2015 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 <u>always</u> 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

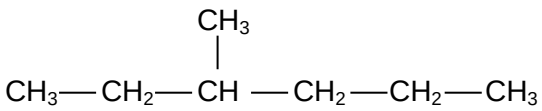
The general comments given below should be considered during all marking. It should be noted that these are general marking principles and may be superseded by decisions made at the Markers' Meeting.

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.

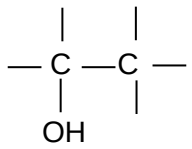
15. Unless the question is clearly about a non-chemistry issue, eg costs in industrial chemistry, a non-chemical answer gains no marks.

    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.

2015 Chemistry Intermediate 2

Part Two: Marking Instructions for each Question

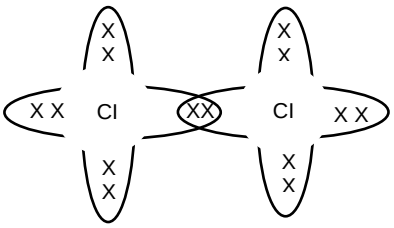
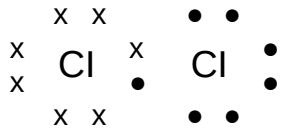
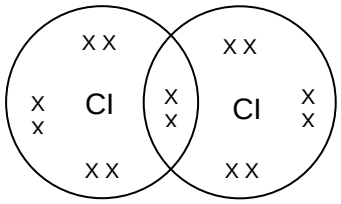
Section A

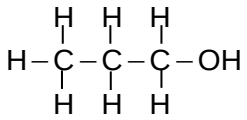
Question	Expected Answer(s)	Max Mark
1.	C	**1**
2.	C	**1**
3.	A	**1**
4.	B	**1**
5.	C	**1**
6.	D	**1**
7.	D	**1**
8.	B	**1**
9.	B	**1**
10.	A	**1**
11.	C	**1**
12.	A	**1**
13.	B	**1**
14.	A	**1**
15.	C	**1**

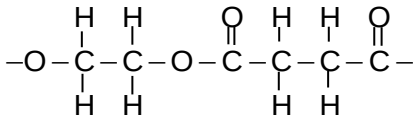
Question	Expected Answer(s)	Max Mark
16.	B	**1**
17.	D	**1**
18.	B	**1**
19.	A	**1**
20.	C	**1**
21.	A	**1**
22.	D	**1**
23.	C	**1**
24.	B	**1**
25.	B	**1**
26.	C	**1**
27.	A	**1**
28.	D	**1**
29.	C	**1**
30.	A	**1**

Section B

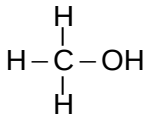
Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
1	**a**		126	**1**		
1	**b**		Same atomic number different mass numbers/ Same number of protons different numbers of neutrons/ Same atomic number different numbers of neutrons/ Same number of protons different mass numbers Same element different mass number Same number of protons different masses Ignore mention of electrons	**1**		
1	**c**		225−235	**1**		
2	**a**		Tetrahedral	**1**		
2	**b**	**i**	Circle weak then strong Both correct for 1 mark	**1**		
2	**b**	**ii**	Chlorine has stronger attraction for electrons/ Chlorine pulls electrons more/ Attraction for the (bonded) electrons is different Hydrogen less attraction for electrons/ Hydrogen pull electrons less/ different electronegativities Electrons not shared equally accept hydrogen has greater pull of electrons	**1**		Ion cancels Different forces of attraction Uneven balance of positive and negative charges

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
3	**a**		Top to bottom going right (Concentrated) hydrochloric acid Water (Concentrated) sulphuric acid Chlorine All correct for 1 mark	**1**		
3	**b**		 **or**  **or**  Accept dot and cross diagrams Shared pair of electrons in overlap Ignore inner electrons	**1**		
4	**a**		(A substance which) burns to produce energy Burns to give out energy	**1**		Gives energy
4	**b**	**i**	Sodium hydroxide/ Sodium oxide Name and incorrect formula – do not penalise	**1**		NaOH/ Na_2O
4	**b**	**ii**	Na^+H^-	**1**		NaH

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
5	**a**		Covalent (molecular)	**1**		Covalent network Molecular ionic
5	**b**	**i**	$TiCl_4 + 4Na \rightarrow Ti + 4NaCl$ Accept multiplies	**1**		
5	**b**	**ii**	Less reactive Sodium is more reactive	**1**		Unreactive Quite reactive
5	**b**	**iii**	Unreactive atmosphere/ Sodium won't react/ Sodium will react with oxygen Neither element reacts with oxygen Imply sodium not reacting or unreactive atmosphere	**1**		
6	**a**		Propan-2-ol	**1**		Propanol Prop-2-ol
6	**b**	**i**	 carbon bond to go to O not H	**1**	Carbon bond to H not O	propanol
6	**b**	**ii**	Addition/ Hydration	**1**		

