Version 1.1



General Certificate of Education (A-level)
June 2011

Chemistry CHEM2

(Specification 2420)

Unit 2: Chemistry In Action

Final

Mark Scheme

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Question	Marking Guidance	Mark	Comments
1(a)	**M1** The activation energy is the minimum / least / lowest energy **M2** (energy) for a reaction to occur / to go / to start OR (energy) for a successful / effective collision	2	Mark independently Ignore "heat" and ignore "enthalpy" Ignore "breaking the bonds"
1(b)	**M1** Catalysts provide an alternative route OR an alternative mechanism OR alternative / different path(way) **M2** Lowers the activation energy	2	Mark independently Ignore reference to "surface"
1(c)(i)	Stay(s) the same	1	
1(c)(ii)	Increases	1	Credit "increase" or "increased"
1(c)(iii)	Increases	1	Credit "increase" or "increased"
1(c)(iv)	Stay(s) the same	1	

1(d)(i)	**M1** yeast or zymase **M2** <u>ethanol</u>	2	Ignore "enzyme" In M2, ignore "alcohol" and ignore any formula
1(d)(ii)	**M1** (Concentrated) H_3PO_4 OR (Concentrated) H_2SO_4 **M2** <u>butan-2-ol</u>	2	Credit correct names Ignore "hydrogenphosphate or hydrogensulfate" Ignore "dilute" or "aq" Do not penalise absence of hyphens in name. In M2, ignore any formula

Question	Marking Guidance	Mark	Comments
2(a)	*One from* • Ti is not produced • TiC / carbide is produced OR titanium reacts with carbon • Product is brittle • Product is a poor engineering material	1	Penalise "titanium carbonate" Ignore "impure titanium" Credit "titanium is brittle"
2(b)	Heat (energy) change at constant pressure	1	**QoL**
2(c)	The enthalpy change in a reaction is independent of the route taken (and depends only on the initial and final states)	1	Credit "heat change at constant pressure" as an alternative to "enthalpy change"

2(d)	**M1** The enthalpy change / heat change at constant pressure when 1 mol of a compound / substance / product **M2** is formed from its (constituent) elements **M3** with all reactants and products / all substances in standard states OR all reactants and products / all substances in normal states under standard conditions / 100 kPa / 1 bar and any specified T (usually 298 K)	3	For M1, credit correct reference to molecule/s or atom/s Ignore reference to 1 atmosphere
2(e)(i)	Na / it is not in its standard state / normal state under standard conditions OR Standard state / normal state under standard conditions for Na is solid / (s)	1	**QoL** Ignore "sodium is a liquid or sodium is not a solid"

2(e)(ii)	**M1** ΔH_r **=** $\sum \Delta H_f$ **(products) - ** $\sum \Delta H_f$ **(reactants)** **M2** ΔH_r = 4(– 411) – (– 720) – 4(+3) = –1644 + 720 – 12 (This also scores M1) **M3** = **– 936** (kJ mol^{-1})	3	Correct answer gains full marks **Credit 1 mark for + 936** (kJ mol^{-1}) **Credit 1 mark for – 924** (kJ mol^{-1}) i.e. assuming value for Na(l) = 0 For other incorrect or incomplete answers, proceed as follows • check for an arithmetic error (AE), which is either a transposition error or an incorrect multiplication; this would score 2 marks (M1 and M2) • If no AE, check for a correct method; this requires **either** a correct cycle with $2Cl_2$ and 4Na OR a **clear complete statement** of M1 which could be in words and scores <u>only M1</u>

2(e)(iii)	Reducing agent OR reductant OR reduces $TiCl_4$ OR electron donor	1	Ignore “reduces titanium”

Question	Marking Guidance	Mark	Comments
3(a)	$Ca(OH)_2$ OR $Mg(OH)_2$	1	Ignore name Could be ionic
3(b)	NaF or sodium fluoride OR NaCl or sodium chloride	1	Either formula or name can score Do not penalise the spelling "flouride" When both formula and name are written, • penalise contradictions • if the attempt at the correct formula is incorrect, ignore it and credit **correct name** for the mark unless contradictory • if the attempt at the correct name is incorrect, ignore it and credit **correct formula** for the mark unless contradictory
3(c)	NaClO OR NaOCl	1	Ignore name (even when incorrect) The correct formula must be clearly identified if an equation is written
3(d)	**Br_2** (ONLY)	1	Only the **correct formula** scores; penalise lower case "b", penalise upper case "R", penalise superscript Ignore name The correct formula must be clearly identified if an equation is written

