Pearson

Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced Subsidiary Level in Chemistry
WCH13/01A

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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)	A description that makes reference to the following points: **M1** – nichrome wire **(1)** **M2** – use of (concentrated) hydrochloric acid/HCl((aq)) **(1)** **M3** – transfer of sample to wire **and** placement in hot/roaring/colourless/blue/non-luminous **flame** **(1)** **M4** (expected result) – (apple) green **(1)**	Allow loop or rod for wire Accept nickel-chromium (alloy)/NiCr wire Allow platinum/Pt wire Allow silica rod Ignore wooden splint Do not award just nickel/Ni or chromium/Cr wire Do not award inoculating loop / sterilising wire Allow any reasonable use of HCl((aq)), eg in cleaning of wire / in making a paste / solution Do not award any other acid Allow 'air-hole open' for descriptor of flame Allow solid / barium nitrate/$Ba(NO_3)_2$/ salt / compound /substance/powder/paste/solution for sample Allow any suitable method of transferring sample to the wire, e.g. dipping wire in sample Allow on/over/under/near/show/above for "in" flame Ignore spray solution in flame Do not award fire / burn Ignore shades Allow colour written in the text above 'expected result'	**4**

Question Number	Answer	Additional Guidance	Mark
1(b)	An answer that makes reference to the following points: Either • (substance) cobalt chloride / $CoCl_2$ (paper) **(1)** • (colour change) blue to pink **(1)** or • (substance) **anhydrous** copper(II) sulfate/ $CuSO_4$ **(1)** • (colour change) white to blue **(1)**	If name and formula given, then both must be correct If name and formula given, then both must be correct M2 dependent on M1 or near miss e.g. copper (II) sulfate white to blue would score (1)	**(2)**

