Pearson Edexcel

Mark Scheme (Results)

Summer 2025

Pearson Edexcel International Advanced Subsidiary Level In Chemistry (WCH13)
Paper 01 Practical Skills in Chemistry I

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Summer 2025
Question Paper Log Number P78744A
Publications Code WCH13_01_2506_MS

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

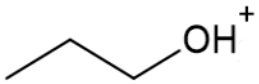
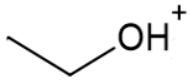
Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

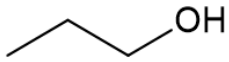
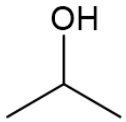
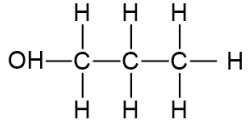
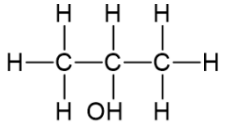
Full marks will be awarded if the candidate has demonstrated the above abilities. Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Additional Guidance	Mark
1(a)	An explanation that makes reference to the following point: • hydrogen chloride / HCl((g))	Do not award hydrochloric acid / HCl(aq) If both name and formula given, both must be correct Do not award if given with any other formula	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	An answer that makes reference to the following point: • orange to green	Allow orange to blue / blue-green Ignore shades	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	An answer that makes reference to the following point: • alcohol –OH (group) / hydroxy / hydroxyl / OH group in a (primary or secondary) alcohol	Allow just alcohol / OH / –OH Do not award tertiary alcohol Do not award hydroxide / OH^-	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)	An answer that makes reference to the following points: • 60 $[C_3H_7OH]^+$ / $[C_3H_8O]^+$  **(1)** • 45 $[C_2H_4OH]^+$ / $[C_2H_5O]^+$  **(1)** • 31 $[CH_2OH]^+$ / $[CH_3O]^+$ **(1)**	Allow structures without brackets / with rounded brackets Charge can be anywhere Penalise lack of charge once only Allow $[CH_3CH_2CH_2OH]^+$ / $[CH_3CHOHCH_3]^+$ Do not award $[C_2H_4O_2]^+$ / $[CH_3COOH]^+$ Allow $[CH_3CHOH]^+$ Allow $[CH_2CH_2OH]^+$ Do not award $COOH^+$ Comment: Also penalise negative charge once only. Comment: mark the answer line first and ignore any working on the right hand side.	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(d)	An answer that makes reference to the following points: • P $CH_3CH_2CH_2OH$  **(1)** • Q $CH_3CHOHCH_3$  **(1)**	Allow displayed / skeletal formulae or any combination Ignore vertical connectivity but do not award horizontal connectivity to –OH as shown  ×  ✓ Allow **(1)** for correct formulae reversed	**(2)**

(Total for Question 1 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	An answer that makes reference to the following points: • use of hydrochloric acid **(1)** • place the sample in a blue / roaring / non-luminous **flame** **(1)**	NOTE: Answers will probably include more details of the process. Look for the two points given and ignore other details Allow any reasonable use of HCl Ignore concentrated/dilute/(aq) Comment: Allow above / over / under the flame	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	An answer that makes reference to two of the following points: • (potassium ion) lilac **(1)** • (rubidium ion) red-violet / red-purple **(1)**	Do not award purple Accept descriptions such as reddish purple or purplish red Allow red / dark red / magenta Ignore just purple Do not award brick / orange red	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	An answer that makes reference to the following point: • addition of sodium / potassium sulfate solution **(1)** • gives a precipitate with (the solution containing) strontium ions **and** no precipitate with (the solution containing) lithium ions **(1)**	Allow any soluble sulfate Allow sulfuric acid Allow sodium / potassium carbonate Do not award hydroxide M2 dependent on M1 or near miss Allow strontium sulfate is insoluble **and** lithium sulfate is soluble	**(2)**

Question Number	Answer	Additional Guidance	Mark
2 (a)(iv)	An answer that makes reference to the following points: • (an advantage is that wooden) splints are cheaper than platinum / nichrome / unreactive wire **(1)** • wood burns making the flame coloured / yellow (making it difficult to see the colour due to the ion) **(1)**	This could be answered in a number of ways Allow just splints are cheaper / easier to obtain Allow no need to clean as a new splint can be used every time Ignore splints / wood is renewable Allow smoke masks the colour Allow wood burns so cannot be reused / wire can be reused (after cleaning) Ignore just difficult to see the colour without some sort of justification Ignore safety concerns	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	An answer that makes reference to the following points: • (Chloride ion) give a white precipitate • (Bromide ion) gives a cream precipitate • (Iodide ion) gives a (pale) yellow precipitate	Allow solid / ppte / ppt in place of precipitate throughout Penalise lack of precipitate once only. This may be mentioned in **(b)(ii)** Ignore (turns) grey Allow off-white All three correct colours and states scores **(2)** Any two correct colours and states scores **(1)**	**(2)**