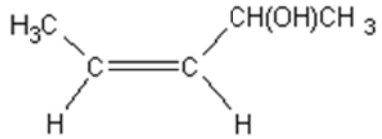
3(e)	**M1** S OR S_8 OR S_2 **M2** I_2 (ONLY)	2	Ignore names penalise lower case "i" for iodine, penalise superscripted numbers Mark independently The correct formula must be clearly identified in each case if an equation is written
3(f)(i)	$CH_3CH_2CH=CH_2$	1	Structure of but-1-ene. Ignore name Credit "sticks" for C-H bonds
3(f)(ii)	$CH_3CH_2CH_2CH_2OH$	1	Structure of butan-1-ol. Ignore name Credit "sticks" for C-H bonds
3(f)(iii)	$CH_3CH_2CH_3$	1	Structure of propane. Ignore name Ignore calculations and molecular formula Credit "sticks" for C-H bonds Ignore the molecular ion
3(f)(iv)	CH_3CH_2Br or C_2H_5Br	1	Structure of bromoethane. Ignore name and structure of nitrile Credit "sticks" for C-H bonds

Question	Marking Guidance	Mark	Comments
4(a)(i)	**2**MoS_2 + **7**O_2 ⟶ **2**MoO_3 + **4**SO_2 OR MoS_2 + **3½**O_2 ⟶ MoO_3 + **2**SO_2	1	Allow multiples Ignore state symbols
4(a)(ii)	**M1 Environmental problem** Acid rain OR An effect either from acid rain or from an acidic gas in the atmosphere. **M2 Use** SO_2 could be used <u>to make / to form / to produce</u> (or wtte) H_2SO_4 / sulfuric acid OR <u>To make / to form / to produce</u> (or wtte) gypsum / $CaSO_4$ or plaster of Paris / plaster board	2	Ignore references to the greenhouse effect Penalise reference to the ozone layer using the list principle
4(a)(iii)	MoO_3 + **3**H_2 ⟶ Mo + **3**H_2O	1	Allow multiples Ignore state symbols

4(a)(iv)	*One from* H_2 is • explosive • (in)flammable • <u>easily</u> ignited	1	Ignore "burns"
4(b)(i)	To allow <u>ions</u> to <u>move</u> (when molten) OR <u>Ions cannot move in the solid</u>	1	
4(b)(ii)	$Ca^{2+} + \mathbf{2}e^- \longrightarrow Ca$	1	Or multiples Ignore state symbols Ignore charge on the electron unless incorrect and accept loss of two electrons on the RHS
4(b)(iii)	(High) <u>electricity</u> / <u>electrical energy</u> (cost)	1	Ignore "energy" and ignore "current"

Question	Marking Guidance	Mark	Comments
5(a)(i)	$Cu + \mathbf{4}HNO_3 \longrightarrow Cu(NO_3)_2 + \mathbf{2}NO_2 + \mathbf{2}H_2O$	1	Or multiples Ignore state symbols
5(a)(ii)	**M1** HNO_3 (+) **5** **M2** NO_2 (+) **4**	2	Ignore working out M1 Credit (V) M2 Credit (IV)
5(a)(iii)	$HNO_3 + H^+ + e^- \longrightarrow NO_2 + H_2O$ OR $NO_3^- + 2H^+ + e^- \longrightarrow NO_2 + H_2O$	1	Or multiples Ignore state symbols Ignore charge on the electron unless incorrect and accept loss of electron on the RHS
5(b)(i)	**In either order** **M1** Concentration(s) (of reactants and products) remain(s) constant / stay(s) the same / remain(s) the same / do(es) not change **M2** Forward rate = Reverse / backward rate	2	For M1 accept [ ] for concentration NOT "equal concentrations" and NOT "concentration(s) is/are the same" NOT "amount" Ignore "dynamic" and ignore "speed" Ignore "closed system" It is possible to score both marks under the heading of a single feature

