Mark Scheme (Results)

October 2019

Pearson Edexcel International Advanced Level
In Chemistry (WCH13)
Paper 01 Practical Skills in Chemistry 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	Answer	Additional guidance	Mark
1(a)(i)	• Na^+/ $Na1^+$/ Na^{+1} •	Ignore sodium and sodium ion Ignore brackets Do not award Na	**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	• Oxygen / O_2 (1) • NO_3^- (1)	Do not award just O Allow O_2^{2-} / ClO_3^- / ClO_4^- / MnO_4^- Do not award NO_2^-/O^{2-}/O^-/ O_2^- Ignore nitrate((V)) / any names	**(2)**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	• Hydrogen / H_2 (1) • H^+ / H_3O^+ / H^{+1} / H^{1+} / ^+H (1)	Do not award just H Ignore names	**(2)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	• **M1** silver chloride / AgCl((s)) (1) • **M2** hydrochloric acid / HCl(aq) (1)	Do not award silver bromide Allow HCl / hydrogen chloride Ignore concentration of the acid Allow TE on HBr/hydrobromic acid if AgBr given as the ppt	**(2)**

(Total for Question 1 = 7 Marks)

Question Number	Answer	Additional guidance	Mark
2(a)	• HCl((aq)) / hydrogen chloride / hydrochloric acid	Ignore gas or fumes	**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)	• Carbon dioxide/CO_2	Ignore gas/ (g)	**(1)**

Question Number	Answer	Additional guidance	Mark
2(c)(i)	• C = CH_3CH_2COOH (1) • D = $CH_3CH_2CH_2OH$ (1)	Allow skeletal, displayed Ignore connectivity of the OH Allow (1) for two correct formulae with the incorrect number of carbon atoms Allow (1) for two correct formulae the wrong way round Ignore names even if incorrect	**(2)**

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	• E = CH_3CH_2CHO	Allow skeletal, displayed Ignore names even if incorrect	**(1)**

Question Number	Answer	Additional guidance	Mark
2(c)(iii)	An answer that makes reference to the following points: • test (1) • observation (1)	Example of test: Benedict's / Fehling's Ignore heat Red ppt / solid Allow brown or orange for red Allow Tollens'/silver mirror test Silver mirror / solid Award (1) for acidified dichromate(VI) turns green OR Bradys reagent gives red/orange/yellow **and** solid/precipitate **Allow TE** on propanone **only** in (c)(ii) Benedict's / Fehling's No reaction scores 1/2 Tollens'/silver mirror test No reaction scores 1/2 Acidified dichromate(VI) No reaction scores 1/2 Iodoform reaction Yellow ppt scores 2/2	**(2)**

Question Number	Answer	Additional guidance	Mark
2(d)(i)	An answer that makes reference to the following points: • **M1** mass/volume of water (1) • **M2** starting temperature of water **and** final temperature of water (1) • **M3** mass of burner at the start **and** mass of burner at the end (1)	Ignore any reference to the mass/volume at the end/during the experiment Allow the mass/volume of the beaker and the mass/volume of the beaker plus water Do not award just the amount of water Allow just temperature change/difference (of the water) Ignore any reference to the temperature during the experiment Allow just mass change of the alcohol burner Allow just mass of alcohol/C/D/E before and after heating Do not award measure the volume of the liquid in the burner at the start and end Ignore any reference to time/SHC of water Ignore any reference to liquids/alcohols instead of C, D or E	**(3)**

Question Number	Answer	Additional guidance	Mark
2(d)(ii)	An answer that makes reference to two of the following points: • putting a lid on the beaker (1) • putting a lid on the burner (before and after combustion) (1) • adding a draught shield around the apparatus / insulating the beaker (1) • using copper instead of a glass beaker (1)	Allow top or bung for lid Allow reweigh burner as soon as possible to prevent loss of liquid Do not award insulating the beaker with flammable material Do not award polystyrene cup Ignore any reference to changing apparatus or adding oxygen Ignore stirring the water Ignore changing the volumes of water Ignore burning more (or less) fuel Ignore not allowing the thermometer to touch the beaker Ignore distance of burner from the beaker Do not award drawing a temperature time graph Do not award a closed environment	**(2)**

(Total for Question 2 = 12 Marks)

Question Number	**Acceptable answers**	**Additional guidance**	**Mark**
3(a)	An answer that makes reference to one of the following points: • to ensure all the air / oxygen has been removed from the test tube or to ensure only / pure hydrogen is in the test tube or hydrogen-air mixture is explosive	Allow to give time for the hydrogen to fill the test tube Allow to prevent an explosion/blast Ignore just hydrogen is flammable / explosive Ignore any reference to hazards other than explosions	**(1)**