Question Number	Answer		Additional Guidance	Mark
2(b)(ii)	An answer that makes reference to the following points: • addition of ammonia solution to the precipitates Any two from • (silver) chloride (precipitate) is soluble in dilute ammonia solution (and concentrated ammonia) or (silver) bromide (precipitate) is soluble only in concentrated ammonia or (silver) iodide (precipitate) is insoluble in (dilute and) concentrated ammonia	**(1)** **(1)**	Ignore concentration for this mark Ignore use of (conc) H_2SO_4 Allow silver bromide is slightly soluble in dilute ammonia Ignore incorrect colours of precipitates throughout	**(2)**

(Total for Question 2 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	An explanation that makes reference to the following points: • both silver nitrate and potassium chromate(VI) are ionic **(1)** • silver / Ag^+ (ions) move towards the cathode / negative electrode / right **and** chromate / CrO_4^{2-} (ions) move towards the anode / positive electrode / left **(1)** • balanced ionic or full equation **(1)**	Allow both (compounds) contain ions Allow the silver **and** chromate ions move towards the middle / each other Ignore just ions move in opposite directions Ignore movement of silver nitrate / nitrate / potassium chromate / potassium Ignore incorrect names of ions $2Ag^+ + CrO_4^{2-} \rightarrow Ag_2CrO_4$ $2AgNO_3 + K_2CrO_4 \rightarrow 2KNO_3 + Ag_2CrO_4$ Ignore state symbols even if incorrect	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	An answer that makes reference to the following point: • (deionised / distilled water) is not a (good) conductor	Allow deionised / distilled water does not contain ions Allow tap water contains ions so it is a conductor Do not award conduction due to / movement of electrons	**(1)**

c	Answer	Additional Guidance	Mark
3(b)(ii)	An answer that makes reference to the following point: • HCO_3^- / hydrogencarbonate / Cl^- / chloride	Allow SO_4^{2-} / sulfate / ClO^- / chlorate ((I)) Do not award CO_3^{2-} / carbonate / OH^- / hydroxide	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	An answer that makes reference to the following point: • the concentration of ions (in tap water) is (very) low	Allow correct ions from 3(b)(ii) Allow very little precipitate is formed Allow precipitate does not move because it's insoluble. Ignore references to red precipitate	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)	An answer that makes reference to the following points: • yellow (dot / colour) moves towards the anode / positive electrode / crocodile clip **(1)** • blue (dot / colour) moves towards the cathode / negative electrode / crocodile clip **(1)**	Allow annotations on the diagram for both marks Allow yellow (dot) moves left / anode turns yellow Allow blue (dot) moves right / cathode turns blue Allow **(1)** if in reverse order	**(2)**

(Total for Question 3 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	An answer that makes reference to the following points: • chloride ions lose electrons (to form chlorine) and so are oxidised **and** manganate((VII)) ions gain electrons (to form manganese((II)) ions) and so are reduced **(1)** • $2Cl^- \rightarrow Cl_2 + 2e^{(-)}$ **(1)**	Allow chloride is oxidised because the oxidation number increases **and** manganate((VII)) is reduced because the oxidation number decreases Allow $2Cl^- - 2e^{(-)} \rightarrow Cl_2$ Ignore state symbols even if incorrect	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)	An answer that makes reference to the following points: • anhydrous calcium chloride acts as a drying agent / removes water / moisture from the chlorine gas **(1)** • ceramic wool stops the calcium chloride from moving / spreading out **(1)**	Allow dries the chlorine (gas) Do not award dehydrating agent Allow ceramic wool ensures that the chlorine gas all passes through the anhydrous calcium chloride Do not award to dry the chlorine (for ceramic wool)	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)	An answer that makes reference to the following point: • so that the air / oxygen is flushed out (of the tube) or iron will react with oxygen before the chlorine reaches it	Allow it takes time for the chlorine to reach the iron wool Allow iron will react with the air before chlorine reaches it Allow so that it only reacts with chlorine	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(d)	An answer that makes reference to the following point: • reacts with / neutralises (unreacted / excess) chlorine	Allow absorbs / removes (unreacted / excess) chlorine Ignore just to stop chlorine escaping (into the air) Do not award comments about absorbing HCl Ignore absorbs water	**(1)**