5(b)(ii)	**M1** The (forward) reaction / to the right is endothermic or takes in / absorbs heat OR The reverse reaction / to the left is exothermic or gives out / releases heat **M2 depends on correct M1 and must refer to temperature/heat** The equilibrium shifts / moves left to right to oppose the increase in temperature	2	M2 depends on a correct statement for M1 For M2, the equilibrium shifts/moves to absorb the heat OR to lower the temperature OR to cool the reaction
5(b)(iii)	**M1 refers to number of moles** There are fewer moles (of gas) on the left OR more moles (of gas) on the right. OR there is one mole (of gas) on the left and 2 moles on the right. **M2 depends on correct M1 and must refer to pressure** The equilibrium shifts / moves right to left to oppose the increase in pressure	2	M2 depends on a correct statement for M1 For M2, the equilibrium shifts/moves to lower the pressure.

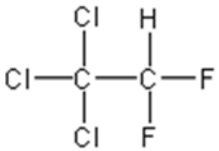
Question	Marking Guidance	Mark	Comments
6(a)	Pentan-2-one	1	ONLY but ignore absence of hyphens
6(b)	Functional group (isomerism)	1	Both words needed
6(c)(i)		1	Award credit provided it is obvious that the candidate is drawing the Z / cis isomer The group needs to be $CHOHCH_3$ but do not penalise poor C–C bonds or absence of brackets around OH Trigonal planar structure not essential
6(c)(ii)	Restricted rotation (about the C=C) OR No (free) rotation (about the C=C)	1	

6(d)		3	If M1 is blank CE = 0, for the clip Check the partial reagents listed and if M1 has a <u>totally incorrect</u> reagent, CE = 0 for the clip Allow the following alternatives **M1** (acidified) potassium dichromate(VI) (solution); mark on from incomplete formulae or incorrect oxidation state **M2** (turns) green **M3** (stays) orange / no (observed) change / no reaction OR **M1** (acidified) potassium manganate(VII) (solution); mark on from incomplete formulae or incorrect oxidation state **M2** (turns) colourless **M3** (stays) purple / no (observed) change / no reaction In all cases for **M3** Ignore "nothing (happens)" Ignore "no observation"

M1 Tollens' (reagent) *(Credit ammoniacal silver nitrate OR a description of making Tollens')* *(Do not credit Ag^+, $AgNO_3$ or $[Ag(NH_3)_2^+]$ or "the silver mirror test" on their own, but mark M2 and M3)*	**M1** Fehling's (solution) / Benedict's *(Penalise $Cu^{2+}(aq)$ or $CuSO_4$ but mark M2 and M3)*
M2 <u>silver mirror</u> OR <u>black solid or black precipitate</u>	**M2** <u>Red solid/precipitate</u> *(Credit <u>orange</u> or <u>brown</u> <u>solid</u>)*
M3 (stays) colourless OR no (observed) change / no reaction	**M3 (**stays) blue OR no (observed) change / no reaction

6(e)(i)	Spectrum is for **Isomer 1** or named or correctly identified	1	The explanation marks in 6(e)(ii) depend on correctly identifying Isomer 1. The identification should be unambiguous but candidates should not be penalised for an imperfect or incomplete name. They may say "the alcohol" or the "alkene" or the "E isomer"

