2014 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

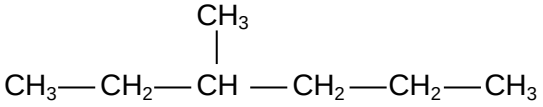
The general comments given below should be considered during all marking. It should be noted that these are general marking principles and may be superseded by decisions made at the Markers' Meeting.

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.

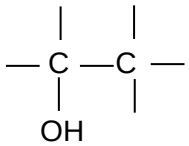
15. Unless the question is clearly about a non-chemistry issue, eg costs in industrial chemistry, a non-chemical answer gains no marks.

    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(s)
1	D
2	A
3	B
4	B
5	D
6	A
7	B
8	A
9	C
10	C
11	B
12	C
13	A
14	B
15	C

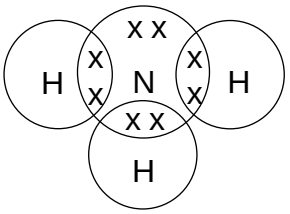
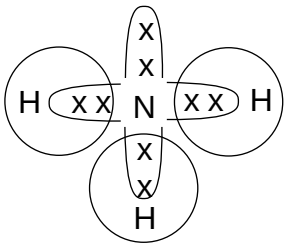
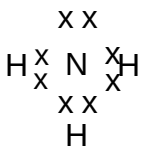
Question	Acceptable Answer(s)
16	D
17	B
18	C
19	C
20	C
21	B
22	A
23	B
24	D
25	A
26	D
27	C
28	C
29	B
30	B

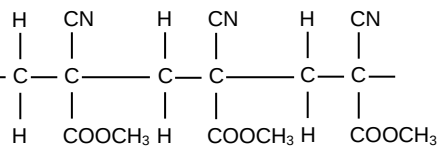
Section B

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
1	**a**		Hydrogen / H_2 / H	**1**	H2 / H^2	
1	**b**	**i**	Use a bigger measuring cylinder – higher capacity measuring cylinder Use less magnesium - smaller strip, smaller mass, less grams, use 0.12g of Magnesium Use less acid – less volume of acid/solution Use a bigger syringe Lower mass of contents of flask Accept weight or mass	**1**		Use less concentrated acid / Lower temperature Use a syringe Powdered magnesium/ lower temperature/ smaller pieces of magnesium/ (Less) amount of magnesium. Change mass of contents of container Bigger test tube
1	**b**	**ii**	Label and units axes ½ Scale ½ Plot points ½ Join plot ½ Allow 1 plotting error Allow ½ box tolerance on plotting Use less than half graph paper -½ Bar graph – max of 1 mark for label and scale Axes can be reversed Accept scale break If line is not drawn to 0/0 then -½	**2**		
1	**b**	**iii**	$\frac{86-46}{6-2}$ ½ $\frac{40}{4}$ =10 ½ or 10 on its own 1	**1**	Correct working shown but arithmetic error made in last step / Only working shown	Wrong working to get correct answer $\frac{4}{40} = 10$

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
2	**a**		(Repulsion by) positive nucleus / (Repulsion by) positive core / Positive charged core (deflected them) / Positive charge nucleus (deflected them)/ Hit positive (protons in the) nucleus of gold atoms Repulsed by positive particles present in gold. Looking for Positive + nucleus/core/protons	**1**		Ions Positive gold atoms Gold is positive Positive metal Attraction of negative electrons – <u>not</u> cancelling Resistance between positively charged particles
2	**b**	**i**	Protons – 79 Electrons – 79 Neutrons – 118 All for 1 mark	**1**		
2	**b**	**iii**	Same atomic number different mass number / Same number of protons different number of neutrons / Same atomic number different number of neutrons/ same element different mass (number) accept abbreviations for protons and neutrons Ignore mention of electrons	**1**		Different number of neutrons in the nucleus/ Same atomic number/ Different mass numbers/ Same atom different mass number