Question Number	**Answer**	**Additional guidance**	**Mark**
3(b)(i)	<table><tr><td>Measurement</td><td>Mass / g</td></tr><tr><td>Mass of test tube</td><td>40.27</td></tr><tr><td>Mass of test tube and copper oxide</td><td>43.42</td></tr><tr><td>Mass of test tube and copper</td><td>42.79</td></tr><tr><td>Mass of copper in copper oxide</td><td>2.52</td></tr><tr><td>Mass of oxygen in copper oxide</td><td>0.63</td></tr></table>	Both correct for the mark	**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	• **M1** calculation of moles of copper (1) • **M2** calculation of moles of oxygen (1) • **M3** (calculation of ratio 1:1) formula of copper oxide (1) **OR** • **M1** % of Cu and O (1) • **M2 %** divided by A_r (1)	Example of calculation: 2.52/63.5 = 0.039685/3.9685x10^{-2} Allow fractions Ignore rounding 0.63/16 = 0.039375/3.9375x10^{-2} Allow fractions Ignore rounding (0.039685/0.039375 = 1:1)CuO If the mole calculation is reversed only M3 can be awarded 2.52/3.15 x 100 = 80% 0.63/3.15 x 100 = 20% Ignore rounding 80/63.5 = 1.256984 20/16 = 1.25 Ignore rounding (1.26/1.25 =(1:1.(008)) CuO	**(3)**

	• **M3** (calculation of ratio 1:1) formula of copper oxide (1)	TE on incorrect masses and at each stage. Allow any correct rounding to whole numbers in **M3** Ignore SF (including 1 SF)	

Question Number	Answer	Additional guidance	Mark
3(c)(i)	• (pink / red copper) turns black/dark(er)/returns to its original colour	Do not award just turns brown Do not award duller	**(1)**

Question Number	Answer	Additional guidance	Mark
3(c)(ii)	An explanation that makes reference to the following points: • **M1** (it appeared that) less mass of oxygen/ less oxygen was lost or (it appeared that) more mass copper was present (1) **M2** because (some of) the copper has been reoxidised (to copper oxide)/now copper oxide not fully reduced or calculated ratio contained more copper / less oxygen or The formula of the oxide contained more copper eg Cu_2O (1)	Allow (some) copper oxide has been formed	**(2)**

(Total for Question 3 = 8 Marks)

Question Number	Acceptable answers	Additional guidance	Mark
4(a)	A description that makes reference to the following points: • **M1dissolve** solid in a beaker using distilled / deionised water (1) • **M2** use of volumetric flask (1) • **M3** add washings and make up to mark with distilled / deionised water (1) • **M4** mix the solution in the flask (1) If the solution is made up directly into the volumetric flask	Allow conical flask Allow solid disappears Do not award test-tube Do not award if no vessel mentioned Distilled / deionised water only needs to be mentioned once for M1 and M3 Do not award just pure water Allow volume flask Can be shown in an unlabelled diagram Do not award if the solution is filtered into the volumetric flask Allow any indication of mixing e.g. invert / shake / swirl If M3 is scored M4 must follow M3. Ignore any mention of weighing Distilled / deionised water only needs to be mentioned once for M1 and M3 Do not award just pure water	**(4)**

	• **M1dissolve** solid using distilled / deionised water (1) • **M2** in a volumetric flask (1) • **M3** rinse weighing boat/ funnel and make up to mark with distilled / deionised water (1) • **M4** mix the solution in the flask (1)	Allow any indication of mixing e.g. invert / shake / swirl If M3 is scored M4 must follow M3. Ignore any mention of weighing	

Question Number	Acceptable answers	Additional guidance	Mark
4(b)(i)	• colourless to (pale) pink	Both colours required Do not award red Ignore clear	**(1)**

Question Number	Acceptable answers	Additional guidance	Mark
4(b)(ii)	• (11.90 + 11.70/2) = 11.8(0) (cm^3)		**(1)**

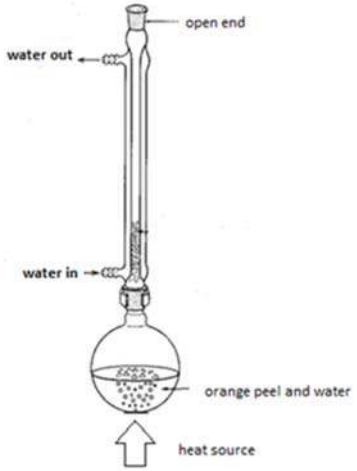
Question Number	**Acceptable answers**	**Additional guidance**	**Mark**
4(b)(iii)	• calculation of moles of NaOH (1) • calculation of moles of H_2X in 25 cm^3 (1) • calculation of moles of H_2X in 250 cm^3 (1)	Example of calculation: (11.80 x 0.213 / 1000) = 2.5134 $x10^{-3}$ / 0.0025134 (mol) 2.5134 $x10^{-3}$ /2 = 1.2567 $x10^{-3}$/ 0.0012567 (mol) 1.2567 $x10^{-3}$ x 10 = 1.2567 $x10^{-2}$ / 0.012567 (mol) Allow TE for each stage Ignore incorrect rounding throughout Ignore SF except 1SF Correct answer with or without working scores 3	**(3)**