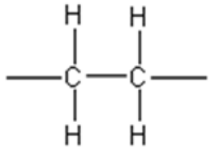
6(e)(ii)	**If Isomer 1 is correctly identified, award <u>any two</u> from** • (Strong / broad) absorption / peak in the range **<u>3230 to 3550</u>** cm^{-1} or specified value <u>in this range</u> or <u>marked correctly</u> on spectrum **<u>and</u>** (characteristic absorption / peak for) **<u>OH</u>** group /**<u>alcohol</u>** group • No absorption / peak in range **<u>1680 to 1750</u>** cm^{-1} or absence <u>marked correctly</u> on spectrum **<u>and</u>** (No absorption / peak for a) **<u>C=O</u>** group / **<u>carbonyl</u>** group / **<u>carbon-oxygen double bond</u>** • Absorption / peak in the range **<u>1620 to 1680</u>** cm^{-1} or specified value <u>in this range</u> or <u>marked correctly</u> on spectrum **<u>and</u>** (characteristic absorption / peak for) **<u>C=C</u>** group / **<u>alkene</u>** / **<u>carbon-carbon double bond</u>**	2	If 6(e)(i) is incorrect or blank, CE=0 Allow the words "dip" OR "spike" OR "trough" OR "low transmittance" as alternatives for absorption. Ignore reference to other absorptions e.g. C-H, C-O

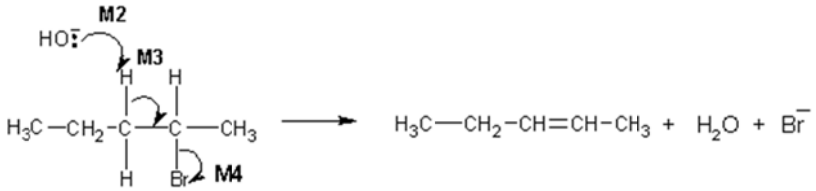
Question	Marking Guidance	Mark	Comments
7(a)(i)	$CH_4 + \mathbf{3}F_2 \longrightarrow CHF_3 + \mathbf{3}HF$	1	
7(a)(ii)	**M1 Initiation** $F_2 \longrightarrow \mathbf{2}F\bullet$ **M2 First propagation** $F\bullet + CHF_3 \longrightarrow \bullet CF_3 + HF$ **M3 Second propagation** $F_2 + \bullet CF_3 \longrightarrow CF_4 + F\bullet$ **M4 Termination (must make C_2F_6)** $\mathbf{2}\bullet CF_3 \longrightarrow C_2F_6$ or CF_3CF_3	4	Penalise absence of dot once only. Radical dot on $\bullet CF_3$ can be anywhere but if the structure is drawn out, the dot must be on the carbon atom. Penalise this error once only. Penalise once only for a line and two dots to show a bond. Penalise each of "Fl" and lower case F, once only in this clip
7(b)(i)	<u>Displayed formula</u> e.g.  	1	<u>All bonds</u> must be drawn out. Ignore bond angles. Penalise "sticks"

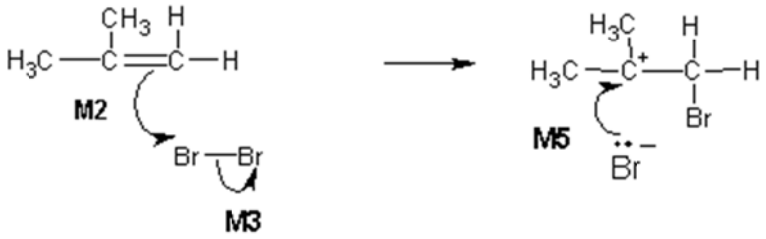
7(b)(ii)	**M1** C—Cl bond OR carbon-chlorine bond **M2** chlorine atom OR chlorine (free) radical **M3** $\mathbf{2}O_3 \longrightarrow \mathbf{3}O_2$	3	M1 NOT carbon-halogen Penalise incorrect spelling of chlorine once only in this clip M2 ignore formulae Ignore Cl_2 or Cl• or ClO• balanced on both sides of the equation Ignore other equations leading to the overall equation