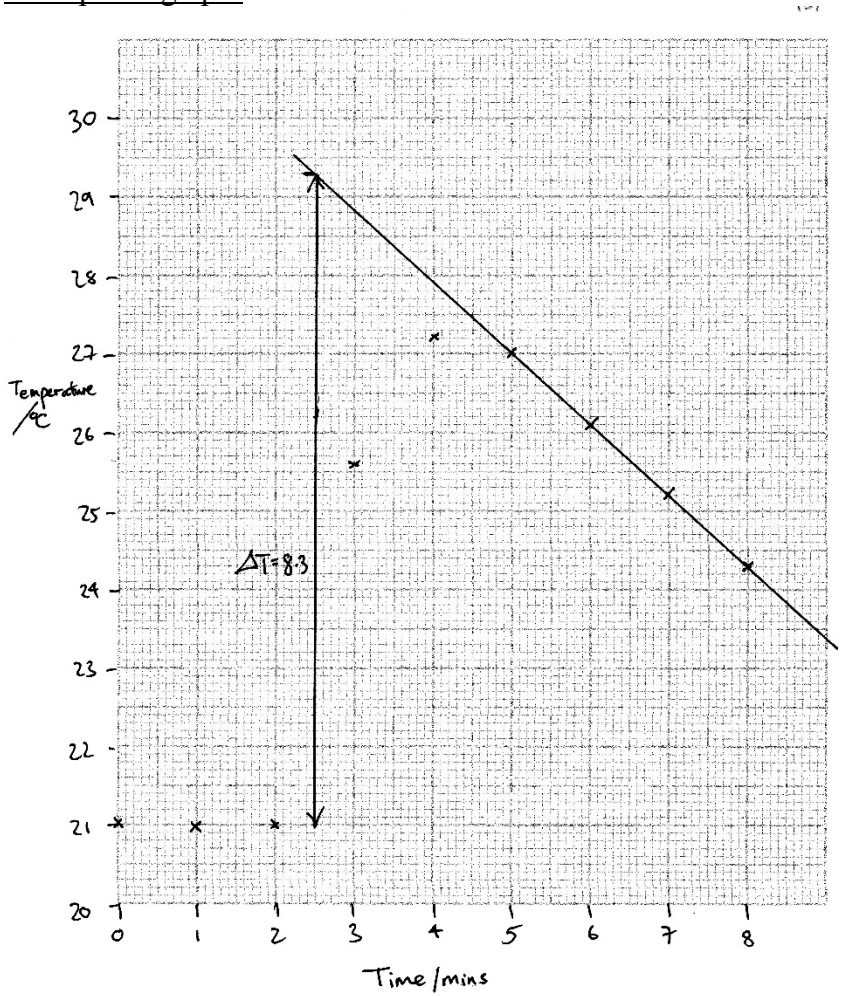
Question Number	Answer	Additional Guidance	Mark
1(c)(i)	An answer that makes reference to the following points: (identity of substance and colour change) • nitrogen dioxide/ nitrogen(IV) oxide / NO_2 **and** brown	If name and formula are given, then both must be correct Do not award any other colours	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	An answer that makes reference to the following points: (identity of gas and colour) • oxygen / O_2 **and** relights a glowing splint / wood	If name and formula are given, then both must be correct Allow rekindles / (re)ignites Allow smouldering for glowing There must be some reference to the splint having been recently extinguished and showing embers. If the gases in (i) and (ii) are correctly identified but the colours are wrong then award (1) mark for 1(c)(i)	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(d)	• equation	Examples of equation $(Ba(NO_3)_2 \cdot 2H_2O \rightarrow)\ BaO + 2NO_2 + \frac{1}{2}O_2 + 2H_2O$ $2(Ba(NO_3)_2 \cdot 2H_2O \rightarrow)\ 2BaO + 4NO_2 + O_2 + 4H_2O$ Ignore state symbols even if incorrect Allow multiples if the candidate has put a number in front of the $Ba(NO_3)_2 \cdot 2H_2O$	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(e)	An answer that makes reference to the following points: (formula) • SO_4^{2-} **(1)** (positive test result) • white precipitate / white solid **(1)**	Mark independently Ignore name Allow ionic equations that include SO_4^{2-} Do not award other ionic equations Allow white ppt(e) Do not award if other chemical tests are mentioned If the precipitate is given as AgCl do not award this mark	**(2)**

(Total for Question 1 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	• axes correct way round and linear scales to cover more than half the graph paper **(1)** • axes labelled with units (allow even if axes are the wrong way round) **(1)** • all points plotted correctly (allow ± small square) **(1)**	Example of graph:  Ignore any hand-drawn lines between the points Do not award 'T' for 'time' for the label on the time axis.	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(b)	An answer that makes reference to the following points: • extrapolated line drawn **(1)** • correct value for ΔT **(1)**	Diagonal line extrapolated back to at least 2.5 minutes ΔT = (29.3 – 21.0 =) 8.3 (°C) TE on their line M2 dependent on the temperature difference being measured at 2.5 minutes Ignore other lines drawn.	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)	An answer that makes reference to the following point: • suitable reason for lower exothermic value	Heat loss (to the surroundings / from the apparatus) Mass of solution is more than 100 g Density is more than 1 g cm^3 Specific heat capacity of not 4.18 J g^{-1} $°C^{-1}$ Do not award if a correct answer is given together with an answer with incorrect chemistry. Do not award reference to non-standard conditions Do not award transfer errors/incomplete reaction	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(i)	• calculation of enthalpy change	<u>Example of calculation</u> $\Delta H = (-69.4 - +15.7 =) -85.1$ (kJ mol^{-1}) Allow value shown on the cycle. Ignore units even if incorrect. Ignore working even if incorrect.	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)(ii)	An answer that makes reference to the following point: • suitable reason why value not found by experiment	<u>Examples of possible reasons</u> Hard to add the correct amount of water Some crystals would be dissolved whilst other not fully hydrated Hard to measure the temperature (change) of a solid Ignore hard to measure the temperature (change) of magnesium sulfate unqualified	**(1)**

