GradeMax

Pearson

Mark Scheme (Results)

January 2026

Pearson Edexcel International Advanced Level in Chemistry
Paper 01: Practical Skills in Chemistry II

WCH16/01

GradeMax

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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.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of 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	Additional Guidance	Mark
1(a)(i)	An answer that makes reference to the following points: • (addition of) sodium hydroxide (solution) or (addition of) ammonia (solution) **(1)** • Fe^{2+}: green precipitate (insoluble in excess / turning brown in air) **(1)** • Cr^{3+}: green precipitate that dissolves in excess **(1)**	Results (M2 and M3) dependent upon test (M1) throughout Allow (addition of aqueous) hydroxide ions / OH^- (aq) Allow near misspellings for precipitate Allow ppt / ppte / solid throughout Allow "green precipitate dissolves" only if "excess" identified as part of M1 or M2 Ignore colour of final solution	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	An answer that makes reference to the following points: • Fehling's solutions / Benedict's solution (and heat) **(1)** • pentan-3-one: solution remains blue **(1)** • pentanal: red precipitate / solid **(1)** or • Tollens' reagent / ammoniacal silver nitrate (and heat) **(1)** • pentan-3-one: no observation / no silver mirror **(1)** • pentanal: silver mirror / silver precipitate / silver solid **(1)** or • acidified (potassium) dichromate(VI) (and heat) **(1)** • pentan-3-one: solution remains orange **(1)** • pentanal: solution turns green **(1)**	Results (M2 and M3) dependent upon Test (M1) throughout Allow no change / no reaction Allow no change / no reaction Allow $Cr_2O_7^{2-}$ **and** H^+ Allow no change / no reaction Allow turns blue Allow up to 2 marks for: (addition of) 2,4-DNPH (1) (pentan-3-one and pentanal) precipitates with different melting temperatures (1)	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	An answer that makes reference to the following points: • (addition) iodine (solution) and alkali / sodium hydroxide solution **(1)** • CH_3CHO: (pale) yellow crystals / precipitate **(1)** • CH_3CH_2CHO: no observation **(1)**	Results (M2 and M3) dependent upon test (M1) throughout Allow iodoform test Allow (solution of) potassium iodide and (sodium) chlorate(I) Allow antiseptic smell Allow no change / no reaction Allow up to 2 marks only if not used as test in (a)(ii) for: (addition of) 2,4-DNPH (1) (CH_3CHO and CH_3CH_2CHO) precipitates with different melting temperatures (1)	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(b)	An answer that makes reference to the following points: |	2,2-dimethylpropan-2-ol	butan-2-ol
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Number of peaks	2	5
Relative peak areas	9:1	3:2:1:1:3		All 4 correct score 2 2-3 correct score 1 Allow numbers for relative peak areas in any order	**(2)**

(Total for Question 1 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	An answer that makes reference to the following point: • (from) orange to green	Allow (from) orange (to green) to blue	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	An explanation that makes reference to the following points: • vapour condenses / turns into a liquid (due to the cold water) **and** returns to the flask / reaction mixture **(1)** • so ethanol is fully converted into ethanoic acid or so that complete / further oxidation can occur **(1)**	Allow vapour condenses **and** prevents loss of reactant (ethanol) / product (ethanoic acid / ethanal) Allow so ethanal is not formed / ethanal is converted into ethanoic acid Allow so partial oxidation does not occur Allow so reaction is complete Allow descriptions of reaction needing continuous heating / time to complete	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	A description that makes reference to the following points: (ethanoic acid will) • (show an absorption / peak for) O−H (stretching vibration in carboxylic acids) between 3300 − 2500 cm^{-1} **(1)** • (show an absorption / peak for) C=O (stretching vibration in carboxylic acids) between 1725 − 1700 cm^{-1} **(1)**	Allow a specific wavenumber between 3200 and 2500 cm^{-1} Allow **no** absorption / peak for O−H (stretching vibration) between 3750 − 3200 cm^{-1} Allow a specific wavenumber between 1725 and 1700 cm^{-1} If no other mark awarded, allow 1 mark for only identifying the correct absorption data ranges	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	An answer that makes reference to the following point: • (volumetric) pipette	 Allow burette Do not award teat / dropping pipette / measuring cylinder	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An answer that makes reference to the following point: • (otherwise) the sodium hydroxide solution (in the burette) would be diluted	 Allow to remove any remaining (distilled) water Allow description of sodium hydroxide as the solution which is being used in the titration / burette Reject answers with incorrect chemistry e.g. decrease titre, increase concentration	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	An answer that makes reference to the following point: • smaller portions / volumes must be added as the pH change becomes greater or using (equally) large portions (of sodium hydroxide) would miss the end-point / equivalence point of the titration	Allow larger portions / volumes are added when the pH does not change very much Allow descriptions of using smaller portions (of sodium hydroxide) to ensure that the end-point / equivalence point of the titration is not missed	**(1)**

