



**2010 Chemistry**

**Intermediate 2**

**Finalised Marking Instructions**

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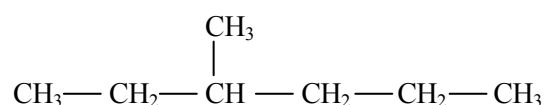
## Intermediate 2 Chemistry

### 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 It should be noted that these are general marking principles and may be superseded by decisions made at the Markers Meeting.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 <sub>3</sub> COOH	1.65
CH <sub>2</sub> ClCOOH	1.27
CHCl <sub>2</sub> COOH	0.90
CCl <sub>3</sub> COOH	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<sub>2</sub>, 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?

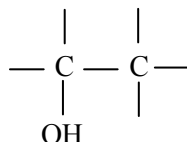
No marks for “because they are ionic” since the word “ionic” appears in the text.

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<sub>2</sub> group, a half mark should be deducted if the ‘O’ or ‘N’ are not bonded to a carbon, ie OH – CH<sub>2</sub> and NH<sub>2</sub> – CH<sub>2</sub>.
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.

## 2010 Chemistry Intermediate 2

### Marking Scheme

#### Section A

1	A	11	A	21	C
2	D	12	D	22	D
3	C	13	B	23	A
4	D	14	D	24	A
5	C	15	B	25	C
6	D	16	C	26	A
7	B	17	A	27	B
8	B	18	A	28	A
9	C	19	B	29	D
10	A	20	C	30	C

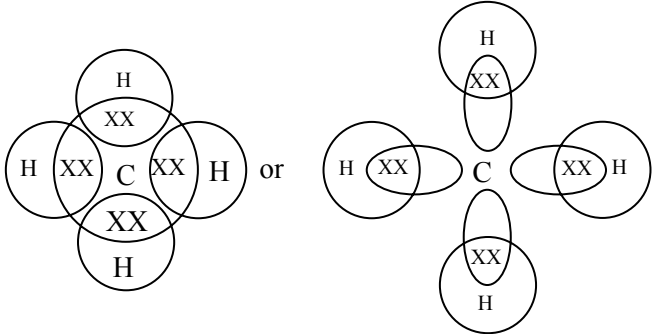
Section B

Question	Acceptable Answer	Mark	Worth ½	Worth 0
1 (a)	Nucleus/nuclei	1 or 0		Protons and neutrons
(b)	(i) 8 Ignore any units given  (ii) Same/equal number of (positive) protons as (negative) electrons Positive charge of protons cancels negative charge of electrons Protons cancel out electrons  (iii) Alkali metals	1 or 0  1 or 0  1 or 0	Same number of positive and negative charges	Wrong charge eg negative protons cancel positive electrons Nucleus attracts same number of protons and electrons  Charges cancel (if no mention of protons/electrons)  Any named group 1 metal Alkaline metals Alkali on its own Alkaline on its own Reactive metals Group 1 metals

Question	Acceptable Answer	Mark	Worth ½	Worth 0
2 (a)	Endothermic	1 or 0		Chemical reaction Freezing
(b)	(s) and (l) and (aq) Accept capitals Ignore size  <b>All 3 for 1 mark</b>	1 or 0		
(c)	Solvent	1 or 0		Solution Aqueous Solute
(d)	$\frac{6 \cdot 72}{0 \cdot 2 \times 4 \cdot 2}$ = 8  or 8 on its own	1 or 0	Correct working shown but with wrong answer  An arithmetic mistake - ½ mark  Correct working and no final answer	Wrong working 141.12 on its own

Question	Acceptable Answer	Mark	Worth $\frac{1}{2}$	Worth 0
3 (a)	Covalent Network/lattice Ignore order given  $\frac{1}{2}$ for bonding $\frac{1}{2}$ for structure	$\frac{1}{2}$ $\frac{1}{2}$	covalent only network/lattice only covalent plus incorrect description of structure network/lattice plus incorrect description of bonding	Polar covalent 3D Tetrahedral Single bonds Molecular/discreet Any mention of ionic cancels correct answer



Question	Acceptable Answer	Mark	Worth ½	Worth 0
(b) (i)	 <p>At least one of the symbols must be shown in correct place.</p> <p>Mixture of dots and crosses acceptable.</p> <p>Accept Lewis dot diagram</p> <p>Ignore inner electrons for carbon.</p> <p>Allow for one slip for misplaced electron.</p> <p>Allow for one slip for symbols.</p> <p>Accept electron pair on line of touching circles</p>	<b>1 or 0</b>		<p>Electrons missing.</p> <p>One of the pair of shared electrons not in the overlap.</p> <p>No symbols shown at all.</p>

