellow-orange or golden yellow for sodium carbonate		**2**

(Total for Question 2 = 8 marks)

Question Number	Acceptable Answers	Reject	Mark
3(a)	**MP1**Starch (solution) (1) **MP2** (dark)blue-black / blue / black to colourless **MP2** dependent on starch indicator but if no indicator is given the correct colour change scores **MP2** IGNORE Clear	Purple / pale blue	2

Question Number	Acceptable Answers	Reject	Mark
3(b)(i)	<table><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>23.65</td><td>22.8(0)</td><td>23.2(0)</td><td>22.7(0)</td></tr></table> All four required.		1

Question Number	Acceptable Answers	Reject	Mark
3(b)(ii)	**MP1** Titres 2 and 4. OR Values (1) **MP2** They are concordant / within 0.2/0.1 cm^3 of each other (1) IGNORE Close / near/consistent If the wrong titres are selected **MP2** cannot be scored	Any difference less than 0.1 cm^3 or greater than 0.2 cm^3	2

Question Number	Acceptable Answers	Reject	Mark
3(b)(iii)	({22.80 + 22.70} / 2 =) 22.75 (cm^3) TE on titres selected in (b)(ii)		1

Question Number	Acceptable Answers	Reject	Mark
3(b)(iv)	Penalise 1 SF and / or incorrect rounding once only in (b)(iv) to (b)(vii) Do not penalise correct intermediate rounding If units are given they must be correct, but penalise once only. (22.75 x 0.0600/1000) = 1.365 x 10^{-3} (mol) / 0.001365(mol) TE from 3(b)(iii)		1

Question Number	Acceptable Answers	Reject	Mark
3(b)(v)	(1.365 x 10^{-3}/2 =) 6.825 x 10^{-4} / 0.0006825 (mol) TE from 3(b)(iv): 3(b)(iv) divided by 2		1

Question Number	Acceptable Answers	Reject	Mark
3(b)(vi)	(6.825 x 10^{-4} x 10 =) 6.825 x 10^{-3} (mol) / 0.006825(mol) TE from 3(b)(v): 3(b)(v) multiplied by 10		1

Question Number	Acceptable Answers	Reject	Mark
3(b)(vii)	(6.825 x 10^{-3} x 1000/10 =) 6.825 x 10^{-1} / 0.6825 (mol dm^{-3}) TE from 3(b)(vi): 3(b)(vi) multiplied by 100		1

Question Number	Acceptable Answers	Reject	Mark
3(c)	**Route 1** **MP1** Dissolve solid (in a beaker/conical flask) in distilled / deionised water (1) **MP2** Pour (the solution) into volumetric flask (using a funnel) **with** washings (1) **MP3** Make(the volumetric flask) up to the mark/specified volume e.g. 250cm^3 **and** shake (1) **Route 2** **MP1** Transfer solid to volumetric flask and add distilled / deionised water (1) **MP2** Dissolve and make up to the mark / specified volume e.g. 250cm^3 (1) **MP3** Shake the flask **MP3** dependent on solution previously being made up to the mark. ALLOW Any indication of mixing e.g. swirl / invert / stir	Any other liquid Titration description	3

(Total for Question 3 = 13 marks)

Question Number	Acceptable Answers	Reject	Mark
4(a)	Any **three** from Same amount / moles of solid or Same amount / moles metal oxide Or Same amount / moles of catalyst ALLOW Same mass (1) Same sized particles / same surface area ALLOW All powders (1) IGNORE All lumps or all granules Same sized solid Same physical state Same concentration of H_2O_2 (1) IGNORE Same amount/volume of hydrogen peroxide Same temperature (1) Same time to replace bung (1) IGNORE Same pressure Same conditions Same shaking Same light Same time	Same concentration of solid	3

Question Number	Acceptable Answers	Reject	Mark
4(b)	Volume / cm^3 (of oxygen /gas) (1) Time (1) The time taken to produce a certain / same volume (of oxygen) or The volume of (oxygen) produced in a certain time (2)	 Time for reaction to finish	2

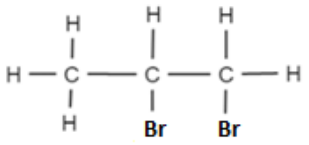
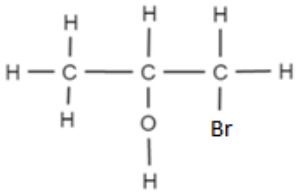
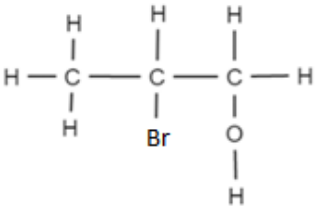
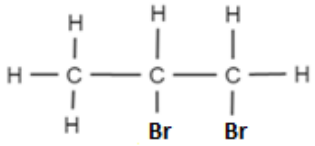
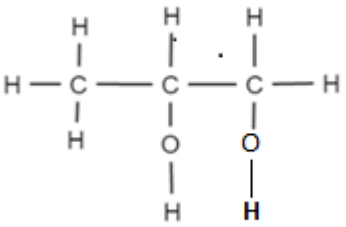
Question Number	Acceptable Answers	Reject	Mark
4(c)	Place solid into a small test tube / container (attached with thread) and knock it over	Any other method	1

