# 2013 Chemistry

# Intermediate 2

# Finalised Marking Instructions

**Part One: General Marking Principles for Chemistry Intermediate 2**

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

**(a)** Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.

**(b)** Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

**GENERAL MARKING ADVICE: Chemistry Intermediate 2**

The marking schemes are written to assist in determining the "minimal acceptable answer" rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates' evidence, and apply to marking both end of unit assessments and course assessments.

**General information for markers**

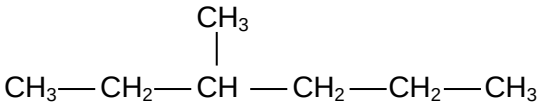
The general comments given below should be considered during all marking. It should be noted that these are general marking principles and may be superseded by decisions made at the Markers' Meeting.

1. Markers are reminded to read candidate responses **in their entirety**. If the candidate shows a clear understanding of the chemistry but does not use the exact words of the Marking Instructions they should still be given credit.

2. Markers are reminded that **no** comments are to be written on scripts. Comments such as 'ARITH', 'ERROR' and 'BOD' (Benefit of doubt) are **not** acceptable.

3. A guiding principle in marking is to give credit for (partially) correct chemistry rather than to look for reasons not to give marks.

   **Example 1:** The structure of a hydrocarbon found in petrol is shown below.



   Name the hydrocarbon.

   Although not completely correct, the answer '3, methyl-hexane' should gain the full mark ie ignore wrong use of commas and dashes.

**Example 2:** A student measured the pH of four carboxylic acids to find out how their strength is related to the number of chlorine atoms in the molecule. The results are shown.

| Structural formula | pH |
|---|---|
| $CH_3COOH$ | 1.65 |
| $CH_2ClCOOH$ | 1.27 |
| $CHCl_2COOH$ | 0.90 |
| $CCl_3COOH$ | 0.51 |

How is the strength of the acids related to the number of chlorine atoms in the molecule?

Although not completely correct, an answer such as 'the more $Cl_2$, the stronger the acid' should gain the full mark.

4. Marks should **not** be deducted for incorrect spelling or loose language as long as the meaning of the word(s) is conveyed.

   **Example:** Answers like "hydrolic acid" (for "hydrochloric acid") and "it gets hotter" (for "the temperature rises") should be accepted.

   However the example below would not be acceptable, as an incorrect chemical term, which the candidate should know, has been given.

   **Example:** If the correct answer is "ethene", and the candidate's answer is "ethane", this should not be accepted.

5. A right answer followed by a wrong answer should be treated as a cancelling error and no marks should be given.

   **Example:** What is the colour of universal indicator in acid solution?

   The answer "red, blue" gains no marks.

6. If a right answer is followed by additional information which does not conflict, the additional information should be ignored, whether correct or not.

7. Full marks should be awarded for the correct answer to a calculation on its own; the part marks shown in the Marking Instructions are for use when working is given.

8. A half mark should be deducted in a calculation for each arithmetic slip.

9. A half mark should be deducted for incorrect or missing units **only when stated in the Marking Instructions.**

10. A half mark should be deducted for transcription errors.

11. Where a wrong numerical answer (already penalised) is carried forward to another step, no further penalty is incurred provided the end result is used correctly.

12. Ignore the omission of one H atom from a full structural formula provided the bond is shown.

13. A symbol or correct formula should be accepted in place of a name **unless stated otherwise in the Marking Instructions**.

14. If an answer comes directly from the text of the question, no marks should be given.

    **Example:** Why do ionic compounds, like copper chloride, conduct electricity when in solution?

    No marks for "because they are ionic" since the word "ionic" appears in the text.

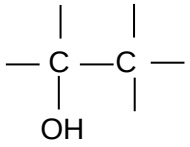
15. Unless the question is clearly about a non-chemistry issue, eg costs in industrial chemistry, a non-chemical answer gains no marks.

