

Commentary on candidate evidence

Assessors awarded the candidate evidence contained in this pack the following marks for questions of the 2026 Advanced Higher question paper, section 2.

Question 1(a)

Candidate 1

The candidate was awarded **0 marks** because they have incorrectly labelled the 4s box as 4s².

Candidate 2

The candidate was awarded **1 mark** because they have correctly labelled and populated the orbital boxes. It is difficult to differentiate between uppercase and lowercase s and p letters and so the case is ignored.

Candidate 3

The candidate was awarded **0 marks** because although they have correctly drawn and populated the orbital boxes, they have not been labelled. The spectroscopic notation given above does not constitute proper labelling.

Question 1(b)

Candidate 1

The candidate was awarded **0 marks** because they have not used a superscripted letter l in the quantum number label.

Candidate 2

The candidate was awarded **1 mark** because they have given a correct response for the quantum number label and the value. It is difficult to differentiate between uppercase and lowercase m and l letters, so positive marking has been adopted.

Question 1(c)(ii)

Candidate 1

The candidate was awarded **0 marks** because they have not made it clear that there are more than two energy levels involved in the transitions or that there are different transitions. Also, the second sentence gives an incorrect direction of electron movement for an emission spectrum.

Candidate 2

The candidate was awarded **1 mark** because they have stated that electrons are excited to higher energy levels, and this suggests more than one higher energy level. The mention of wavelengths absorbed can be ignored in this instance since the answer is clearly describing emission and the electrons are first promoted.

Candidate 3

The candidate was awarded **1 mark** because they have stated that there are different transitions.

Candidate 4

The candidate was awarded **0 marks** because they have not suggested that there are more than two energy levels.

Candidate 5

The candidate was awarded **0 marks** because they begin by making a correct statement about electrons being promoted and then falling back down to lower energy levels. However, they then go on to incorrectly suggest that absorption or emission occurs at this point, and it involves complementary colours.

Candidate 6

The candidate was awarded **1 mark** because they have stated there are different electron transitions.

Candidate 7

The candidate was awarded **1 mark** because they have stated that electrons fall to more than one lower energy level.

Question 1(c)(iii)(A)

Candidate 1

The candidate was awarded **1 mark** because the final answer is incorrect as they did not convert energy into J. However, they have written the correct expression (1 mark). This mark could also have been awarded for correct substitution into the expression.

Candidate 2

The candidate was awarded **0 marks** because the final answer is incorrect. They cannot be awarded 1 mark for correct substitution into the expression since they have omitted wavelength.

Candidate 3

The candidate was awarded **1 mark** because the final answer has been incorrectly rounded. However, they have written the correct expression (1 mark). This mark could also have been awarded for correct substitution into the expression.

Candidate 4

The candidate was awarded **1 mark** because the final answer has been incorrectly rounded. However, they have written the correct expression (1 mark).

Question 1(c)(iii)(B)

Candidate 1

The candidate was awarded **1 mark** because it is assumed, due to the wording of the question, that the wavelength referred to is of caesium.

Candidate 2

The candidate was awarded **1 mark** because they correctly state that the wavelength of potassium is smaller than caesium.

Candidate 3

The candidate was awarded **0 marks** because although the statement is correct, there is no comparison of wavelengths given in the answer.

Candidate 4

The candidate was awarded **0 marks** because even if the value for the shortest wavelength of light for caesium were correct, 1 mark could not be awarded as there is no comparison of the wavelengths of caesium and potassium.

Question 2(a)(i) and (ii)

Candidate 1

- (i) The candidate was awarded **0 marks** because they have given an incorrect final answer.
- (ii) The candidate was awarded **2 marks** because they have correctly calculated the final answer using the incorrect value for ΔS in part (i). An appropriate number of significant figures have been given and the units, although not required, are correct.

Candidate 2

- (i) The candidate was awarded **0 marks** because they have given an incorrect final answer as the value is in kJ and negative.
- (ii) The candidate was awarded **1 mark** because they have given the correct final answer. However, this answer is calculated using an incorrect value for ΔH . Therefore, 2 marks could not be awarded. They have correctly used a value of 0 for ΔG (1 mark).

