2012 Chemistry

Intermediate 2

Finalised Marking Instructions

Intermediate 2 Chemistry

General information for markers

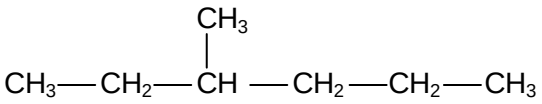
The general comments given below should be considered during all marking. It should be noted that these are general marking principles and may be superseded by decisions made at the Markers' Meeting.

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_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.

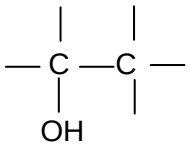
15. Unless the question is clearly about a non-chemistry issue, eg costs in industrial chemistry, a non-chemical answer gains no marks.

    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.

2012 Chemistry Intermediate 2

Marking Scheme

Section A

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

Section B

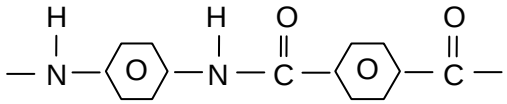
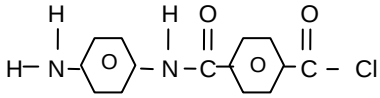
Question	Acceptable Answer	Mark	Worth ½	Worth 0	Cancelling
1 (a)	Network/ Lattice	**1**		Ionic Molecular	ionic molecular
(b)	Sb_2O_3 $(Sb^{3+})_2(O^{2-})_3$ accept correct partial ionic formula (must have brackets)	**1 or 0**		Sb203 Sb^20^3 Incorrect symbols	
(c) (i)	11 B 5 Both correct for 1 mark	1			
(ii)	Isotopes				

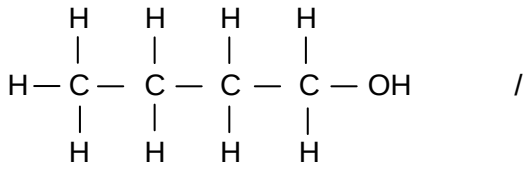
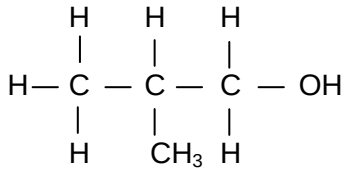
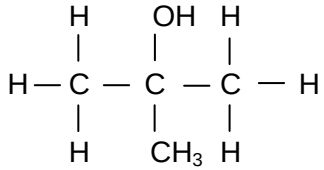
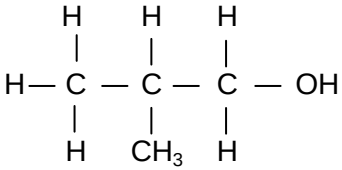
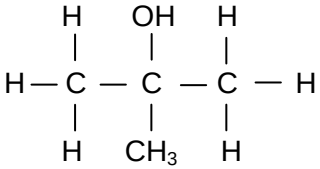
Question	Acceptable Answer	Mark	Worth ½	Worth 0	Cancelling
2 (a) (i)	$\frac{32 - 10}{8}$ = 2.75 (2.8, 3 must have working) or 2.75 on its own	**1**	$\frac{32 - 10}{8}$ Arithmetic mistake No follow through	Incorrect reading of scales 3.375 (27/8) 22/10 $\frac{32 - 5}{8}$	
(ii)	4.5	**1**			
(b)	$NaN_3 \rightarrow Na + N_2$ Ignore state symbols and attempts to balance. Allow electricity over the arrow.	**1/0**		Word equation Equation with electricity as a reactant Use = instead of arrow	
(c)	Explosive/ Highly reactive/very reactive Flammable So that the nitrogen gas does not react with the sodium metal	**1**		It reacts Cause injury to driver It could pierce/damage airbag Produces hydrogen Poisonous/toxic	

Question	Acceptable Answer	Mark	Worth ½	Worth 0
3 (a)	<table><tr><td>Volume of water (cm^3)</td></tr><tr><td>0</td></tr><tr><td>**2**</td></tr><tr><td>**4**</td></tr><tr><td>**6**</td></tr></table>	**1/0**		
(b)	Time taken until colour change/blue-black colour appears/ Rate = 1/time R =1/t Time + colour to change How quickly it turns blue/black	**1**		Time taken Using a stopwatch Change in colour Sharp colour change
(c)	White tile/background under beaker to see colour change Sharp/sudden/quick colour change	**1**		Using syringes/measuring cylinders/ The human eye Cross on white paper underneath Using same person each time. Repeat & average