Question Number	Answer		Additional Guidance	Mark
2(c)(ii)	An answer that makes reference to the following points:			**(3)**
	• pH = 4.8 (at half equivalence / 10 cm^3)	**(1)**	Allow pH in range of 4.5 − 5.0 Accept correct pH value identified on graph	
	• K_a = ($10^{-4.8}$ =) 1.5849×10^{-5} (mol dm^{-3})	**(1)**	For pH 4.5, $K_a = 3.1623 \times 10^{-5}$ (mol dm^{-3}) For pH 5.0, $K_a = 1 \times 10^{-5}$ (mol dm^{-3}) Allow TE from incorrect pH Ignore SF	
	• when the acid is half-neutralised, pK_a = pH	**(1)**	Accept [CH_3COONa] = [CH_3COOH] at 10 cm^3 Allow pK_a = pH at half of volume for (complete) neutralisation / equivalence	

Question Number	Answer	Additional Guidance	Mark
2(d)(i)	An answer that makes reference to the following points: • propan-1-ol (and ethanoic acid) **(1)** • in the presence of (concentrated) sulfuric acid / H_2SO_4 (catalyst) **and** heat / warm / reflux **(1)**	Ignore formulae Allow name / formula of any strong acid	**(2)**

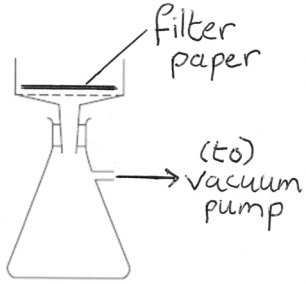
Question Number	Answer	Additional Guidance	Mark
2(d)(ii)	• balanced equation **(1)**	e.g. $CH_3COOH + CH_3CH_2CH_2OH \rightleftharpoons CH_3COOCH_2CH_2CH_3 + H_2O$ Allow → Allow displayed, structural or skeletal formula Ignore state symbols even if incorrect	**(1)**

(Total for Question 2 = 14 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	An explanation that makes reference to the following points: • use an ice bath (to cool the reaction mixture / reactants) **(1)** • add (the sodium nitrite to the mixture) gradually / slowly / dropwise **(1)** • use a thermometer / temperature probe to check the temperature (does not exceed 10 °C) **(1)**	Allow just ice Allow ice and salt mixture Allow use thermometer to monitor the temperature	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	• phenol and N_2 on the RHS **(1)** • rest of the equation correct **(1)**	Example of equation $C_6H_5N_2^+ + H_2O \rightarrow C_6H_5OH + N_2 + H^+$ Allow skeletal / displayed formulae Allow $C_6H_5N_2Cl + H_2O \rightarrow C_6H_5OH + N_2 + HCl$ M2 dependent on M1	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	An explanation that makes reference to two of the following points: • (solvent must) dissolve 4-hydroxyazobenzene at high temperatures / when solvent is hot **(1)** • 4-hydroxyazobenzene must have low solubility in the solvent at low temperature / when solvent is cold **(1)** • solvent must not react with 4-hydroxyazobenzene **(1)**	4-hydroxyazobenzene **only** dissolves when solvent is hot scores M1 only Allow insoluble Ignore references to cost / toxicity / volatility / polarity / intermolecular forces	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	• horizontal line in funnel, labelled as filter paper **(1)** • side arm of flask labelled (to) vacuum pump **(1)**	<u>Example of labelled completed diagram</u>  Allow labels of low pressure / water pump / water aspirator	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	An explanation that makes reference to the following points: • (washed with solvent) to remove soluble impurities (from the crystals / 4-hydroxyazobenzene) **(1)** • (solvent is cold) to prevent the crystals dissolving / reduce loss of crystals **(1)**	Ignore name of solvent throughout	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iv)	An answer that makes reference to the following point: • pure compounds have a sharp melting temperature / melt over a narrow temperature range	Accept reverse argument Allow compare the closeness of the melting temperature of the 4-hydroxyazobenzene with a data book value	**(1)**