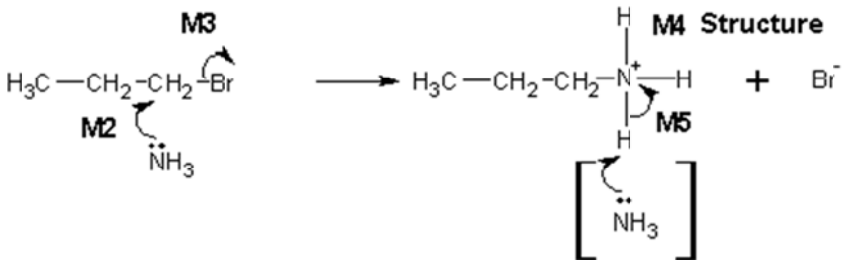
Question	Marking Guidance	Mark	Comments
8(a)(i)	**M1** (yellow precipitate is) silver iodide OR AgI (which may be awarded from the equation) **M2** $Ag^+ + I^- \longrightarrow AgI$ (Also scores M1 unless contradicted) **M3** sodium chloride OR NaCl	3	For M2 Accept multiples Ignore state symbols Allow crossed out nitrate ions, but penalise if not crossed out
8(a)(ii)	The silver nitrate is acidified to • react with / remove <u>ions that would interfere</u> with the test • prevent the formation of other <u>silver precipitates</u> / <u>insoluble silver compounds</u> that would interfere with the test • remove (other) <u>ions that react</u> with the silver nitrate • react with / remove carbonate / hydroxide / sulfite (ions)	1	Ignore reference to “false positive”
8(a)(iii)	**M1 and M2 in either order** **M1** <u>Fluoride</u> (ion) OR <u>F^-</u> **M2** • <u>Silver fluoride / AgF</u> is soluble / dissolves (in water) • <u>no precipitate</u> would form / <u>no visible /observable</u> change	2	Do not penalise the spelling “flouride”, Penalise “fluride” once only Mark M1 and M2 independently

8(b)	**M1** Ba^{2+} + SO_4^{2-} $\longrightarrow$ $BaSO_4$ (or the ions together) **M2** white precipitate / white solid / white suspension **M3** Barium meal or (internal) X-ray or to block X-rays **M4** $BaSO_4$ / barium sulfate is insoluble (and therefore not toxic)	4	For M1, ignore state symbols Allow crossed out sodium ions, but penalise if not crossed out For M2, ignore "milky" If $BaSO_3$ OR BaS used in M1 and M4, penalise once only For M3 Ignore radio-tracing For M4 NOT barium ions NOT barium NOT barium meal NOT "It" unless clearly $BaSO_4$

8(c)	**M1** **2**(12.00000) + **4**(1.00794) = 28.03176 **M2** Ethene and CO or "they" have an imprecise M_r of 28.0 / 28 OR Ethene and CO or "they" have the same M_r to one d.p. OR These may be shown by two clear, simple sums identifying both compounds **M3** C_2H_4 + **2**O_2 → **2**CO + **2**H_2O ($H_2C=CH_2$) **M4** Displayed formula  **M5** Type of polymer = Addition (polymer)	5	M1 must show working using 5 d.p.for hydrogen Penalise "similar" or "close to", if this refers to the imprecise value in M2, since this does not mean "the same" For M3, accept $CH_2=CH_2$ OR CH_2CH_2 For M4, all bonds must be drawn out including those on either side of the unit. Penalise "sticks" Ignore brackets around **correct** repeating unit but penalise "n" Penalise "additional"

Question	Marking Guidance	Mark	Comments
9(a)(i)	**M1 <u>Elimination</u>**  **M2** must show an arrow from the <u>lone pair on the oxygen</u> of a negatively charged hydroxide ion <u>to a correct</u> H atom **M3** must show an arrow from a C-H bond adjacent to the C-Br bond towards the appropriate C-C bond. Only award if a reasonable attempt has been made at the attack on the H atom of the appropriate adjacent C-H **M4** is independent provided it is from their <u>original molecule</u> Award full marks for an E1 mechanism in which **M3** is on the correct carbocation. **N.B. These are double-headed arrows**	4	For M1, accept "Base elimination" but <u>no other prefix.</u> Penalise **M2** if covalent KOH Penalise **M4** for formal charge on C of C-Br or incorrect partial charges on C-Br Ignore other partial charges Penalise once only in any part of the mechanism for a line and two dots to show a bond. <u>Max any 2 of 3 marks</u> **<u>for the mechanism</u>** for wrong reactant (or wrong product if shown). Accept the correct use of "sticks" for the molecule except for the C-H being attacked
9(a)(ii)	**Structure for pent-1-ene** $CH_3CH_2CH_2CH=CH_2$	1	Penalise C_3H_7 Accept correct "sticks"