Question	Acceptable Answer	Mark	Worth ½	Worth 0
4 (a)	Homogeneous Accept loose spellings	**1**		Homozygous Heterogeneous
(b)	Greater (surface) area ½ More collisions/greater chance of collisions ½	**1**		Smaller particles
(c)	$\frac{1.8}{90}$ ½ = 0.02 or 1/50 ½ Or 0.02 or 1/50 on its own 1	**1**	$\frac{1.8}{90}$ only Arithmetic mistake No follow through	

Question	Acceptable Answer	Mark	Worth ½	Worth 0
5 (a)	Same general formula ½ Similar/same (chemical) properties (accept description of chemical properties) ½ Ignore any mention of physical properties Ignore any additional info	**1**		Same basic formula Same physical properties Same difference in mass between members Examples ie alkanes, alkenes.
(b) (i)	More carbons, the more heat (energy) released/ Greater number of carbon atoms, the greater the amount of heat (energy) (released) The larger/bigger the alkanal/molecule the more heat energy (released) Number increases by 600 each time C atom is added Energy released is proportional to number of C atoms Higher energy released means more C atoms Treat energy <u>needed</u> as a slip	**1**		Incorrect cause & effect. The higher the amount of energy released the greater the number of carbon atoms. As you go down the alkanals heat energy increases.
(ii)	2800 to 3200	**1**		

Question	Acceptable Answer	Mark	Worth ½	Worth 0
6 (a)	(Very) strong/stronger than steel Ignore light/tough/bulletproof/	**1**		Strong bonds Very light//tough/bulletproof
(b) (i)	 Dots or dashes for end bonds is fine Ignore missing delocalised electron circles Accept with brackets or brackets + n	**1**	Repeating unit only show 1 end bond	No end bonds 
(ii)	Amide/peptide Accept loose spelling ie amid	**1**		Amine/amino: cancelling amite

Question	Acceptable Answer	Mark	Worth ½	Worth 0
7 (a)	Hydration Catalytic hydration	**1 or 0**		addition
(b)	Ethyl propanoate Accept lose spelling but must have –yl & -oate	**1**		Any numbers in name
(c)	 or  Or  ANY Correct isomer worth 1 mark accept shortened structures/mixtures accept one slip of missing H atom **or** one missing bondC-H or C-C but not both	**1**	If bond goes to incorrect element as per general marking instructions no 17  	not a slip if C-O bond is missing or written C-H-O

<table>
<tr><th>Question</th><th>Acceptable Answer</th><th>Mark</th><th>Worth ½</th><th>Worth 0</th></tr>
<tr><td>8 (a)</td><td>
<table>
<tr><th>Observation with bromine solution</th><th>Saturated or unsaturated</th></tr>
<tr><td>No change</td><td>Saturated</td></tr>
<tr><td>Bromine decolourises</td><td>Unsaturated</td></tr>
<tr><td>No change</td><td>Saturated</td></tr>
<tr><td>Bromine decolourises</td><td>Unsaturated</td></tr>
</table>
Brown to colourless is ok
½ mark each</td><td>2</td><td></td><td>Colour change
Bromine goes clear</td></tr>
<tr><td>(b)</td><td>Use a fume cupboard/well ventilated area
Don’t breathe in (bromine) fumes/
Wear gloves
Thiosulphate pesent</td><td>1</td><td></td><td>Hair tied back
Wash hands after using bromine
Airing cupboard</td></tr>
<tr><td>(c)</td><td>Cyclohexane or isomers of it</td><td>1</td><td></td><td></td></tr>
</table>

Question	Acceptable Answer	Mark	Worth ½	Worth 0
9 (a)	Add iodine (to water/sample/beaker) ½ Stays brown/red/orange/yellow ½ Wont change colour Turns blue/black if starch is present Not blue/black if no starch present	**1**		Add iodine to visking tubing Cancelling No follow through for incorrect test
(b) (i)	Glucose Maltose (Accept correct formula for glucose or maltose)	**1**		Sugars, monosaccharide or disaccharide
(ii)	Acid/ Named Acid	**1**		Enzyme Any named enzyme Water Alkali (alkaline hydrolysis)