(Total for Question 3 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	An answer that makes reference to two of the following points: • brown fumes / gas / vapour • condensation seen at the top of the test tube • solid dissolves (in water of crystallisation)	 Allow any shade of brown e.g. pale brown Do not award brown smoke Ignore formulae or names of gases Allow cloudy / misty / steamy fumes Ignore water vapour Ignore change in amount / volume of solid Ignore change in colour Ignore effervescence / bubbling	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	An answer that makes reference to the following point: • oxidising (agent)	Allow oxidant / oxidiser Allow oxidising agent that causes flammability Ignore assists combustion Do not award oxidative Do not award oxidable Do not award flammable	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	An answer that makes reference to the following point: • glowing splint relights / rekindles		**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	An answer that makes reference to the following points: • (risk of) contact between the splint and the oxidising agent / metal nitrate **(1)** • (splint will) burn / combust uncontrollably **(1)**	Accept charcoal / parts of splint falling on metal nitrate Allow (splint will) catch fire / react vigorously TE if flammable identified in 4bi M1 – contact between splint and metal nitrate M2 – metal nitrate will burn / combust	**(2)**

Question Number	Answer		Additional Guidance	Mark
4(c)(i)			Correct answer with some working scores 5 marks TE throughout	**(5)**
	• calculation of moles of NO_2 and O_2	**(1)**	<u>Example of calculation</u> n = (436 ÷ 24000 =) 0.018167 (mol)	
	• the ratio of metal nitrate to gaseous NO_2 and O_2	**(1)**	1:2.5	
	• calculation of moles of hydrated metal nitrate	**(1)**	n = (0.018167 ÷ 2.5 =) 7.2667×10^{-3} (mol)	
	• calculation of molar mass of hydrated metal nitrate	**(1)**	M_r = (2.16 ÷ 7.2667×10^{-3} =) 297.25	
	• calculation of relative atomic mass of M	**(1)**	A_r = (297.3 – 28 – 96 – 108 =) 65.25 Relative atomic mass must be given to at least 1dp	
	Alternative method • calculation of volume of NO_2 / volume of O_2	**(1)**	<u>Example of calculation</u> volume of NO_2 = (436 × 0.8 =) 348.8 (cm^3) or volume of O_2 = (436 × 0.2 =) 87.2 (cm^3)	
	• calculation of moles of NO_2 / moles of O_2	**(1)**	moles of NO_2 = (348.8 ÷ 24000 =) 0.014533 (mol) or moles of O_2 = (87.2 ÷ 24000 =) 0.0036333 (mol)	
	• calculation of moles of hydrated metal nitrate	**(1)**	n = (0.014533 ÷ 2 =) 7.2667×10^{-3} (mol) or n = (0.0036333 × 2 =) 7.2667×10^{-3} (mol)	
	• calculation of molar mass of hydrated metal nitrate	**(1)**	M_r = (2.16 ÷ 7.2667×10^{-3} =) 297.25	
	• calculation of relative atomic mass of M	**(1)**	A_r = (297.3 – 28 – 96 – 108 =) 65.25 Relative atomic mass must be given to at least 1dp	

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	An answer that makes reference to the following points: • zinc / Zn **(1)** • white / colourless (crystals) **(1)**	Allow TE on answer from (c)(i) provided a d-block element is identified e.g. copper and green / blue	**(2)**

(Total for Question 4 = 13 marks)

TOTAL FOR PAPER = 50 MARKS