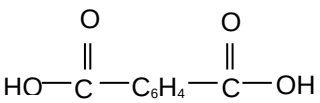
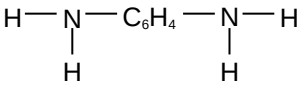
Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
3	**a**		First – oxygen Second – argon Third – nitrogen All for 1 mark	**1**		
3	**b**		(fractional) Distillation / (fractional) Condensation	**1**		Fractional separation/ Evaporation – cancels/ Liquidation/ fractional
3	**c**		Not enough oxygen (in air) Concentration of oxygen in air is too low Not a high enough percentage of oxygen/ small percentage of oxygen Not a sufficient amount of oxygen <u>Only</u> 20% oxygen in air	**1**		Air contains other gases/ Oxygen is not main component/ Air not pure oxygen/ Oxygen is spread out around splint/ Majority of air is nitrogen 20% oxygen in air

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
4	a		 or  or  accept ● or x or e other symbol or mixture 1 element symbol must be given Ignore size of symbol Shared electrons in overlap or on line If inner electrons shown, they must be correct Lone pair of electrons must be shown, don't need to be paired	1		
4	b		Weak (bonds between molecules)/ Not a strong force of attraction Ammonia has weak bonds If explanation given then must contain correct chemistry at Int 2 level and if not - cancels	1		Not strong as electrons free to move
4	c	i	Only partially dissociates / Not completely ionised	1		Ions partially dissociate/ The hydroxide ions do not fully dissociate/ Not all hydroxide ions associate Lower pH/ Does not have a lot of OH ions/ Partially dissociates when mixed with an acid

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
4	**c**	**ii**	gfm NH_3=17g ½ moles of NH_3 =510/17=30 moles ½ moles of $(NH_4)_3PO_4$ =30/3=10 moles ½ Mass of $(NH_4)_3PO_4$ =10x149=1490 grams ½ OR $3NH_3 \longrightarrow (NH_4)_3PO_4$ 3 mole 1mole ½ 3 x17 ½ 51 ⟶ 149 ½ 510 ⟶ 1490 ½ Accept follow through Correct answer but no working 2 If use wrong formula or wrong substance then -1 mark so max is 1 mark NH_3 to H_3PO_4 = 980 H_3PO_4 to $(NH_4)_3PO_4$ = 775.4	**2**		
5	**a**		Exothermic / exothermal	**1**		Endothermic exotherm
5	**b**		 Accept 1 missing bond but not C-C in chain Accept 1 missing atom but not C in chain Ignore any brackets identifying repeating unit End bonds can be ~ or dots	**1**	1 missing end bond bond goes to wrong element eg 	both end bonds missing only 2 units missing COO/groups C=C left in chain
5	**c**		Hydrogen cyanide / Carbon monoxide	**1**		Cyanide gas cyanide

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
6	**a**		Sweeter ½ Use less of it ½ Use less for same sweetness 1 Ignore reference to calories	**1**		Stronger sugar
6	**b**	**i**	Isomers			
6	**b**	**ii**	Hydroxyl	**1**		Hydroxide Alcohol OH
7	**a**	**i**	Heterogenous	**1**		Heterozygous/ hetero
7	**a**	**ii**	3-methylheptane / 3 methylheptane 3 methyl heptane accept comma in place of dash	**1**		3-methyl septane
7	**a**	**iii**	any acceptable isomer of C_8H_{18} Full or shortened or a mixture is acceptable allow 1 missing hydrogen allow 1 missing bond - C to H	**1**	If attach branch in structure to H rather than C	either of structures given in question - octane or 3-methylheptane
7	**b**	**i**	Heat catalyst first / Heat middle first Heat catalyst immediately Heat catalyst then the liquid paraffin/ Ignore additional information	**1**		Test-tube heated all over Heat in middle of test-tube Heat catalyst Mostly on catalyst and little bit on ceramic wool

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
7	**b**	**ii**	Bromine decolourises / Decolourises / Turns from orange / brown/yellow/reddish brown to colourless Turns colourless	**1**		Goes clear/ Colour change/ Bubbles appear Wrong initial colour of bromine solution
7	**b**	**iii**	Continue heating and remove delivery tube/bromine solution Separate the 2 tubes before heat is removed Take delivery tube out before heating is stopped Heat whilst tube is being removed	**1**		Continue heating/ Remove tube