Candidate 3

- (i) The candidate was awarded **0 marks** because they have given an incorrect final answer.
- (ii) The candidate was awarded **1 mark** because they have given an incorrect final answer using follow through from part (i), as they did not convert the value for ΔS into $\text{kJ K}^{-1} \text{mol}^{-1}$. They have correctly used a value of 0 for ΔG (1 mark). This mark could also have been awarded for correctly calculating the value for ΔH .

Candidate 4

- (i) The candidate was awarded **1 mark** because they have given a correct answer, to an appropriate number of significant figures. The unit, although not required, is correct.
- (ii) The candidate was awarded **2 marks** because they have correctly calculated the final answer. An appropriate number of significant figures have been given and the units, although not required, are correct. Although, the units for ΔH are not correct (uppercase K), this is ignored as it is not a final answer.

Question 2(c)

Candidate 1

The candidate was awarded **0 marks** because they have not made it clear what they mean by 'using'. It does not suggest that the absorbance was measured nor that it was compared to a standard of known concentration.

Candidate 2

The candidate was awarded **1 mark** because they have stated that the more energy absorbed the greater the concentration (1 mark). There is no comparison to a standard of known concentration or mention of a calibration graph.

Candidate 3

The candidate was awarded **0 marks** because they have not stated that the absorbance or intensity is measured. They have stated that the amount of light absorbed corresponds to the concentration of mercury but have not given the exact relationship.

Candidate 4

The candidate was awarded **1 mark** because they have stated that the absorbance is measured (recorded) and have also stated the relationship between concentration and absorbance (1 mark). There is no comparison to a standard of known concentration or mention of a calibration graph.

Candidate 5

The candidate was awarded **0 marks** because they have correctly stated that a higher concentration will absorb more light. However, this is then followed by making an incorrect statement about the energy gap which cancels out the correct statement.

Candidate 6

The candidate was awarded **0 marks** as they have not mentioned measuring the absorbance/intensity of the sample. They did mention using a calibration graph; however, they have incorrectly described this graph.

Question 3(a)(i)(A)

Candidate 1

The candidate was awarded **1 mark** because they have correctly identified reaction 2 and explained that this is due to a lower ΔG value.

Candidate 2

The candidate was awarded **0 marks** because they have calculated the ΔG values, however, they have not used them to explain why reaction 2 is more likely.

Candidate 3

The candidate was awarded **1 mark** because they have identified reaction 2 and stated that ΔG is more negative.

Candidate 4

The candidate was awarded **0 marks** because they have identified reaction 2, however, there is no comparison of the ΔG values to explain their choice.

Question 3(a)(i)(B)

Candidate 1

The candidate was awarded **1 mark** because they have correctly defined the conditions for ΔG° .

Candidate 2

The candidate was awarded **0 marks** because they have re-stated information given in the question.

Candidate 3

The candidate was awarded **0 marks** because they appear to be comparing reactions 1 and 2 rather than comparing ΔG and ΔG° .

Candidate 4

The candidate was awarded **0 marks** because they have not compared ΔG to ΔG° .

Candidate 5

The candidate was awarded **1 mark** because they have given a reason why ΔG is different from ΔG° .

Candidate 6

The candidate was awarded **0 marks** because they have not compared ΔG to ΔG° .

Candidate 7

The candidate was awarded **1 mark** because they have explained how differences in temperature will lead to different values for ΔG to ΔG° .

Question 3(a)(ii)(B)

Candidate 1

The candidate was awarded **1 mark** because they have stated that blue light is absorbed (1 mark). There is no mention of the electrons moving to higher energy d orbitals.

Candidate 2

The candidate was awarded **0 marks** because they have correctly recognised that electrons are moving up and they have made it clear that the movement is between d orbitals, but they have incorrectly referred to this as being a split 3d orbital. They have also correctly stated that blue light is absorbed, however, the mark cannot be awarded as they have referred to emitting yellow light.

Candidate 3

The candidate was awarded **1 mark** because they have stated that blue light is absorbed (1 mark).

Candidate 4

The candidate was awarded **1 mark** because they have stated that an electron is promoted to a higher energy d orbital in a d-d transition (1 mark).

Question 3(b)(i) and (ii)

Candidate 1

- (i) The candidate was awarded **0 marks** because they have given an incorrect final answer.
- (ii) The candidate was awarded **1 mark** because they have incorrectly carried through their incorrect answer to (i). They have correctly divided a calculated mass of NaCl by 5.27 g to give a percentage by mass (1 mark).

