

2003 Chemistry

Intermediate 2

Finalised Marking Instructions

Intermediate 2 Chemistry

General information for markers

The general comments given below should be considered during all marking.

- 1 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 'distiling' (for 'distillation') and 'it gets hotter' (for 'the temperature rises') should be accepted.

- 2 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.

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

Example: Why can the tube not be made of copper?

If the correct answer is related to a low melting point, and the candidate's answer is 'It has a low melting point and is coloured grey' this would **not** be treated as having a cancelling error.

- 4 Full marks are usually awarded for the correct answer to a calculation on its own **unless working is specifically asked for**; the part marks shown in the marking scheme are for use when working is given.

- 5 A half mark should be deducted in a calculation for each arithmetic slip **unless stated otherwise in the marking scheme**.

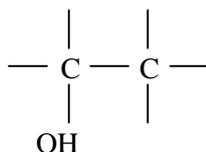
- 6 A half mark should be deducted for incorrect or missing units **only when stated in the marking scheme**. No marks should be deducted for incorrect or missing units at intermediate stages in a calculation.

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

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

- 9 With structures involving an -OH or an -NH₂ group, a half mark should be deducted if the 'O' or 'N' are not bonded to a carbon, i.e. OH-CH₂ and NH₂-CH₂.

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



- 11 A symbol or correct formula should be accepted in place of a name **unless stated otherwise in the marking scheme**.

12 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.

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

Example: A student found that 0.05 mol of propane, C₃H₈ burned to give 82.4 kJ of energy.

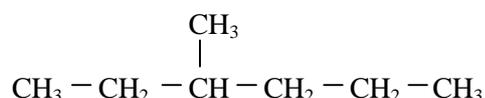


Name the kind of enthalpy change which the student measured.

No marks should be given for 'burning' since the word 'burned' appears in the text.

14 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 ₃ COOH	1.65
CH ₂ ClCOOH	1.27
CHCl ₂ COOH	0.90
CCl ₃ 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 Cl₂, the stronger the acid' should gain the full mark.

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

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

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Marking scheme

Section A

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

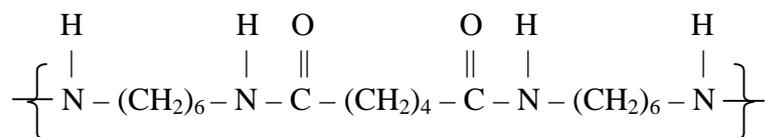
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Marking scheme

Section B

1. (a) A biological catalyst/protein 1 mark
- (b) Correctly circled COOH group 1 mark
- (c) The sugar might ferment producing alcohol/to prevent alcohol being produced 1 mark
2. (a) A reaction which releases energy/heat
or
Where products have less energy than reactants 1 mark
- (b) 2 1 mark
- (c) Gas jar A contains more oxygen/(33% oxygen as opposed to 20% in air) 1 mark
3. (a) An arrow on or near wire pointing from electrode B to electrode A 1 mark
- (b) $2\text{Ag}^+(\text{aq}) + 2\text{I}^-(\text{aq}) \longrightarrow 2\text{Ag}(\text{s}) + \text{I}_2(\text{s})$ 1 mark
- (c) To complete the circuit
or
To allow ions to flow
or
To act as a conductor 1 mark
- (d) Add starch, this gives a blue-black colour 1 mark
4. (a) Energy 1 mark
- (b) Plants/vegetables 1 mark
- (c) Oils are less saturated (more unsaturated/more double bonds) than fats
or
The forces between molecules are lower in oils 1 mark
- (d) By adding hydrogen across double bonds (by [catalytic] hydrogenation)
or
By making oils more saturated 1 mark
5. (a) Going down a group the energy required to remove an electron decreases 1 mark
- (b) Going from sodium to argon there is a general increase in the energy required 1 mark
- (c) Between 400 and 750 kJ mol^{-1} 1 mark