Question	Acceptable Answer	Mark	Worth ½	Worth 0
10 (a)	Trap sunlight/ light Harness energy from sun/ Absorbs sunlight/ Stores sun energy Ignore explanations.	**1**		to allow photosynthesis to take place happen/ to allow plants to make their own food/ to produce oxygen/ catalyst Traps energy
(b)	Provides energy/ Gives us energy	**1**		Provides oxygen and energy (cancelling) To help them live/breathe Balances photosynthesis
(c)	Lowers it/ Decreases pH/ Move it towards 7/ neutralises it Goes down/ Makes it acidic – max drop to pH 4	**1**		Drops to < 4

Question	Acceptable Answer	Mark	Worth ½	Worth 0
11 (a)	Student draws workable diagram - Syringe (must have plunger) - Displacement of water into a vertical measuring cylinder/graduated test tube (Ignore water levels including through delivery tube)	**1**	Closed off tubes Big gaps between plunger & syringe Measuring cylinder not vertical Delivery tube through side of trough or measuring cylinder Delivery tube not under measuring cylinder ie 'sloppy' diagrams (-1/2)	Test-tube Beaker
(b)	Calcium chloride or correct formula	**1 or 0**		
(c)	Correct labels and units ½ Scale on X and Y axis ½ Correct plotting of points ½ Joining of points (by ruler allowed) ½ - ½ if not used at least half the graph paper - ½ if line not through origin Max of 1 mark if bar graph or spike graph (labels, units and scale) or if both scales taken from table Allow ½ box tolerance on plotting of points Allow 1 plotting error Axes can be reversed 0,0 does not need to be marked on scale but line must go through the origin	**2**	If try to extend graph -1/2 for scale If 2 graphs and not crossed out mark the graph on p23 If 2 graphs and both crossed out give the higher of the marks	

Question	Acceptable Answer	Mark	Worth ½	Worth 0
12 (a)	Hydrogen/H_2	**1 or 0**		H, H2, H^2
(b)	One which does not completely ionise/dissociate One which partially ionise/dissociate (into ions) Does not fully ionise Partially breaks up/splits up Partially ionises Exists mainly as molecules Is not completely ionised <u>and</u> is lacking in hydrogen ions	**1 or 0**		Doesn't split/break up (into ions) Low concentration of ions Any mention of pH Any mention of named ions Ions only partially ionise Not all bonds dissociate
(c)	Circle lower ½ Circle higher ½ No follow through	**1 or 0**		

Question	Acceptable Answer	Mark	Worth ½	Worth 0
13 (a)	Precipitation/precipitate Accept loose spelling	**1 or 0**		Redox Addition neutralisation
(b) (i)	$Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow Ba^{2+}SO_4^{2-}{}_{(s)}$ State symbols not required	**1 or 0**		
(ii)	Spectator (ions)/spectate	**1**		Watching / observer

Question	Acceptable Answer	Mark	Worth ½	Worth 0
14 (a)	Loses electron(s) Oxidises/oxidation Change into ions Forms a compound	**1 or 0**		Changes into negative ions Reduced to ions (cancelling)
(b) (i)	$Ag \rightarrow Ag^+ + e$ State symbols not required Do not need '-' above e	**1**		
(ii)	Positive (silver) ions are attracted to (negative) spoon/ Silver ions are positive So cutlery has constant supply of electrons for reduction of silver ions to take place on cutlery	**1**		Opposites attract So negative electrons can build up cutlery has constant supply of electrons so it gains electrons

Question	Acceptable Answer	Mark	Worth ½	Worth 0
15 (a) (i)	2 x 0.25 ½ = 0.5 ½ 0.5 no working 1	**1**	2 x 0.25 only/ Arithmetic mistake	2 x 250 = 500 2/250 = 0.008 (will give 0.64 as follow through) n=cv no working
(ii)	GFM Fe_2O_3 = 160 ½ Moles of Fe_2O_3 = $\frac{0.5}{2}$ = 0.25 or mole ratio stated ½ Fe_2O_3 : H_3PO_4 1 : 2 Mass of Fe_2O_3 = 0.25 X 160 ½ = 40 ½ Or 40 on its own (2) Allow follow through using number of moles from part (i) if show working If atomic number is used instead of mass – max 1 mark If use ratio 1:1 80g 1 ½ if show working			
(b)	Stops oxygen/air Stops water/ Stops oxygen/air and water	**1 or 0**	Barrier Protection/ Physical protection	protection

[END OF MARKING INSTRUCTIONS]