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
8	**a**	**i**	Esters	**1**		fats
8	**a**	**ii**	Contains only carbon to carbon single bonds / No carbon to carbon double bonds/ There isn't a double bond only a carbonyl group/	**1**		No double bond/ Doesn't undergo addition / No other bonds that allow an atom to add on/ Doesn't decolourise bromine Contains only single bonds (in main structure)
8	**b**		Glycerol / Propan -1,2,3 -triol Propane-1,2,3-triol accept incorrect punctuation	**1**		
8	**c**		4·18 × 0·1 × 8 = 3·344 / 3·34 / 3·3 / 3 with working 3·3 or 3·34 or 3.344 on its own	**1**	Arithmetic error correct working but incorrect answer Shown working but incorrect rounding	Incorrect ∆T 3 on its own
9	**a**		Strong / Lightweight/ light	**1**		Stops rusting Flexible Tough Bulletproof Hardwearing Long lasting Impact resistant Durable Above are not cancelling but metal - cancels
9	**b**	**i**	Amide link/ amide group peptide	**1**		Amine - cancels
9	**b**	**ii**	 or  If attempt to draw out C_6H_4 – ignore but must have correct numbers of C and Hs	**1**		No end functional groups/ Mixture of functional groups

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
10	**a**		gfm = 60g ½ Moles = 6/60 = 0·1 (moles) ½ C = 0·1/0·1 = 1 ($moll^{-1}$) 1 Accept follow through Minus ½ mark arithmetic error correct working but incorrect answer	**2**		0.1 x1000 100 Does not get 2nd mark
10	**b**		Reaction with magnesium – slower ½ Current – lower ½	**1**		Cancelling applies but ignore any circling of fast and 60
11	**a**		Sulphuric acid / H_2SO_4	**1**		Use of super-scripts e.g. H^2SO^4
11	**b**		Step 2 – filtration / filtering 1 Step 3 – evaporation / evaporating 1 Check diagrams for answers if no names given on page 23	**2**		2 – neutralisation/ Stirring/ Add magnesium 3- Crystallisation Diagrams instead of names Cancelling applies if 2 answers given

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
12	**a**		Nickel gives its electrons to gold / Nickel is higher up in ECS / reactivity series Nickel is more reactive than gold Nickel gives gold sacrificial protection Nickel sacrifices itself. Gold is lower in ECS/ reactivity series Gold is less reactive	**1**		Displacement – cancels Rusts - cancels Nickel is higher They are further apart nickel is oxidised
12	**b**		$Ni \longrightarrow Ni^{2+} + 2e^-$ Ignore state symbols/ Charge on e not required. $Ni - 2e^- \longrightarrow Ni^{2+}$	**1**		
12	**c**		Stops oxygen / Stops air Stops water / Stops oxygen and water/ Barrier between nickel and water/oxygen/water Prevents reaction between nickel and water/oxygen/air Shield between nickel and oxygen/water/air	**1**	Physical protection /Barrier (protection)/ Shield (protection)/ Protects it/gold from oxygen and water	Rusting, displacement, sacrificial – cancels/ Stops nickel from losing electrons/ Physical/ DC supply

Question			Acceptable Answer(s)	Max Mark	½ mark	Unacceptable
13	**a**		To complete the circuit Ignore additional information unless wrong chemistry at Int. 2 level.	**1**		To act as an electrolyte To create ion bridge To act as a salt bridge Conducts electricity Electrons - cancels To allow electricity to flow/move/ To allow current to flow/ To conduct the flow of electricity/ Carries the current (from silver to zinc)/ To allow conductivity between metals
13	**b**	**i**	10·92	**1**		
13	**b**	**ii**	Smaller / Less / Lower/ Decreases/ Drops Not as high	**1**		Less effective
14	**a**		Ores/ Metal ores	**1**		Native/ Un-combined/ transition
14	**b**		$Al(OH)_3$ / Accept partial correct ionic $Al^{3+}(OH)_3$ / $Al(OH^-)_3$ / $Al^{3+}(OH^-)_3$ Brackets required around OH /accept brackets around Al	**1**		$AlOH_3$ use of superscripts e.g. $Al(OH)^3$
14	**c**		Reduction / electrolysis	**1**		Redox extraction

[END OF MARKING INSTRUCTIONS]