Question Number	Acceptable Answers	Reject	Mark
4(d)	Weigh metal oxide before and after use (1) Filter/decant (and dry) OR compare masses (1) Measure change in mass of metal oxide before and after the experiment scores (2) OR Repeat experiment with different amounts of oxide (1) Compare (total) volume of oxygen given off (1) OR Repeat experiment with a non-oxide catalyst (1) Compare (total) volume of oxygen given off (1) OR If the oxide has lost oxygen the metal will remain. Look / test for the metal. Scores (1)	Carry out the experiment without the catalyst Heating the metal oxides and test for oxygen	2

(Total for Question 4) = 8 marks

Question Number	Acceptable Answers	Reject	Mark
5(a)	Reagent: (concentrated)Potassium hydroxide / KOH / sodium hydroxide / NaOH (1) Conditions: Alcoholic / ethanolic / ethanol / alcohol / alc (heat) (1) Conditions mark dependent on the correct reagent.	ethanoic	2

Question Number	Acceptable Answers	Reject	Mark
5(b)(i)	Bromine water / bromine dissolved in organic solvent (1) yellow / orange / brown **and** turns colourless/decolourises (1) OR Bromine/Br_2 (1) Red/ brown/red brown **and** turns colourless/decolourises (1) IGNORE Goes clear OR Acidified / H^+ / H_3O^+/ sulfuric acid / H_2SO_4 **and** $KMnO_4$ / MnO_4^- /potassium permanganate / manganate(VII) (1) Pink or purple **and** turns colourless / decolourises (1) IGNORE Goes clear Result dependent on correct reagent or very near miss such as missing out the acid with $KMnO_4$	Red UV light UV light Hydrochloric acid	2

Question Number	Acceptable Answers	Reject	Mark
5 (b)(ii)	For bromine / bromine in an organic solvent  For bromine water  OR  ALLOW  For potassium manganate(VII)  ALLOW Undisplayed methyl groups / OH groups / skeletal / structural formulae Connectivity of OH except if C—H—O	1,3—addition products	1

Question Number	Acceptable Answers	Reject	Mark
5(c)(i)	Observation : Steamy / white / misty **and** fumes / gas IGNORE Additional tests on HCl, even if incorrect Effervescence	Smoke	1

Question Number	Acceptable Answers	Reject	Mark
5(c)(ii)	<table><tr><th>Chemical</th><th>Hazard</th><th>Safety precaution</th></tr><tr><td rowspan="2">PCl_5</td><td>Toxic / poisonous OR</td><td>Fume cupboard/hood</td></tr><tr><td>Corrosive</td><td>Fume cupboard / hood or gloves</td></tr><tr><td rowspan="2">$CH_3CH_2CH_2OH$</td><td>Toxic / poisonous OR</td><td>Fume cupboard / hood</td></tr><tr><td>Flammable</td><td>No flames or alternative method of heating</td></tr><tr><td rowspan="2">HCl</td><td>Toxic / poisonous OR</td><td>Fume cupboard/hood</td></tr><tr><td>Corrosive</td><td>Fume cupboard / hood or gloves</td></tr></table> All 6 correct is 3 marks 4 or 5 correct is 2 marks 3 or 2 correct is 1 mark ALLOW Use of hazard symbol instead of stating the hazard. Safety precaution is dependent on the correct hazard or near miss such as: If multiple hazards are mentioned any wrong hazard negates a correct one.	Gas mask /do not breathe No Fire	3

Question Number	Acceptable Answers	Reject	Mark
5 (d)(i)	Orange to green ALLOW Orange to green-blue or Orange to blue		1

Question Number	Acceptable Answers	Reject	Mark
5 (d)(ii)	**MP1** Any heat source **and** round bottom / pear shaped flask ALLOW just arrow for heat / **hot** water bath/electric heater (1) IGNORE Lack of liquid in the flask **MP2** Correct condenser sloping downwards **and** with water entering at bottom and leaving at top ALLOW Just arrows for water direction (1) IGNORE Lack of obvious joint between flask and condenser (i.e. one piece apparatus) Length of the neck of the flask **MP3** Still head shut at the top (with a thermometer) **and** no obvious gaps between condenser and flask **and** a receiver (1) IGNORE Line between flask and condenser Ignore position of thermometer if drawn Lack or presence of anti bumping granules ALLOW Reflux apparatus can score **MP1** only.	Conical flask Sealed system or open vessel	3

Question Number	Acceptable Answers	Reject	Mark
5 (d)(iii)	No **peak / trough** due to the O-H / -OH / -O-H (absorption/stretch in alcohols) IGNORE reference to aldehyde group		1

Total for Question 5 = 14 marks

TOTAL FOR PAPER = 50 MARKS

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