Candidate 2

- (i) The candidate was awarded **0 marks** because they have given an incorrect final answer.
- (ii) The candidate was awarded **2 marks** because they have used an incorrect value from part (i) to correctly calculate a percentage mass of NaCl in the cheese. An appropriate number of significant figures has been given.

Question 5(a)(i)(A)

Candidate 1

The candidate was awarded **0 marks** because they have given an answer that is similar to the correct answer, but it is not correct.

Candidate 2

The candidate was awarded **0 marks** because they have given an answer that is similar to the correct answer, but it is not correct.

Question 5(a)(i)(C)

Candidate 1

The candidate was awarded **0 marks** because they have neither mentioned electrons in the answer nor that they have been donated to the calcium ion.

Question 5(a)(ii)(B)

Candidate 1

The candidate was awarded **1 mark** because they realise the purpose is to get an accurately known concentration.

Candidate 2

The candidate was awarded **0 marks** because they have not made it clear that the concentration must be accurately known.

Question 5(b)

Candidate 1

The candidate was awarded **0 marks** because they have given a correct numerical answer and made a correct statement about the hardness of the water. However, they have used an unacceptable number of significant figures. General marking principle (h) has been applied. The candidate could have been awarded this mark if they had already lost a mark for incorrect units or an inappropriate number of significant figures elsewhere in the paper.

Candidate 2

The candidate was awarded **0 marks** because they have given an incorrect numerical answer and have not made a statement about the hardness of the water.

Candidate 3

The candidate was awarded **0 marks** because they have made a correct statement about the hardness of water; however, they have not given a correct numerical value for the concentration.

Candidate 4

The candidate was awarded **1 mark** because they have given a correct numerical answer and made a correct statement about the hardness of the water. The value is to an acceptable number of significant figures. The unit is given as mg/L which is an acceptable alternative format to mg l^{-1} .

Question 6(a)(i)

Candidate 1

The candidate was awarded **0 marks** because they have not written the correct molecular formula for hydrogen.

Question 6(a)(iii)

Candidate 1

The candidate was awarded **0 marks** because they have correctly drawn the curly arrows; however, the structure of the ethoxide nucleophile is not correct. There is no transition state drawn.

Candidate 2

The candidate was awarded **0 marks** because they have drawn the arrow coming from the wrong part of the nucleophile to the haloalkane. The transition state does not have a negative charge.

Candidate 3

The candidate was awarded **2 marks** because they have correctly drawn the curly arrows and the structure of the nucleophile (1 mark). There is a negative charge drawn on the oxygen of the transition state, but it can be ignored as it has been scored out. Otherwise, the transition state has been correctly drawn (1 mark).

Candidate 4

The candidate was awarded **1 mark** because they have correctly drawn the curly arrows and the structure of the nucleophile (1 mark). The transition state is missing the square brackets and the negative charge outside.

Candidate 5

The candidate was awarded **1 mark** because they have correctly drawn the curly arrows and the structure of the nucleophile (1 mark). The transition state has an incorrect dotted line through the O atom to the CH₂ and has no charge on the outside of the square brackets.

Question 6(a)(iv)

Candidate 1

The candidate was awarded **0 marks** because they have given a correct name for the ether, but it is not the systematic name.

Candidate 2

The candidate was awarded **0 marks** because they have given an unacceptable position number in the name of the ether.

Question 6(b)(ii)

Candidate 1

The candidate was awarded **0 marks** because they have written a correct numerical answer, however, the five significant figures given is not acceptable (up to 2 more than the data is allowed). General marking principle (h) applies. If the candidate has

already lost a mark for significant figures or incorrect units elsewhere in the paper, then they would be awarded 1 mark for this numerical answer. The unit mark cannot be awarded as the unit given is incorrect. Determining a rate constant unit is independent of the units rule (general marking principle (i)) and must be correct for the mark to be awarded.

Candidate 2

The candidate was awarded **2 marks** because they have given a correct value to an acceptable number of significant figures (1 mark) and the units are correct (1 mark).

Candidate 3

The candidate was awarded **1 mark** because they have given a correct final value to an acceptable number of significant figures (1 mark). The units are incorrect as the s is uppercase. Determining a rate constant unit is independent of the units rule (general marking principle (i)) and must be correct for the mark to be awarded.

