GradeMax

Pearson

Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced Level in Chemistry
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: • two correct liquids **(1)** • third correct liquid **(1)** Result of the positive test • orange / red / yellow precipitate formed **(1)**	Pentan-3-one, propanal, and propanone Accept name or formulae but if both given both must be correct Allow misspelling of precipitate Allow ppt / ppte / solid throughout	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	An answer that makes reference to the following points: **Test 1** Any test to identify **propanal** • Tollens' / ammoniacal silver nitrate **(1)** • propanal gives a silver mirror **(1)** **OR** • Benedict's / Fehling's **(1)** • a blue (solution) gives a (brick) red precipitate with propanal **(1)** **OR** • (heat) sodium / potassium dichromate(VI) **and** (dilute) sulfuric acid **(1)** • turns (from orange to) green with propanal **(1)** **Test 2** The test to identify **propanone** • iodine and sodium hydroxide **(1)** • propanone gives (pale) yellow solid / crystals / precipitate **(1)**	Allow tests in either order Observation mark depends on correct reagent(s) or near miss Allow $Cr_2O_7^{2-}$ / H^+ Allow acidified for sulfuric acid Do not award **concentrated** sulfuric acid Do not award hydrochloric acid Allow blue Allow iodine and alkali Allow KI and chlorate(I)/ClO^- Ignore Iodoform test Allow just antiseptic smell	**(4)**

Question Number	Answer		Additional Guidance	Mark
1(b)	An explanation that makes reference to the following points: Any test to distinguish between propan-1-ol and propanoic acid • any indicator e.g. blue litmus	**(1)**	Do not award a test already mentioned (a) Do not award PCl_5 Ignore pH meter (not a chemical test) Do not award addition of sodium	**(2)**
	• propanoic acid turns red	**(1)**	Allow reverse argument	
	OR • addition of Mg / any carbonate / any hydrogencarbonate	**(1)**		
	• effervescence / bubbles with propanoic acid	**(1)**	Allow additional reactions on gas produced e.g. limewater cloudy if they have not mentioned bubbles Allow reverse argument	
	OR • (heat) sodium / potassium dichromate(VI) **and** (dilute) sulfuric acid	**(1)**		
	• turns (from orange to) green with propan-1-ol	**(1)**	Allow $Cr_2O_7^{2-}$ / H^+ Allow acidified for sulfuric acid	
	OR • addition of any carboxylic acid and (conc) sulfuric acid	**(1)**	Allow reverse argument	
	• sweet / fruity ester smell with propan-1-ol	**(1)**		
	OR • addition of any alcohol acid **and** (conc) sulfuric acid	**(1)**	Allow reverse argument	
	• sweet / fruity ester smell with propanoic acid	**(1)**	Allow reverse argument	

Question Number	Answer	Additional Guidance	Mark
1(c)	An answer that makes reference to the following points: • pentan-3-one / $CH_3CH_2COCH_2CH_3$ **(1)** • (there are 2 sets of peaks so) 2 proton/hydrogen environments **(1)** • the CH_3 is a triplet **and** the CH_2 is a quartet **(1)**	Allow CH_3 split three times **and** CH_2 split four times This can be shown by a labelled formula Ignore any reference to peak areas, ppm or n+1 rule	**(3)**