    **Example:** Why does the (catalytic) converter have a honeycomb structure?

    A response such as "to make it work" may be correct but it is not a chemical answer and the mark should not be given.

16. With structures involving an – OH or an – $NH_2$ group, a half mark should be deducted if the 'O' or 'N' are not bonded to a carbon, ie OH – $CH_2$ and $NH_2$ – $CH_2$.

17. When drawing structural formulae, a half mark should be deducted if the bond points to the 'wrong' atom, eg




18. When formulae of ionic compounds are given as answers it will only be necessary to show ion charges if these have been specifically asked for. However, if ion charges are shown, they must be correct. If incorrect charges are shown, no marks should be awarded.

19. When it is very difficult to make a decision about a partially correct answer, a half mark can be awarded.

20. When marks have been totalled, a half mark should be rounded up.

**Part Two: Marking Instructions for each Question**

**Section A**

| Question | | | Acceptable Answer |
|---|---|---|---|
| 1 | | | B |
| 2 | | | A |
| 3 | | | B |
| 4 | | | B |
| 5 | | | C |
| 6 | | | A |
| 7 | | | B |
| 8 | | | A |
| 9 | | | D |
| 10 | | | C |
| 11 | | | C |
| 12 | | | C |
| 13 | | | B |
| 14 | | | C |
| 15 | | | B |

| Question | | | Acceptable Answer |
|---|---|---|---|
| 16 | | | B |
| 17 | | | D |
| 18 | | | C |
| 19 | | | D |
| 20 | | | A |
| 21 | | | C |
| 22 | | | A |
| 23 | | | D |
| 24 | | | A |
| 25 | | | D |
| 26 | | | D |
| 27 | | | A |
| 28 | | | A |
| 29 | | | B |
| 30 | | | D |

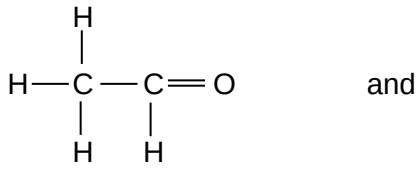
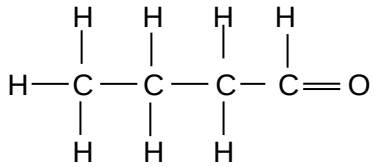
**Section B**

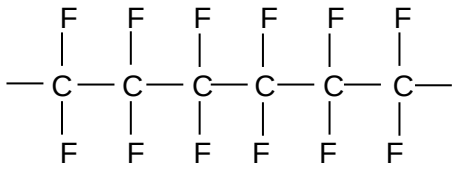
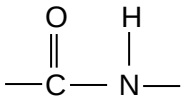
| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **1** | **a** | **i** | Red | **1** | | Red + any other colour will cancel |
| **1** | **a** | **ii** | Same group/<br>Same number of outer electrons/<br>Both in group 2/<br>Same column/<br>Both alkaline earth metals<br>Same chemical group<br><br>Ignore additional correct or incorrect information | **1** | | Contain 2+ ions/<br>Same electron arrangement/<br>Similar electron arrangement/<br>Strontium is below calcium/<br>Same valency<br>Similar chemical properties<br><br>None cancelling |
| **1** | **b** | | LH electrode = positive/+<br>RH electrode = negative/-<br><br>Both correct for mark | **1** | | |
| **2** | **a** | | **<u>Time</u>** until cross can no longer be seen/<br>Rate = 1/time<br>1/time<br>1/t<br>1/T<br>Time until reaction is finished | **1** | | How long it takes/<br>1/time for rapid distinct colour change/<br>Until you can no longer see the cross<br>Colour change/<br>How fast/<br>How quick<br>$s^{-1}$ |
| **2** | **b** | | Concentration of sodium thiosulphate/<br>Volume of sodium thiosulphate/<br>Concentration of hydrochloric acid/<br>Volume of hydrochloric acid/<br>(Size of) beaker used<br>Same cross/<br>Volume of reactants<br>Same person viewing cross<br>Depth of solution<br>(Volumes of each) solution<br>Concentration of reactants<br>Volumes (used)<br>Concentration (used) | **1** | | Temperature/<br>Amount of acid/<br>Same size of test tube<br>Number of moles of acid or sodium thiosulphate<br>Depth of beaker<br>Strength of acid |