Question Number	Answer	Additional Guidance	Mark
4 (e)(i)	• calculation of moles of iron **(1)** • calculation of M_r of iron(III) chloride **(1)** • calculation of mass of iron(III) chloride **(1)**	<u>Example of calculation</u> $2.00 \div 55.8 = 0.035842 / 0.0358 / 3.5842 \times 10^{-2} / 3.58 \times 10^{-2}$ (mol) (ans 1) $55.8 + (3 \times 35.5) = 162.3$ (ans 2) (ans 1) × (ans 2) $0.035842 \times 162.3 = 5.8172 / 5.82$ (g) Allow use of 56 for 55.8 Accept answers in the range 5.8(1) to 5.92 Do not award 5.80 Correct answer with no working scores **(3)** Ignore SF except 1SF	**(3)**

Question Number	Answer	Additional Guidance	Mark
4 (e)(ii)	An explanation that makes reference to the following points: • because iron(III) chloride / the product absorbs / reacts with water (from the air) to form hydrated iron(III) chloride. **(1)** • so it includes the mass of (extra) water **(1)**	Allow any suggestion that the iron(III) chloride is hydrated	**(2)**

(Total for Question 4 = 11 marks)

Question Number	Answer	Additional Guidance	Mark
5(a)	• calculation of moles of zinc (ions) **(1)** • calculation of moles of magnesium **and** moles Mg > moles Zn **(1)** Alternative method • calculation of moles of zinc ions **(1)** • calculation of mass of magnesium needed **and** 1.2(15)(g) < 2.20(g) **(1)**	<u>Example of calculation:</u> $50 \div 1000 \times 1.00 = 0.0500 / 0.05 / 5 \times 10^{-2}$ $2.20 \div 24.3 = 0.090535 / 9.0535 \times 10^{-2}$ Allow 0.09(05) > 0.05 for **(2)** marks $50 \div 1000 \times 1.00 = 0.0500 / 0.05 / 5 \times 10^{-2}$ 0.05 x 24.3 = 1.2(15)(g) Allow TE on wrong moles of zinc Allow use of 24 for Mg Ignore SF	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)	• recall of expression for energy transferred ($Q = mc\Delta T$) **(1)** • calculation of temperature rise **(1)** • calculation of energy change **(1)** • calculation of enthalpy change of reaction including sign and units **(1)**	<u>Example of calculation</u> Energy transferred = mass × specific heat capacity × temperature change This may be seen in M3 55.2 – 19.4 = 35.8(°C) 50.0 × 4.18 × 35.8 = 7482.2 (J) Ignore sign (7482.2 ÷ 1000) ÷ 0.0500 = –149.6(4) / −150 kJ mol^{-1} Accept −149 640 / −150 000 J mol^{-1} Allow TE throughout Allow TE on **5(a)** for moles of zinc (ions) Ignore SF in M1 and M2 and ignore SF except 1 SF in the final answer Correct answer with no working scores (4) The following answers all score **(3)** marks −82.64 / −82.6 / −83 (uses mol Mg instead of Zn) −53.24 / −53.2 / −53 (adds mol of Mg to mol of Zn) −184.69 / −184.7 / −185 (mol Mg – mol Zn)	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An answer that makes reference to the following point: • heat loss (to the surroundings)	Ignore references to non-standard conditions	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(d)	An explanation that makes reference to four of the following points: • use of an insulated container **(1)** • use of a lid for the container (to reduce heat loss) **(1)** • record the temperature every 30 seconds / use a data logger **(1)** • use a lower concentration of solution so heat loss would be lower **(1)** • use a graph of temperature against time to give a more accurate value of temperature change **(1)**	Ignore references to changing quantities / concentrations of chemicals Allow polystyrene cup Ignore calorimeter Allow any lid whether stated as insulated or not Ignore draft shield Allow any regular time interval < 1 minute Allow temperature recorded until steady, magnesium added and then temperature recorded every 30 seconds Allow cooling curve for graph Allow use a digital thermometer / temperature probe / thermometer with smaller scale divisions. **(1)** Ignore use of burette / pipette / more accurate balance / repeats Ignore descriptions of how the graph can be used to find the more accurate value of temperature change	**(4)**

(Total for Question 5 = 11 marks)
TOTAL FOR PAPER = 50 MARKS

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