(Total for Question 1 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	An answer that makes reference to the following points: • using a teat pipette / dropping pipette **(1)** • added dropwise / drop by drop (at the beginning) **(1)**	Allow use a burette Allow dropper Ignore just **pipette** but it will allow access to M2 Ignore slowly and shaking	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	A description that makes reference to the following points: • white **and** precipitate / solid **(1)** • precipitate dissolves (in excess solution) **(1)**	Allow ppt / ppte / solid throughout Ignore any descriptors e.g. gelatinous Allow forms colourless solution Ignore just turns colourless Ignore disappears	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	An answer that makes reference to the following point: • white and precipitate / solid	 Allow ppt / ppte / solid throughout Ignore formulae Do not award if any additional observations are given e.g. bubbles	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An answer that makes reference to the following point: • sulfuric acid contains sulfate/ SO_4^{2-} ions (so the test would always give a positive result even if the compound being tested was not a sulfate)	Allow barium chloride would react with the sulfuric acid giving a (white) ppt	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	An answer that makes reference to the following points: • **A** (high resistance) voltmeter • **B** copper/ Cu • **C** $Cu^{2+}(aq)$ • **D** $Zn^{2+}(aq)$ **(2)**	All 4 correct = 2 marks 2-3 correct = 1 mark Ignore any reference to anode/cathode Allow copper((II)) sulfate solution / $CuSO_4(aq)$ Allow any soluble copper (II) salts eg $CuCl_2$ (aq) Allow zinc sulfate solution / $ZnSO_4$ (aq) Allow any soluble zinc salts eg $ZnCl_2$ (aq) Ignore just copper/ zinc ions Penalise lack of aq/ solutions once only in C and D	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	A description that makes reference to the following points: • (strip of) filter paper (cut to size) **(1)** • dipped into a (saturated) **solution** of potassium nitrate / KNO_3 **(aq)/ aqueous** **(1)**	Allow any sensible material e.g. tissue paper Allow KCl/$NaNO_3$ Allow soaked in KNO_3 Do not award liquid KNO_3 If name and formula are given both must be correct Allow a gel / agar in a tube and containing KNO_3(aq) scores 2	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(iii)	An answer that makes reference to the following point: • $Cu^{2+}(aq) + Zn(s) \rightarrow Cu(s) + Zn^{2+}(aq)$	Allow a balanced equation using any soluble copper (II) salts eg $CuCl_2$ (aq) Do not award $\rightleftharpoons$	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(i)	An answer that makes reference to the following points: • toxic **and** oxidising (agent)	 Allow poisonous Ignore harmful/ lethal Allow oxidant / oxidiser Ignore causes flammability/things to burn Do not award flammable Do not award oxidative/ oxidised/ oxidation Do not award combustion adjuvant Ignore the order	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(ii)	An answer that makes reference to the following point: • (carry out in a / use a) fume cupboard	Allow fume hood Allow keep away from flammable substances Ignore open space Ignore gloves/ masks/ goggles/lab coat/ ventilated room	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(iii)	An answer that makes reference to the following points: • starch **(1)** • blue-black to colourless **(1)**	Allow blue or black to colourless M2 dependent on M1	**(2)**

Question Number	Answer		Additional Guidance	Mark
2(d)(iv)	• moles of thiosulfate in mean titre	**(1)**	Example of calculation $n = 23.70 \times 0.038 / 1000 = 9.006 \times 10^{-4} / 0.0009006$ (mol)	**(5)**
	• moles of Cu^{2+} in 25.0 cm^3 of solution	**(1)**	n (2:1:2) = $9.006 \times 10^{-4} / 0.0009006$ (mol) This may be shown by x 2 and ÷ 2	
	• moles of Cu^{2+} in 250 cm^3 of solution	**(1)**	$n = 9.006 \times 10^{-3} / 0.009006$ (mol)	
	• mass of copper in the brass screw	**(1)**	$m = 63.5 \times 9.006 \times 10^{-3} = 0.57188$ (g)	
	• % of copper in the brass screw	**(1)**	% = 0.57188 ÷ 0.88 × 100 = 64.986 % / 65% Ignore SF except 1SF in the final answer TE throughout unless percentage greater than 100% Correct answer with **some** working scores 5	

(Total for Question 2 = 20 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• moles of calcium carbonate **and** moles of HCl at the start **(1)** • moles of HCl in excess **(1)**	Example of calculation $0.2 \div 100.1 = 0.001998 / 1.998 \times 10^{-3} / 0.002$ (mol) Accept $M_r = 100$ $50 \times 1 / 1000 = 0.05$ (mol) $0.05 - (0.002 \times 2) = 0.046$ (mol) Ignore SF except 1 SF in the final answer Final answer with or without working scores 2	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An answer that makes reference to the following point: • measuring cylinder	Ignore any volume of the measuring cylinder e.g. 50 cm^3 Do not award a burette / pipette / conical flask / beaker	**(1)**