(Total for Question 2 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	An answer that makes reference to the following point: • concentration would be less **and** because the mass (of sodium hydroxide) would include the moisture	Allow water for moisture Do not award refence to substances other than sodium hydroxide Do not award reference to the volume increases	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	• 9.51 – 9.55 (g)	Allow 9.51 ~ 9.55 (g) Allow 9.53 ±0.02 (g)	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	• calculation of molar mass of borax **(1)** • calculation of moles of borax weighed out **(1)** • calculation of moles of borax in pipetted 25.0 cm^3 **(1)**	<u>Example of calculation</u> Molar mass = 381.2 ($g\ mol^{-1}$) n = (9.53 ÷ 381.2 =) 0.025 / 2.5 x 10^{-2} (mol) n = (0.025 x (25 ÷ 500 =) 0.00125 / 1.25 x 10^{-3} (mol) Ignore SF except 1 SF Correct answer with no working scores (3) TE throughout	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	An answer that makes reference to the following point: • (from) yellow) (to) orange	Do not award any other colours	**(1)**

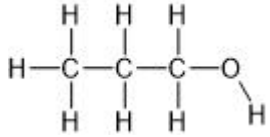
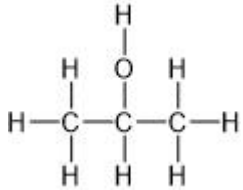
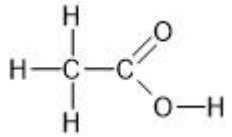
Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	• calculation of moles of HCl **(1)** • calculation of concentration of HCl in mol dm^{-3} **(1)** • calculation of concentration of HCl in g dm^{-3} to 2/3SF **(1)**	<u>Example of calculation</u> n = (0.00125 x 2 =) 0.0025 / 2.50 x 10^{-3} (mol) c = (0.0025 ÷ (16.30 ÷ 1000 =) 0.15337 / 1.5337 x 10^{-1} c = (0.15337 x 36.5 = 5.5982 =) 5.60/5.6 Correct answer with no working scores (3) Allow calculations done in any order, including in one step. TE throughout and from 3(b)(i) Common wrong answers: Using 0.00125 as the moles of HCl gives 2.80/2.8 (scores 2) Dividing 0.00125 by 2 gives 1.40 /1.4 (scores 2) Using the mean of 3 titres (16.53) gives 5.52/5.5 (scores 2)	**(3)**

(Total for Question 3 = 9 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	• HCl	Ignore state symbols Ignore name Do not award if more than one answer given.	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	• carbon dioxide / CO_2	If name and formula given then both must be correct Ignore state symbols Do not award if given with other substances	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)(iii)	• (**Q**) alcohol **(1)** • (**R**) carboxylic acid **(1)**	Allow hydroxy / hydroxyl Ignore references to classification Do not award hydroxide Allow carboxy / carboxyl / carboxylic Ignore just acid Allow (1) if answers reversed Allow (1) if two correct formulae given such as Q = OH and **S** = COOH / correct displayed formulae Do not award -HO for -OH If name given then ignore formulae	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(a)(iv)	• **Q** displayed formula **(1)** • **R** displayed formula **(1)**	Examples of formulae  or   Allow non-displayed OH Do not award non-displayed methyl group ($-CH_3$) Allow (1) for two correct displayed formulae in the wrong boxes Allow (1) for two correct skeletal/structural formulae Ignore molecular formulae Ignore bond angles and length	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(a)(v)	An answer that makes reference to the following points: • Yes **and** **Q**/alcohol would not have a peak due to C=O or **R**/carboxylic acid would have a peak due to C=O	Allow TE on any alcohol and carboxylic acid in (a)(iv) Allow Yes **and** O−H peak values are different in **Q**/alcohol and **R**/carboxylic acid Allow Yes **and** the fingerprint regions would be different Allow wavenumber / stretching vibration for peak. Ignore just reference to the spectra being different.	**(1)**