Question	Acceptable Answer	Mark	Worth ½	Worth 0
(ii)	<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;"> <math display="block">\begin{array}{c} \text{H} \\   \\ \text{C} \\ / \quad   \quad \backslash \\ \text{H} \quad \text{H} \quad \text{H} \end{array}</math> </div> <div style="margin: 0 10px;">or</div> <div style="text-align: center;"> <math display="block">\begin{array}{c} \text{H} \\   \\ \text{C} \\ / \quad   \quad \backslash \\ \text{H} \quad \text{H} \quad \text{H} \end{array}</math> </div> </div> <p>Use professional judgement to establish tetrahedral shape.</p> <p>Symbols not required.</p> <p>Accept outer electron diagram if correct shape is shown.</p> <p>Dotted line and triangle not necessary.</p> <p>Professional judgement - Must not be square planar.</p>	<b>1 or 0</b>		$\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}$

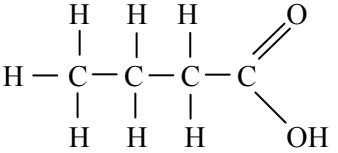
Question	Acceptable Answer	Mark	Worth ½	Worth 0
4 (a) (i)	25(%) Accept between 24 -26  If blank, check part (ii) and may award mark if 25% has obviously been used in the calculation	1 or 0		75
(ii)	25/100 × 6 = 1.5 1.5 on its own  Accept follow through from part (i) if it applies	1 or 0	-½ mark per arithmetic mistake	
(b)	4 moles to 2 moles 4 × 108g = 2 × 248 432 = 496 1.08 = 1.08 × 496/432 = 1.24  OR  no of moles of Ag = 1.08/108 = 0.01 moles no of moles of Ag <sub>2</sub> S = 0.01/2 = 0.005  GFM Ag <sub>2</sub> S = 248 Mass of Ag <sub>2</sub> S = 0.005 × 248 = 1.24  Ignore units/absence of units/ incorrect units given Check paper for indication of final answer.	½  ½  1    ½  ½    1	-½ mark per arithmetic mistake, even if correct final answer is given  -1 mark if atomic numbers are used  -1 mark if incorrect chemical used in calculation	If they only have calculated the GFM for Ag <sub>2</sub> S (as 248)

Question	Acceptable Answer	Mark	Worth ½	Worth 0
5 (a)	Heat the catalyst and then the liquid paraffin/mineral wool Heat catalyst first	1 or 0	Heat the catalyst (with no mention of heating paraffin) Heat moved between the two chemicals Heat moved along the test tube Heat catalyst and the paraffin/wool	Heat paraffin then catalyst Heat paraffin/wool Description of type of flame used to burn
(b)	To prevent suck-back or some description	1 or 0		Blowback Tube can smash/crack Air bubble could form Prevent an explosion or other vague answer
(c) (i)	Aluminium oxide/ $Al_2O_3$ / formula must be correct (Aluminium) silicate Other silicate	1 or 0		Steel wool Correct name and incorrect formula cancels
(c) (ii)	Allows reaction to occur at lower temperature Lower energy required Lower activation energy	1 or 0		Cheaper Saves energy Can be reused Remains unchanged Prevents harmful gases being produced Does not affect outcome of the reaction Does not need to be heated To change temperature used

Question	Acceptable Answer	Mark	Worth $\frac{1}{2}$	Worth 0
(d)	Addition Bromination Halogenations Additional Brominisation	1 or 0		Addition polymerisation Addition plus incorrect Saturation

Question	Acceptable Answer	Mark	Worth ½	Worth 0
6 (a)	$  \begin{array}{ccccccc}  & \text{H} & \text{H} & \text{O} & \text{H} & \text{H} & \text{H} \\  &   &   &    &   &   &   \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\  &   &   & &   &   &   \\  & \text{H} & \text{H} & & \text{H} & \text{H} & \text{H}  \end{array}  $ <p>Allow one slip:  one missing bond but not in carbonyl group <b>or</b>  one missing hydrogen  Accept correct (partial) shortened structural formula</p>	<b>1 or 0</b>		2 slips
(b)	Heptan-4-one/heptan4one /heptane-4-one/hept-4-one/ hept4one/hepta-4-one  Must have hept, 4, and one	<b>1 or 0</b>		Septan-4-one Alkene ending given – hepten-4-one -one missing
(c)	147 – 155 approx 150 or any number within the range accept a range within the tolerance	<b>1 or 0</b>		Any other value