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
7	**a**	**i**	Serine	**1**	Se	serine+ another amino acid
7	**a**	**ii**	Not enough amino acids samples/ Not one of amino acids tested for/ Spots didn't match up/line up/ Its higher than the known amino acids/ Travelled different distance to known amino acids/ It doesn't reach to known amino acids Different amino acid/	**1**		Amino acid did not travel up paper/ It has run of the top
7	**b**		Peptide/amide	**1**		
8	**a**		Carboxyl	**1**		Carboxylic (acid)
8	**b**	**i**	Condensation (polymerisation)	**1**		Addition negates
8	**b**	**ii**	 must have 1 terminal O Allow 1 end bond missing Allow 1H bonded to carbon to be missing Allow 1 C to C to H bond to be missing	**1**		Both end bonds missing Both or either end has H Both ends have an O

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
9	**a**		Supply energy	**1**		
9	**b**		Oils have greater unsaturation compared to fats/ Has more unsaturation/ Has more carbon to carbon double bonds/ is unsaturated Fats are greater saturation compared to oils/ Fats have more saturation/less unsaturation/ Fats more less carbon to carbon double bonds/ Fats are saturated	**1**		It's an alkaline/ Oils are alkenes Fats are alkanes
9	**c**		Heterogeneous	**1**		

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
10	**a**		Hydrolysis Accept loose spelling	**1**		Hydration cancels
10	**b**		 **or** CH_3OH	**1**	C to HO bond	
11	**a**		(Same) volume (of sodium chloride) (Same) concentration (of sodium chloride) $50cm^3$/ $0{\cdot}1\ moll^{-1}$/ (same) size of metals (same) surface area of metals Depth of metals in solution Number of moles temperature	**1**		Mass of metal
11	**b**	**i**	The greater the difference in reactivity (between the metals) the greater the voltage/ The less reactive the metal, the greater the voltage The more reactive, the less the voltage Metals close to Mg on the ecs will produce lower voltage	**1**		
11	**b**	**ii**	Value greater than 2·25	**1**		
11	**c**		Complete the circuit/ Allow the ions to move	**1**		Act as an electrolyte Allow electricity to flow

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
12	**a**		Boil it/ Heat it/ Leave it overnight/on windowsill/ Use a bunsen	**1**		Filter negates Leave it
12	**b**		GFM $CuSO_4$ = 159·5 **(½)** Moles of $CuSO_4 = \frac{3 \cdot 19}{159 \cdot 5} = 0 \cdot 02$ **(½)** $C = \frac{0 \cdot 02}{0 \cdot 1} = 0 \cdot 2$ **(1)** Using 100 instead of 0·1 then −1	**2**		
13	**a**		Aluminium will sacrificially protect steel/ Aluminium will lose electrons to (steel)	**1**		
13	**b**		$Al \rightarrow Al^{3+} + 3e$ Ignore state symbols	**1**		
13	**c**		Stops oxygen/ Stops water/ Stops oxygen and water Protects/prevents = stops	**1**		Physical protection Protective layer Barrier protection Rust cancels

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
14	**a**	**i**	Sulphuric (acid)	**1**		
14	**a**	**ii**	No more bubbles of gas/ Solid left at bottom/ Unreacted magnesium left Magnesium stops reacting	**1**		Stops reacting All acid used up Stops dissolving
14	**a**	**iii**	Remove (unreacted) magnesium/ Remove (excess) magnesium Ignore reference to dissolving	**1**		Remove excess
14	**b**		Weak	**1**		

Question			Expected Answer(s)	Max Mark	½ mark	Unacceptable
15	**a**		Contains more hydrogen ions than hydroxide ions Greater concentration of hydrogen ions than hydroxide ions	**1**		Contains hydrogen ions More hydrogen ions Neutralise an alkali
15	**b**	**i**	Starch	**1**		
15	**b**	**ii**	16·0	**1**		
15	**b**	**iii**	Moles of iodine = 0·005 × 0·016 = 0·00008 **(½)** Moles of vitamin C = 0·00008 **(½)** Concentration Vit C $= \frac{0 \cdot 00008}{0 \cdot 025} = 0 \cdot 0032$ **(1)** **OR** $\frac{C \times 25}{1} = \frac{0 \times 0 \cdot 005 \times 16}{1}$ **(½)** **(½)** C × 25 = 0·08 C = 0·0032 **(1)** Allow 16 **and** 25 together But if only moles of Vit C/iodine calculated must be in litres or −1 Allow follow through	**2**		
16	**a**		Pink	**1**		
16	**b**		Left to right Arrow through or near wires	**1**		Arrow on ion bridge

[END OF MARKING INSTRUCTIONS]