Candidate 4

The candidate was awarded **1 mark** because they have given a correct final value to an acceptable number of significant figures (1 mark). The units are incorrect. Determining a rate constant unit is independent of the units rule (general marking principle (i)) and must be correct for the mark to be awarded.

Question 6(b)(iii)

Candidate 1

The candidate was awarded **0 marks** because they have given a correct numerical answer to an acceptable number of significant figures. However, the unit is incorrect as an uppercase K has been used. General marking principle (i) applies. 1 mark can be awarded if the candidate has already lost a mark elsewhere for incorrect units or an unacceptable number of significant figures.

Candidate 2

The candidate was awarded **0 marks** because they have given a correct numerical answer to an acceptable number of significant figures. However, the unit is incorrect as an uppercase K has been used. General marking principle (i) applies. 1 mark can be awarded if the candidate has already lost a mark elsewhere for incorrect units or an unacceptable number of significant figures.

Question 7(a)(ii)(A)(I)

Candidate 1

The candidate was awarded **1 mark** because they have stated the oxygen is lacking electrons, which is taken as meaning electron deficient.

Candidate 2

The candidate was awarded **0 marks** because they incorrectly stated that the carbon atom forms a carbocation.

Candidate 3

The candidate was awarded **0 marks** because they incorrectly imply that the carbon has a full positive charge rather than a slightly positive charge.

Candidate 4

The candidate was awarded **0 marks** because they have not specified the type of charge on the carbon atom.

Candidate 5

The candidate was awarded **0 marks** because they imply the carbon will have a full positive charge which cancels out the subsequent correct answer.

Question 7(a)(ii)(A)(II)

Candidate 1

The candidate was awarded **1 mark** because they have correctly stated that pi bonds are less stable.

Candidate 2

The candidate was awarded **1 mark** because they have correctly stated that pi bonds are less stable. The statement about oxygen having a greater pull on electrons is extra information that does not contradict the correct answer.

Question 7(a)(ii)(B)

Candidate 1

The candidate was awarded **0 marks** because they have not specified that the hydrogen is an ion.

Candidate 2

The candidate was awarded **1 mark** because they stated that water loses a proton which is taken as meaning donating a proton.

Question 7(b)

Candidate 1

The candidate was awarded **0 marks** because they have omitted an H atom on the left-hand side of the structure. The connectivity of the left-hand methyl group is unacceptable as the bond is too short.

Candidate 2

The candidate was awarded **1 mark** because they have drawn a correct structural formula for the ester.

Question 7(c)(ii)

Candidate 1

The candidate was awarded **0 marks** because they have made no mention of steric hindrance or bulky groups.

Candidate 2

The candidate was awarded **0 marks** because they have made no mention of steric hindrance or bulky groups.

Candidate 3

The candidate was awarded **0 marks** because they have made no mention of steric hindrance or bulky groups.

Candidate 4

The candidate was awarded **0 marks** because they correctly state that there are less bulky alkyl groups. However, they go on to incorrectly state that a carbocation will form which cancels out the correct answer.

Candidate 5

The candidate was awarded **0 marks** because they incorrectly state that there would be no steric hindrance rather than stating less.

Question 8(a)(ii)

Candidate 1

The candidate was awarded **1 mark** because they have correctly mentioned 3 of the 4 points (1 mark); using hot solvent to dissolve the vanillin, cooling the solution and filtering. However, they have not stated that a minimum volume of solvent should be used.

Candidate 2

The candidate was awarded **1 mark** because they have correctly mentioned all 4 points; using minimum hot solvent to dissolve the vanillin, cooling the solution and filtering. However, they have not stated that the vanillin is dissolved (max 1 mark).

Candidate 3

The candidate was awarded **0 marks** because they have only mentioned 1 of the 4 points; filtering. They have not stated minimum volume, hot solvent and cooling.

Candidate 4

The candidate was awarded **1 mark** because they have correctly mentioned 3 of the 4 points (1 mark); minimum volume, hot solvent and cooling. However, they have omitted filtering as the last step. Since they have not mentioned dissolving the vanillin a maximum of 1 mark can be awarded.