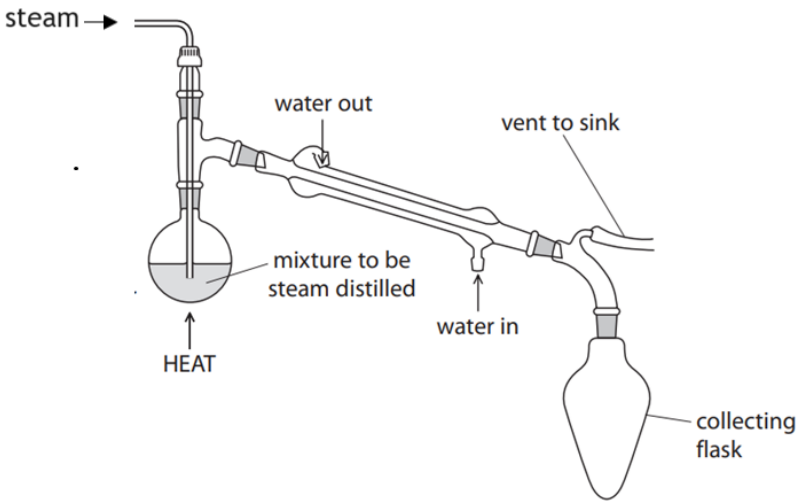
Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	An answer that makes reference to the following point: • bubbles stop being produced / effervescence stops **Or** solid (reacts and) disappears	Ignore no more gas produced Allow solid dissolves (completely) Allow the $CaCO_3$ has dissolved / disappeared Do not award additional incorrect observations	**(1)**

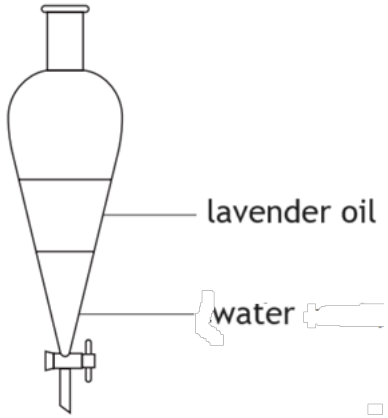
Question Number	Answer		Additional Guidance	Mark
3(b)	An explanation that makes reference to the following points: • (in all runs the) same amount of $CaCO_3$ is reacting • the shorter the time the faster the rate (so 1/t is a quantitative way to compare rates)	**(1)** **(1)**	Allow the concentration of the reactants is (effectively) constant Allow the concentration of HCl/ $CaCO_3$ is (effectively) constant Allow the only variable is the temperature Allow the larger the value of 1/t the faster the rate Allow reverse argument Ignore 1/t is directly proportional to rate Ignore t is inversely proportional to rate	**(2)**

Question Number	Answer		Additional Guidance	Mark
3(c)	An explanation that makes reference to the following points: • graph of ln 1/t against 1/T • draw/plot a line (of best fit) • calculate the (negative) gradient (of the line) • multiply the gradient by the gas constant /(−) R (to get E_a)	**(1)** **(1)** **(1)** **(1)**	Allow ln K for ln1/t Do not award ln 1/T Do not award 1/t for 1/T Ignore + or - gradient Allow gradient = $-E_a/R$	**(4)**

(Total for Question 3 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	An answer that makes reference to the following point: • pestle **and** mortar	Comment Be lenient with spellings Do not award grinder	**(1)**

Question Number	Answer		Additional Guidance	Mark
4(b)	An answer that makes reference to the following points:  			**(3)**
	• steam entering the flask and going into a liquid	**(1)**	Allow a steam generator	
	• round bottomed or pear-shaped flask	**(1)**	Ignore anti bumping granules	
	• flask being heated and the apparatus has no gaps and would work.	**(1)**	Allow Bunsen burner for heat Ignore thermometer if it is sealed If steam is not entering the flask score (0)	

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	An answer that makes reference to the following points:  • two layers labelled the correct way round **(1)** • upper layer has a line at the top **(1)**	If layers are reversed score 1 Allow organic layer Accept aqueous layer Ignore any shading	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	An answer that makes reference to the following points: • it is cloudy because it contains water/moisture **(1)** • add (a drying agent such as ((anhydrous)) calcium chloride / $CaCl_2$ / magnesium sulfate / $MgSO_4$ / calcium sulfate $CaSO_4$ **(1)**	Allow it is immiscible with water Ignore it is hydrated Allow silica gel Do not award copper(II) sulfate Do not award conc sulfuric acid	**(2)**

(Total for Question 4 = 8 marks)
TOTAL FOR PAPER = 50 MARKS