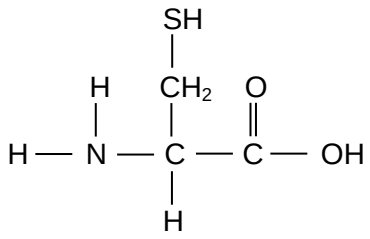
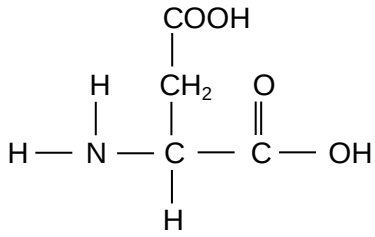
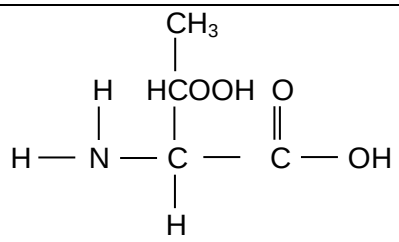
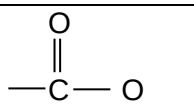
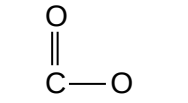
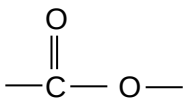
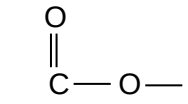
| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **2** | **c** | | Carried out in a fume cupboard/<br>Don't breath in fumes/<br>Take care with sulphur dioxide given off/<br><br>Any answer that gives an indication that sulphur dioxide produced is toxic/poisonous/<br><br>Conical flask (could be used instead of beaker)/<br>Add sodium carbonate (at end of reaction to limit the release of sulphur dioxide)/<br>Carry out experiment in a well-ventilated room<br>Open windows | **1** | | Gloves/<br>Lab coat/<br>Sodium thiosulphate is an irritant<br>Temperature of glass<br>Point away from person |
| **2** | **d** | | $Na^+$/<br>$Cl^-$<br><br>Only one is needed to be circled can be on either side of equation<br><br>Named ion – sodium or chloride | **1** | | Chlorine<br>Sodium or chloride circled + another ion |
| **3** | **a** | | Hydrogen/<br>$H_2$/<br>H | **1** | | h/<br>$H^2$/<br>H2 |
| **3** | **b** | | $\frac{72 - 0}{40} = 1{\cdot}8$<br><br>Or 1·8 on its own | **1** | ½ mark – working only $\frac{72}{40}$<br><br>½ mark – arithmetic error | |
| **3** | **c** | | 0 | **1** | | |
| **3** | **d** | | Slower/<br>Decreases/<br>Less/<br>Take longer to react/<br>Lower rate of reaction/<br>Increases the time | **1** | | Decreases the time/<br>It's a weak acid/<br>Less reactive<br>Takes longer, increases rate<br>Longer and rate incorrect –cancels |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **4** | **a** | | Proton = 1<br>Neutron = 2<br>Electron = 1<br><br>All 3 for 1 mark | **1** | | |
| **4** | **b** | | Protium/<br>Top one/<br>1 | **1** | | one |
| **5** | **a** | | Polar covalent/<br>polar<br>Ionic<br>Polar covalent molecular<br>Polar covalent network | **1** | | Covalent/<br>Hydrogen<br>Van der waals |
| **5** | **b** | **i** | Increases and drops/decreases to zero<br>increases then decreases<br><br>increases as the atomic number increases | **1** | | any description of the pattern in the graph (increases, drops, increases, drops)/<br><br>as they increase so does the atomic number (wrong cause and effect) |
| **5** | **b** | **ii** | Greater than 0·7 but less than 1·2/<br>Accept numerical value | **1** | | Drawn at 2, 10,18 |
| **6** | **a** | | $\frac{1{\cdot}57}{157}$ = 0·01 moles<br><br>0·01 moles on its own | **1** | ½ mark – working only $\frac{1{\cdot}57}{157}$<br><br>½ mark – arithmetic error | |
| **6** | **b** | | (Covalent)Network/<br>Lattice | **1** | | Covalent<br>Giant molecule<br>Ionic - cancels |