Question	Acceptable Answer	Mark	Worth ½	Worth 0
7 (a) (i)	Fermentation Anaerobic respiration	1 or 0		Brewing
	(ii) Enzyme/biological catalyst Enzyme protein Ignore names of enzymes given	1 or 0		Any named enzyme Protein Bacteria
(b)	Yeast is denatured/destroyed/loses its shape Enzyme is denatured/destroyed/loses its shape Yeast dies/is killed	1 or 0	Won't work at high temperatures Works best at lower temperatures Yeast works at optimum temperatures Works best at body temperature Works best at room temperature Does not work as well at high temperatures	Enzyme dies/killed Yeast reacts with heat
(c)	Distillation Correct description of the distillation process to include both boiling and condensation stages Fractional distillation	1 or 0		Boil it Boil it because alcohol and water have different boiling points Separate off the alcohol Remove water by evaporation Fractionating Fractionation

Question	Acceptable Answer	Mark	Worth ½	Worth 0
<b>8 (a)</b>	Esters Alkyl alkanoates	<b>1 or 0</b>		Organic Ester plus any incorrect answer
<b>(b) (i)</b>	Hydrolysis Hydrolysed Accept spelling variations of the above	<b>1 or 0</b>		Hydrolysisation Hydrolysatation De-esterification
<b>(ii)</b>	<div style="text-align: center;">  </div> <p>Allow 1 slip – missing bond but not from COOH group <b>or</b> missing H but not from COOH group</p> <p>Accept (partial) shortened structural formula</p> <p>Ignore any attempt to draw alcohol</p>	<b>1 or 0</b>		2 slips



Question	Acceptable Answer	Mark	Worth ½	Worth 0
9 (a)	Photosynthesis	1 or 0		
(b)	<p>Glucose turns Benedict's (solution) from blue to (brick) red/yellow/orange/green</p> <p><b>OR</b></p> <p>Iodine turns blue/black/purple with starch (no initial colour required)</p> <p>Must have initial colour with Benedict's for full mark</p> <p>Iodine turns blue/black with starch (and Benedict's turns brick red with glucose.)</p> <p>Tyndall beam test and correct result</p> <p>Do not need to say 'the other does not'</p>	1 or 0	Benedict's turns brick red/yellow/orange/green with glucose.	Only colour change given Benedict's test Iodine test Tyndall beam Any mention of protein cancels correct answer
(c)	Circle /underline any of the – OH groups	1 or 0		Carbon atom included in answer
(d)	2,8 2,8,0	1 or 0	Electron arrangement of neon/same as neon/ same electron arrangement of neon	Like neon Like electron arrangement of neon

Question	Acceptable Answer	Mark	Worth ½	Worth 0
<b>10 (a)</b>	Any value below 7 Accept a range if it is below 7	<b>1 or 0</b>		0-7
<b>(b)</b>	<p data-bbox="427 427 1055 528"><b>(i)</b> As the temperature increases the solubility decreases OR As the temperature decreases the solubility increases</p> <p data-bbox="427 563 1016 595">Correct use of units in the description of the trend</p> <p data-bbox="427 630 909 662">Allow slip e.g. lemonade instead of CO<sub>2</sub></p> <p data-bbox="427 697 719 761">Correct cause and effect Looking for a trend</p> <p data-bbox="427 834 1039 970"><b>(ii)</b> Correct extrapolation of line Value must come from candidate's graph +/- ½ box tolerance cross or point rather than line acceptable</p> <p data-bbox="427 1005 826 1037">1.90-1.94 if line not extrapolated</p>	<b>1 or 0</b>		<p data-bbox="1767 427 2085 528">As the solubility of carbon dioxide decreases, the temperature increases.</p> <p data-bbox="1767 563 2078 627">It has 1.2 g l<sup>-1</sup> at 30 °C and 1.56 g l<sup>-1</sup> at 20 °C</p> <p data-bbox="1767 834 2074 970">Approximations not accepted Incorrect extrapolation of line</p>