Question 8(a)(iii)

Candidate 1

The candidate was awarded **1 mark** because they have not given a correct final answer. However, they have correctly calculated the theoretical mass of vanillin (1 mark).

Candidate 2

The candidate was awarded **2 marks** because they have given a correct final answer to an acceptable number of significant figures. Although not required, the unit stated is correct.

Candidate 3

The candidate was awarded **1 mark** because they have given an incorrect final answer. The candidate has multiplied an incorrect number of moles of vanillin by 152 (1 mark).

Candidate 4

The candidate was awarded **1 mark** because they have given an incorrect final answer. They have correctly calculated a theoretical mass of vanillin (1 mark). This value is different to the one stated in the marking instructions as the value for moles of vanillin has been rounded to 1 significant figure, which is acceptable.

Question 8(a)(iv)

Candidate 1

The candidate was awarded **1 mark** because they have stated the effect of impurities on the melting point (1 mark). No explanation has been given.

Candidate 2

The candidate was awarded **2 marks** because they have stated the effect of impurities on the melting point (1 mark). They have also correctly explained that this is due to disruption of the intermolecular bonding (1 mark).

Candidate 3

The candidate was awarded **1 mark** because they have stated the effect of impurities on the melting point (1 mark). The explanation given is incorrect.

Candidate 4

The candidate was awarded **1 mark** because they have stated the effect of impurities on the melting point (1 mark). No explanation has been given.

Candidate 5

The candidate was awarded **0 marks** because they have correctly stated the effect of impurities on the melting point in the first sentence. However, the second sentence is incorrect and cancels the correct answer.

Candidate 6

The candidate was awarded **0 marks** because they have correctly stated the melting point range is wider; however, they go on to incorrectly state that it would be higher too.

Question 8(b)(ii)

Candidate 1

The candidate was awarded **1 mark** because they have given a correct reagent.

Candidate 2

The candidate was awarded **0 marks** because they have not stated that the copper(II) oxide is hot.

Candidate 3

The candidate was awarded **1 mark** because they have given a correct reagent.

Candidate 4

The candidate was awarded **1 mark** because they have given a correct reagent.

Candidate 5

The candidate was awarded **0 marks** because they have not stated that the potassium dichromate is acidified.

Candidate 6

The candidate was awarded **0 marks** because they have omitted the oxidation state of the copper.

Question 10(a)(ii)

Candidate 1

The candidate was awarded **1 mark** because they have given an incorrect final value. They have written the correct expression for the calculation (1 mark). This partial mark may also have been awarded for correctly calculating a concentration from an incorrect value for $\log_{10}c$.

Candidate 2

The candidate was awarded **1 mark** because they have correctly calculated the concentration. However, the final answer is given to too few significant figures (min 1 fewer than the data). General marking principle (h) applies and if a mark has not been lost elsewhere for significant figures or units, then 2 marks could have been awarded.

Question 10(b)(i)

Candidate 1

The candidate was awarded **0 marks** because they have not joined at least one of the bonds from oxygen to the carbon chain.

Candidate 2

The candidate was awarded **1 mark** because they have drawn a correct skeletal structural formula.

Candidate 3

The candidate was awarded **1 mark** because they have drawn a correct skeletal structural formula.

Candidate 4

The candidate was awarded **1 mark** because they have drawn a correct skeletal structural formula.

Candidate 5

The candidate was awarded **1 mark** because they have drawn a correct skeletal structural formula. One of the lines in the carbonyl double bond is touching the carbon chain and that is the minimum requirement.

Question 10(b)(ii)(B)(I)

Candidate 1

The candidate was awarded **0 marks** as they have omitted the square brackets.

Candidate 2

The candidate was awarded **1 mark** because they have written a correct equilibrium expression.

Candidate 3

The candidate was awarded **0 marks** because they have omitted the (aq) state symbol.

Candidate 4

The candidate was awarded **0 marks** because they have incorrectly used a lowercase k for the equilibrium constant. Also, they have written 'tartic acid' instead of tartaric acid. Any one of these errors results in 0 marks being awarded. K in this expression is not a unit and so is not affected by general marking principle (i).

Question 10(b)(ii)(C)

Candidate 1

The candidate was awarded **0 marks** because they have incorrectly suggested that smaller volumes of both liquids should be used.

Candidate 2

The candidate was awarded **1 mark** because they have correctly suggested that smaller volumes MIBK and more extractions should be used.