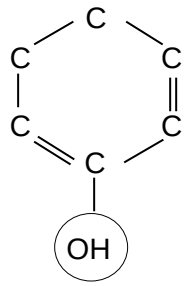
| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **6** | **c** | | $Ca_3(PO_4)_2$<br>$(Ca^{2+})_3(PO_4^{3-})_2$<br>$(Ca^{2+})_3(PO_4)_2$<br>$Ca_3(PO_4^{3-})_2$ | **1** | | |
| **7** | **a** | | carbon dioxide/<br>$CO_2$ | **1** | | incorrect formula |
| **7** | **b** | **i** | $\frac{100 \times 70{\cdot}4}{56{\cdot}3}$ = 125·04 rounded to 125<br>Accept 125 or 125.04 on its own | **1** | Working only $\frac{100 \times 70{\cdot}4}{56{\cdot}3}$<br>½ mark – arithmetic error | |
| **7** | **b** | **ii** | £130 | **1** | | |
| **8** | **a** | | (Different) boiling points | **1** | | Melting points/<br>Molecular size/<br>Number of carbon atoms/<br>viscosity<br>None cancel |
| **8** | **b** | | Increasing number of carbon atoms<br>Increases viscosity(thickness)/<br>Decreasing carbon atoms will decrease viscosity(thickness)/<br>More carbons, greater viscosity(thickness)/ | **1** | | Any mention of relating number of carbon atoms to position of ball in measuring cylinder/<br>The higher the hydrocarbons the higher the viscosity<br>The higher the number of hydrocarbons the higher the viscosity |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **8** | **c** | | 2,3-dimethylbutane/<br>2,3 dimethylbutane/<br>2-3 dimethylbutane/<br>23- dimethylbutane<br><br>Accept loose spelling of methyl and butane but ane must be present eg buthane<br>Accept (di)<br>Accept spaces between di and methyl and butane<br><br>Ignore wrong use of commas and dashes | **1** | | |
| **9** | **a** | |  and<br>  <br><br>both required for 1 mark<br><br>allow one missing H or one missing C to H bond | **1** | | No 5 bonded carbons |
| **9** | **b** | **i** | Butanoic acid<br>Accept loose spelling – must have oic acid<br>Ignore number 1 ie but-1-anoic acid | **1** | | |
| **9** | **b** | **ii** | Turns lime water milky/chalky/cloudy | **1** | | lime water test |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **10** | **a** | | Thermoplastic/<br>thermalplastic | **1** | | |
| **10** | **b** | **i** |  <br>both end bonds must be present, dotted lines, squiggles /<br>allow one missing C to F bond/<br>allow one missing F<br>don't penalise for size/shape of F<br>must have 6 carbons<br>ignore brackets | **1** | only 1 end bond | missing C to C bond/<br>no end bonds<br>Fl<br>Carbon to carbon double bond<br>F at end |
| **10** | **b** | **ii** | Addition/<br>additional | **1** | | |
| **10** | **c** | | Carbon monoxide/<br>CO | **1** | | HF<br>$F_2O$<br>$F_2$ |
| **11** | **a** | | 2,8,8<br>2)8)8<br>2,8,8,0<br><br>Accept commas or brackets or dots | **1** | | 8,8,2/<br>2,8,8,2 |
| **11** | **b** | **i** |  | **1** | | |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **11** | **b** | **ii** |  <br>or<br>  <br>or | **1** | If bond goes to wrong atom | |
| | | |  <br>COOH /$H_2N$ written instead of drawn<br>Ignore any attempt to draw out HCOOH in 3rd amino acid – all other COOH groups must be correct | | | |
| | | | | | | |
| **12** | **a** | |  or<br>  or<br>  <br>  | **1** | | |
| **12** | **b** | | Hydrolysis | **1** | | Digestion<br>hydration |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **12** | **c** | | $\frac{8{\cdot}9}{890}$ 0·01 mole ½<br><br>0·01 × 3 = 0·03 moles ½<br><br>GFM stearic acid = 284 ½<br><br>Mass of stearic acid = 0·03 × 284 = 8·52 ½<br><br>1mole → 3 moles ½<br>890g → 3 × 284g (½ for GFM for stearic acid)<br><br>8.9→ $\frac{8.9}{890}$ (½ ) × 852g (3 × 284)<br>Mass of stearic acid = 8.52g ½ | **2** | Allow follow through if made a mistake in calculation/ arithmetic error | |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **13** | **a** | **i** | Any value less than 7/<br>Accept acid pH number range eg 3 to 6 | **1** | | 7 and any value higher than 7 |
| **13** | **a** | **ii** |  <br><br>Can include C to O bond | **1** | | if OH on carboxyl has been circled/ circled C to OH |
| **13** | **b** | | Label both axes + units (%) ½<br>Scale ½<br>Plotting points ½<br>Join points ½<br><br>Allow 1 plotting error<br>Allow ½ box tolerance in plotting<br>Less than half graph paper used – minus ½<br>Plot at 0/0 is not joined to plot 2/50 – minus ½<br><br>Axes can be reversed | **2** | | |
| **14** | **a** | | To place zinc, magnesium and copper(metals) in order of reactivity<br>Order of reactivity of metals<br><br>Ignore any mention of potassium permanganate | **1** | To find out which <u>metal</u> reacts best/ fastest | |
| **14** | **b** | | To supply oxygen/O/$O_2$<br>Oxidising agent<br>Oxidiser | **1** | | To act as a catalyst - cancels<br>To allow metal to react |