Question	Acceptable Answer	Mark	Worth ½	Worth 0
<b>11 (a)</b>	Acid rain Dissolved/absorbed SO <sub>2</sub> Dissolved/absorbed NO <sub>2</sub> /oxides of nitrogen/generic term Dissolved/absorbed CO <sub>2</sub> Dissolved/absorbed soluble non metal oxides	<b>1 or 0</b>		Free H <sup>+</sup> ions Nitrate pollution Pollution Sulphur dioxide Nitrogen dioxide Carbon dioxide
<b>(b)</b>	<p data-bbox="427 528 728 592"><b>(i)</b> Calcium, carbon, oxygen Ca/C/O/O<sub>2</sub></p> <p data-bbox="916 632 1115 659" style="text-align: center;"><b>all 3 for 1 mark</b></p> <p data-bbox="427 699 582 762"><b>(ii)</b> Water/H<sub>2</sub>O hydrogen/H<sub>2</sub></p>	<b>1 or 0</b>		Any incorrect element will cancel
		<b>1 or 0</b>		H Any incorrect formula

Question	Acceptable Answer	Mark	Worth ½	Worth 0
12 (a)	Stops air/oxygen <b>or</b> water/moisture Physical barrier to air/oxygen <b>or</b> water/moisture Stops iron losing electrons to oxygen <b>and</b> water  Ignore mention of salt if correct reference to water/oxygen	<b>1 or 0</b>		Painting provides barrier Physical protection Physical barrier Stops water, oxygen and hydrogen getting to it Stops iron losing electrons Less water/oxygen
(b)	<p>(i) Galvanising Galvanisation</p> <p>(ii) Zinc sacrifices itself Zinc gives sacrificial protection Zinc is being oxidised Zinc corrodes (by losing electrons)             The zinc gives away its electrons (to the iron) Zinc is more reactive Zinc is higher up in the ECS (or reverse of above for iron)             If the word 'it' is used it should refer to iron in the answer</p>	<b>1 or 0</b>  <b>1 or 0</b>		Sacrificial protection    Zinc displaces iron Zinc is too strong for iron Zinc rusts  Any mention of ions cancels

Question	Acceptable Answer	Mark	Worth ½	Worth 0
13 (a)	The reading on the pH probe shows 7/neutral (pH probe) turns green/becomes neutral/goes to 7 pH turns to 7 End point of neutralisation/complete neutralisation	1 or 0		Turns blue/any incorrect colour Neutralisation Until reaction has finished

Question	Acceptable Answer	Mark	Worth ½	Worth 0
(b)	Moles of acid = $C \times V$ $= 0.1 \times 0.02$ $= 0.002$	½ ½	-½ per arithmetic error -½ if cm <sup>3</sup> used instead of litres only in method 1	
	1 mole to 2 moles moles of NaOH = $0.002 \times 2 = 0.004$ $c = n/v$ $= 0.004/0.05$ $= 0.08$			
	OR			
	$H \times C \times V = OH \times C \times V$ $2 \times 0.1 \times 20 = 1 \times C \times 50$ $4 = 50C$	½ ½	-½ if cm <sup>3</sup> and litres mixed in method 2/3	
	$C = 4/50$ $= 0.08$			
	OR			
	$\frac{C_A V_A}{C_B V_B} = \frac{b}{a}$			
	$\frac{0.1 \times 20}{C_B \times 50} = \frac{1}{2}$	½		
	$C_B = \frac{0.1 \times 20 \times 2}{50}$			
	$= \frac{4}{50}$	½		
$= 0.08$	½			

Question	Acceptable Answer	Mark	Worth ½	Worth 0
<b>14 (a) (i)</b>	LHS = copper/Cu Top RHS = Iron/Fe Bottom RHS = 100cm <sup>3</sup> 0.1mol l <sup>-1</sup> <b>all 3 for 1 mark</b>	<b>1 or 0</b>		
	<b>(ii)</b> Repeated (½) to allow averages/mean (½) to be calculated	<b>2 x ½</b>	More than one measurement taken Calculate average	Control of other variables
<b>(b) (i)</b>	From right to left → arrow should be on wires or very close to it	<b>1 or 0</b>		Arrow in solution Arrow in solution and on wires cancels
	<b>(ii)</b> (good) conductor of electricity Contains delocalised electrons Conducts Conductive Free moving electrons	<b>1 or 0</b>		Cheap Insoluble Solid Unreactive

[END OF MARKING INSTRUCTIONS]