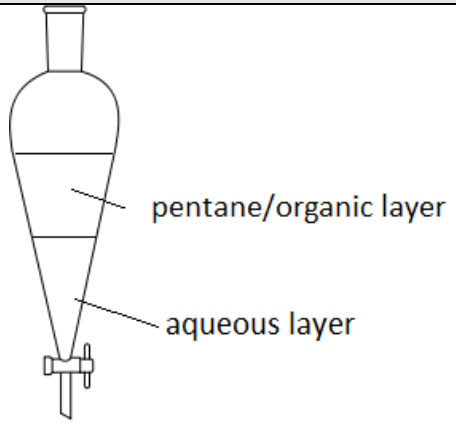
Question Number	**Acceptable answers**	**Additional guidance**	**Mark**
4(b)(iv)	• correct expression (1) • molar mass to 2 or 3 SF (1)	Example of calculation: 1.13 / 1.2567 x10^{-2} (= 89.918) = 90 / 89.9 Allow TE from (b)(iii) Allow commas for decimal points Answer must be to 2 or 3 SF Correct answer with or without working scores 2 Ignore units even if incorrect	**(2)**

Question Number	**Answer**	**Additional guidance**	**Mark**
4(c)(i)	• calculation of percentage uncertainty	Example of calculation: $\frac{0.05 \times 2}{11.70} \times 100 = 0.8547$ (%) = (+/-) 0.9 / 0.85/0.855 (%) IGNORE SF Do not award 0.86% This is the only place where we penalise incorrect rounding in the paper	**(1)**

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	An answer that makes reference to the following points: • **M1** use a more dilute solution of NaOH or use a greater mass of the acid (1) • **M2** To make titration reading larger (and so reduce the % error) (1)	Allow use a greater volume of **acid** Allow just using larger volume Ignore any references to correct procedure	**(2)**

(Total for question 4 = 14 Marks)

Question Number	Answer	Additional guidance	Mark
5(a)	• **M1** round-bottomed / pear shaped flask containing mixture **and** heat (1) • **M2** vertical condenser with water jacket **and** water flowing in the correct direction (1) • **M3** no gaps and open condenser and apparatus would work (1)	Example of diagram:  M1 Allow unlabelled arrow for heat/ electrical heater Do not award conical flask/flask with no liquid in Ignore anti bumping granules M2 The water in and water out do not have to be at the ends of the condenser. M3 Ignore thermometer in the top of the condenser if it does not seal the apparatus. Do not award if the condenser and flask are one piece of apparatus Allow just M2 for distillation apparatus with correct condenser and water flow	**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)		Allow for the top layer pentane and limonene or just limonene Allow the top layer to fill the funnel Allow water for the bottom layer Do not allow water and limonene for the bottom layer Do not award more than 2 layers Both layers must be labelled	(1)

Question Number	Answer	Additional guidance	Mark
5 (b)(ii)	Any **two** from; • shake / invert (and release the pressure) (1) • (allow to settle) and run off the lower aqueous layer (1) • Run off or pour out the pentane layer (into a fresh container) (1)	 Allow TE on incorrect layers in (b)(i) Do no award if the upper layer is decanted off or pipetted out. Do not award if there is no indication of the nature of the layer being run off (or the one left behind) Ignore subsequent distillation/drying etc	**(2)**

Question Number	Answer	Additional guidance	Mark
5(c)	• calculation of percentage of limonene in the orange peel	Example of calculation: $\frac{150 \times 10^{-3}}{23} \times 100$ = 0.65217 (%)/ 6.5217 x10^{-1} Ignore SF Ignore rounding errors Correct answer with or without working scores the mark.	**(1)**

Question Number	Answer	Additional guidance	Mark
5(d)	• calculation of mol of bromine (1) • (calculation of the ratio of limonene to bromine)and state the number of C=C in limonene (1)	Example of calculation: mol of Br_2 = 0.32 / 160 = 0.002/2.0 $X10^{-3}$ (ratio of mol of limonene to bromine is 1:2) 2 alkene / C=C per molecule of limonene Allow 1 limonene molecule contains a triple bond	**(2)**

(Total for question 5 = 9 Marks)

(TOTAL FOR PAPER 50 MARKS)

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