| Question | | | Acceptable Answer/s | Max Mark | ½ mark | Unacceptable |
|---|---|---|---|---|---|---|
| **14** | **c** | | Magnesium – very fast reaction/ fast/ fastest<br>Bursts into flames/<br>Burns with a bright white light<br><br>Copper – dull glow/<br>no reaction<br>Slow/ slowest<br>Moderately slow<br><br>Both must given for 1 mark | **1** | | |
| **14** | **d** | | Potassium will explode/<br>Potassium is too reactive/<br>Boiling tube will explode/<br>Test tube will break<br>Reacts too vigorously/<br>React violently/<br>Light bright enough to blind people/<br>Extremely reactive<br>Too ferocious | **1** | | It reacts/<br>Highly reactive/<br>Too dangerous<br>Too flammable/<br>Highly flammable |
| **15** | **a** | | Less reactive/<br>Lower down in ECS/<br>Sodium is more reactive/<br>Not as reactive as sodium/<br>Not very reactive/<br>Lower than sodium<br>It is unreactive | **1** | | Sodium is similar to titanium<br>Slow at reacting |
| **15** | **b** | | $Na \longrightarrow Na^+ + e$<br>$Na - e \longrightarrow Na^+$<br><br>Ignore state symbols<br>Correct symbols to be used | **1** | | Use of = sign |
| **15** | **c** | | Unreactive<br><br>To stop sodium reacting with air<br>So oxygen isn't present (to react with either metal)<br><br>Full outer (electron) shell<br>Stable outer shell | **1** | | No reference to titanium or titanium chloride<br>Eg to stop titanium reacting with air |

[END OF MARKING INSTRUCTIONS]