9 (b)	**M1** **Electrophilic addition** M4 Structure  **M2** must show an arrow from the double bond towards the Br atom of the Br-Br molecule **M3** must show the breaking of the Br-Br bond. **M4** is for the structure of the tertiary carbocation with Br on the correct carbon atom. **M5** must show an arrow from the lone pair of electrons on the negatively charged bromide ion towards the positively charged carbon atom. **N.B. These are double-headed arrows**	5	For M1, both words required. **For the mechanism** **M2** Ignore partial negative charge on the double bond. **M3** Penalise partial charges on Br-Br bond if wrong way and penalise formal charges Penalise once only in any part of the mechanism for a line and two dots to show a bond Max any 3 of 4 marks **for the mechanism** for wrong organic reactant or wrong organic product (if shown) or primary carbocation. If HBr is used, max 2 marks **for their mechanism** Accept the correct use of “sticks”

9(c)	**M1 <u>Nucleophilic substitution</u>**  **M2** must show an arrow from the lone pair of electrons on the nitrogen atom of an ammonia molecule to the C atom. **M3** must show the movement of a pair of electrons from the C-Br bond to the Br atom. **M3** is independent provided it is from their <u>original molecule</u> **M4** is for the structure of the alkylammonium ion, which could be a condensed formula. A positive charge must be shown on/or close to, the N atom. **M5** is for an arrow from the N-H bond to the N atom. Award full marks for an S_N1 mechanism in which M2 is the attack of the ammonia on the intermediate carbocation. **N.B. These are double-headed arrows**	5	For M1, both words required. Penalise **M2** if NH_3 is negatively charged. Penalise **M3** for formal charge on C or incorrect partial charges The second mole of ammonia is not essential for M5; therefore ignore any species here. Penalise once only for a line and two dots to show a bond. Max any 3 of 4 marks **<u>for the mechanism</u>** for wrong organic reactant (or wrong organic product if shown) Accept the correct use of "sticks"

General principles applied to marking CHEM2 papers by CMI+ June 2011

It is important to note that the guidance given here is generic and specific variations may be made at individual standardising meetings in the context of particular questions and papers.

Basic principles

- **Examiners should note that throughout the mark scheme, items that are underlined are required information to gain credit.**
- **Occasionally an answer involves incorrect chemistry and the mark scheme records CE = 0, which means a chemical error has occurred and no credit is given for that section of the clip or for the whole clip.**

A. The "List principle" and the use of "ignore" in the mark scheme

If a question requires **one** answer and a candidate gives two answers, no mark is scored if one answer is correct and one answer is incorrect. There is no penalty if both answers are correct.

N.B. Certain answers are designated in the mark scheme as those which the examiner should "Ignore". These answers are not counted as part of the list and should be ignored and will not be penalised.

B. Incorrect case for element symbol

The use of an incorrect case for the symbol of an element should be penalised **once only** within a clip.
For example, penalise the use of "h" for hydrogen, "CL" for chlorine or "br" for bromine.

C. Spelling

In general

- The names of chemical compounds and functional groups **must be spelled correctly** to gain credit.
- Phonetic spelling may be acceptable for some chemical terminology.

N.B. Some terms may be required to be spelled correctly or an idea needs to be articulated with clarity, as part of the "Quality of Language" (**QoL**) marking. These will be identified in the mark scheme and marks are awarded only if the QoL criterion is satisfied.

D. Equations

In general

- Equations **must** be balanced.
- When an equation is worth two marks, one of the marks in the mark scheme will be allocated to one or more of the reactants or products. This is independent of the equation balancing.
- State symbols are generally ignored, unless specifically required in the mark scheme.

E. Reagents

The command word "Identify", allows the candidate to choose to use **either** the name or the formula of a reagent in their answer. In some circumstances, the list principle may apply when both the name and the formula are used. Specific details will be given in mark schemes.