Candidate 3

The candidate was awarded **0 marks** because they have not made it clear that the 'smaller samples' refers to the solvent.

Question 10(c)(ii)(B)

Candidate 1

The candidate was awarded **1 mark** because they have given a correct numerical value. However, the unit is not correct. General marking principle (i) applies and if they have not lost a mark for significant figures or units elsewhere, they can still be awarded 2 marks.

Candidate 2

The candidate was awarded **1 mark** because they have given an incorrect numerical value as they have not divided the path length by 10. They have correctly extracted a value of 4 for specific optical rotation from the graph (1 mark).

Candidate 3

The candidate was awarded **0 marks** because they have given an incorrect numerical value as they have not correctly extracted a value of 4 for specific optical rotation from the graph. They have also not correctly completed the calculation using their incorrect value from the graph.

Candidate 4

The candidate was awarded **1 mark** because they have given an incorrect numerical value. They have correctly extracted a value of 4 for specific optical rotation from the graph (1 mark).

Question 11(a)(ii)

Candidate 1

The candidate was awarded **0 marks** because they have correctly stated that there is a sigma bond joining the pesticide to the enzyme, requiring a lot of energy to break. However, the description of the sigma bond is incorrect as the orbitals involved are not unhybridised p orbitals.

Candidate 2

The candidate was awarded **0 marks** because they have incorrectly stated that the pesticide binds to the enzyme via a hydrogen bond.

Candidate 3

The candidate was awarded **0 marks** because they have not named the strong bond involved.

Question 11(b)(i)

Candidate 1

The candidate was awarded **0 marks** because they have incorrectly stated the drug is acting as an inhibitor.

Candidate 2

The candidate was awarded **0 marks** because they have correctly stated the drug is acting as an antagonist. However, they then go on to state '(inhibitor)', which is incorrect and cancels the correct answer.

Question 12(a)

Candidate 1

The candidate was awarded **0 marks** because they have not calculated the number of moles of each element correctly. They have also not multiplied by an appropriate factor to get an empirical formula.

Candidate 2

The candidate was awarded **1 mark** because they have correctly calculated the number of moles of each element. Although, the working is crossed out, since no other working has been given, marks can be awarded for the correct crossed out work.

Candidate 3

The candidate was awarded **1 mark** because they have correctly calculated the number of moles of each element (1 mark). However, they have not multiplied by an appropriate factor to get a whole number ratio.

Candidate 4

The candidate was awarded **0 marks** because they have used the wrong RAM to calculate the number of moles of oxygen. They have also not multiplied by an appropriate factor to get a whole number ratio for the empirical formula and simply rounded the values.

Candidate 5

The candidate was awarded **1 mark** because they have incorrectly calculated the number of moles of nitrogen, oxygen and hydrogen due to using the molecular mass instead of the RAM for each. However, they have correctly multiplied by an appropriate factor to get a whole number ratio for the empirical formula (1 mark).

Question 12(b)(ii)

Candidate 1

The candidate was awarded **0 marks** because they have identified the correct fragment; however, the response is missing the positive charge on the carbon atom.

Candidate 2

The candidate was awarded **0 marks** because their response is not a possible fragment.

Candidate 3

The candidate was awarded **1 mark** because they have given a correct structure for the ion fragment.

Candidate 4

The candidate was awarded **1 mark** because they have given a correct structure for the ion fragment. As there are no brackets present, the positive charge has been correctly placed on the carbon.

Question 12(d)

Candidate 1

The candidate was awarded **0 marks** because they are suggesting there would only be one peak in the spectrum.

Candidate 2

The candidate was awarded **1 mark** because they have made it clear that all peaks would be singlets.

Candidate 3

The candidate was awarded **0 marks** because they are suggesting there would only be one peak in the spectrum.

Candidate 4

The candidate was awarded **1 mark** because they have made it clear that all peaks would be singlets.

Candidate 5

The candidate was awarded **0 marks** because they are suggesting there would only be one peak in the spectrum.

Question 12(e)

Candidate 1

The candidate was awarded **1 mark** because they have drawn a correct structural formula.

Candidate 2

The candidate was awarded **0 marks** because they have drawn a structural formula that would be correct if the connectivity of the atoms were correct in the carboxyl group.