6. (a) Correctly drawn structure 1 mark



- (b) The molecules have functional groups at each end of the molecule 1 mark

7. (a) Methanol 1 mark

(b) (i) $(0.010 - 0.004) = 0.006 \text{ mol l}^{-1}$ 1 mark

(ii) $0.006/400 = 0.000015 (1.5 \times 10^{-5})$ 1 mark

8. (a) Ethanoic acid is a weak acid
or
There is an equilibrium in the solution 1 mark

- (b) pH: 'lower' circled 1 mark
Rate: 'faster' circled 1 mark

- (c) ½ mark for an appropriate relationship eg

$$\frac{[\text{Volume} \times \text{Concentration}](\text{alkali})}{\text{Balancing no (alkali)}} = \frac{[\text{Volume} \times \text{Concentration}](\text{acid})}{\text{Balancing no (acid)}}$$

$$\begin{array}{lcl} 0.5 \times 33.4 (0.0334) = & \text{conc} \times 20 & (\frac{1}{2} \text{ mark}) \\ 16.7 & = & \text{conc} \times 20 \\ 16.7/20 & = & \underline{0.835} \quad (1 \text{ mark}) \end{array} \quad \begin{array}{l} \\ \\ 2 \text{ marks} \end{array}$$

9. (a) No more bubbles of gas are produced (½) and some of the solid remains unreacted (½) 1 mark

- (b) To ensure that all acid used up/neutralisation is complete 1 mark

- (c) Step 2 = Filtration (½) ; step 3 = evaporation (½) 1 mark

(d) 1 mole Mg gives 1 mole MgSO₄ (½)
24.5 g gives 120.5 (½)
4.9g gives 120.5 x 4.9/24.5 (½)
= 24.1 (½) 2 marks

10. (a) Carbon dioxide and water (correct formulae accepted) 1 mark
- (b) (i) x and y axes scales (1/2) x and y axes labels (1/2)
 points plotted (1/2) line drawn (1/2)
- lose (1/2) if less than half paper used
 maximum of 1 if bar graph format used 2 marks
- (ii) 5.5 or value given should coincide with candidate's graph
 If no graph drawn or wrongly drawn then 5.5 can be correct taken from table 1 mark
11. (a) 2,3-dimethylbutane 1 mark
- (b) Correctly drawn product 1 mark
- $$\begin{array}{ccccccc}
 & & \text{C}_2\text{H}_5 & & \text{H} & & \text{CH}_3 & & \text{H} \\
 & & | & & | & & | & & | \\
 \text{H} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{CH}_3 \\
 & & | & & | & & | & & | \\
 & & \text{H} & & \text{C}_2\text{H}_5 & & \text{H} & & \text{CH}_3
 \end{array}$$
12. (a) It has delocalised electrons/metallic bonding/electrons free to move 1 mark
- (b) Each atom gains an electron 1 mark
- (c) Discrete electrodes (1/2)
 Electrodes under solution (1/2)
 Copper indicated as appearing at negative electrode [solid drawn or
 Copper labelled] (1/2)
 Chlorine indicated as appearing at positive electrode [bubbles of gas
 or Chlorine labelled] (1/2) 2 marks
13. (a) $\text{Zn(s)} \longrightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^-$ 1 mark
- (b) Tin less active than steel/iron (iron/steel more reactive)
 or
 Tin is lower down reactivity series than iron/steel (iron/steel higher up
 reactivity series)
 or
 Electrons flow from iron/steel to tin 1 mark
- (c) Cr_2O_3 1 mark

14. (a) An unsaturated cyclic compound such as cyclohexene or methylcyclopentene or dimethylcyclobutene or ethylcyclobutene (a diene or alkyne with 6 carbons would also be acceptable) 1 mark
- (b) Bromine solution 1 mark
15. (a) Ethoxypropane 1 mark
- (b) Condensation 1 mark
- (c) 36°C 1 mark

[END OF MARKING INSTRUCTIONS]