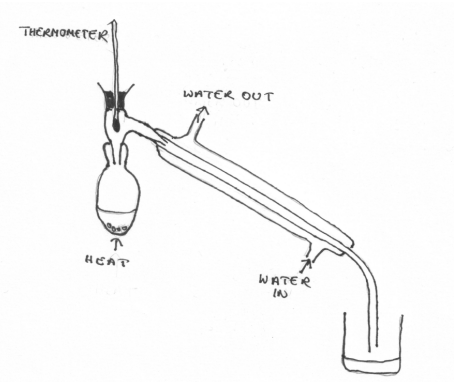
Question Number	Answer	Additional Guidance	Mark
4(b)	An answer that makes reference to the following points: (bromine water) • from brown/ orange / yellow **(1)** • to colourless **(1)** (Benedict's / Fehling's reagent) • from blue (solution) **(1)** • to (brick) red precipitate **(1)**	Standalone marks Ignore layers throughout Do not award red Allow decolourises Ignore clear Do not award reference to effervescence Allow red-brown for red Allow solid / ppt(e) for precipitate Do not award brown / orange / pink for red Ignore reference to the solution turning colourless before the precipitate is formed Do not award reference to the solution turning white and the precipitate is formed Do not award silver mirror.	**(4)**

(Total for Question 4 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	An answer that makes reference to the following points: • use of gloves **(1)** • use a fume cupboard / hood **(1)**	Allow ensure laboratory is well-ventilated Ignore masks, safety specs, goggles, lab coat Ignore flammability Do not award using a lower concentration or less HCl	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	An answer that makes reference to the following point: • pressure / gas / CO_2 must be released	Allow to prevent the build up of pressure Ignore reference to explosions Ignore just a gas is produced Do not award reference to release air / water vapour / other gases Do not award a reference to removal of lower / aqueous layer	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	An answer that makes reference to the following point: • cloudy to clear	 Allow milky for cloudy Ignore just 'goes clear' Ignore reference to colourless	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(a)(iv)	An answer that makes reference to the following points: • (bp1) round-bottomed/pear-shaped flask • (bp2) heat • (bp3) still head with no gaps to outside and no blockages • (bp4) still head with entry to condenser • (bp5) thermometer with any part of bulb or bottom of thermometer opposite entry to condenser • (bp6) labelling (of condenser) with water in and water out • (bp7) condenser with exit for distillate or vent for gases • (bp8) collection vessel 8 points scores (4) 6 – 7 scores (3) 4 – 5 scores (2) 2 – 3 scores (1)	<u>Examples of diagram</u>  Reflux apparatus scores 1 mark (points 1,2, and 6) Do not award for bp1 conical flask / flat-bottomed flask Allow for bp2 a diagram of a flame / Bunsen burner Ignore fractionating column for bp3	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(b)	An answer that makes reference to three of the following points: • rate is inversely proportional to time **(1)**	Allow any indication that a shorter time means a faster rate Ignore just restatement of times from the table without comment Allow greatest / higher for fastest Allow reference to shorter time	**(3)**
	• 2-chloro-2-methylpropane is **tertiary** **and** rate (of hydrolysis) is fastest/faster **(1)**	Allow reference to shorter time Ignore reference to stability of carbocations	
	• 1-chloro-2-methylpropane and 1-bromo-2-methylpropane are primary (halogenoalkanes) **and** C-Br bonds are hydrolysed / broken faster / faster rate than C-Cl bonds **(1)**	Ignore references to bond strength of C-Br bonds and C-Cl bonds Allow reference to shorter time to hydrolyse C-Br bonds Accept reverse arguments throughout	

(Total for Question 5 = 11 marks)

TOTAL FOR PAPER = 50 MARKS