The guiding principle is that a reagent is a chemical which can be taken out of a bottle or container. Failure to identify complete reagents **will be penalised**, but follow-on marks (e.g. for a subsequent equation or observation) can be scored from an incorrect attempt (possibly an incomplete reagent) at the correct reagent. Specific details will be given in mark schemes.
For example, **no credit** would be given for

- the cyanide ion or CN^- when the reagent should be potassium cyanide or KCN;
- the hydroxide ion or OH^- when the reagent should be sodium hydroxide or NaOH;
- the $Ag(NH_3)_2^+$ ion when the reagent should be Tollens' reagent (or ammoniacal silver nitrate). In this example, no credit is given for the ion, but credit could be given for a correct observation following on from the use of the ion. Specific details will be given in mark schemes.

In the event that a candidate provides, for example, **both** KCN and cyanide ion, it would be usual to ignore the reference to the cyanide ion (because this is not contradictory) and credit the KCN. Specific details will be given in mark schemes.

F. Oxidation states

In general, the sign for an oxidation state will be assumed to be positive unless specifically shown to be negative.

G. Marking calculations, such as those involving enthalpy changes

In general

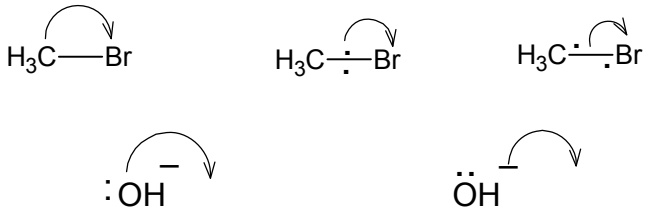
- The sign for an enthalpy change will be assumed to be positive unless specifically shown to be negative.
- A correct answer alone will score **full marks** unless the necessity to show working is specifically required in the question.
- A correct numerical value with the **wrong sign** will usually score **only one mark**.

All other values **gain no credit** except

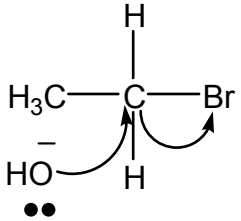
- Two marks can be awarded for correct chemistry with an arithmetic error.
- One mark can be awarded for a correct mathematical statement (or cycle) for the method.

H. Organic reaction mechanisms

Curly arrows should originate either from a lone pair of electrons or from a bond.
The following representations should not gain credit **and will be penalised each time** within a clip.



For example, the following would score zero marks



When the curly arrow is showing the formation of a bond to an atom, the arrow can go directly to the relevant atom, alongside the relevant atom or **more than half-way** towards the relevant atom.

In free-radical substitution

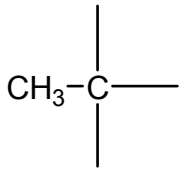
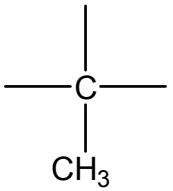
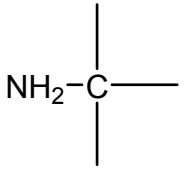
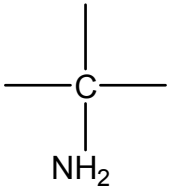
- The absence of a radical dot should be penalised **once only** within a clip.
- The use of double-headed arrows or the incorrect use of half-headed arrows in free-radical mechanisms should be penalised **once only** within a clip

In mass spectrometry fragmentation equations, the absence of a radical dot on the molecular ion and on the free-radical fragment would be considered to be two independent errors and both would be penalised if they occurred within the same clip.

I. Organic structures

In general

- Displayed formulae must show all of the bonds and all of the atoms in the molecule, but need not show correct bond angles.
- Bonds should be drawn correctly between the relevant atoms.
  For example, if candidates show the alcohol functional group as C ─ HO, they should be penalised **on every occasion**.
- Latitude should be given to the representation of C ─ C bonds in structures, given that CH_3─ is considered to be interchangeable with H_3C─ even though the latter would be preferred.
- Poor presentation of vertical C ─ CH_3 bonds or C ─ NH_2 bonds should **not** be penalised. For the other functional groups, such as ─ OH and ─ CN, the limit of tolerance is the half-way position between the vertical bond and the relevant atoms in the attached group.
  By way of illustration, the following would apply

(a)  allowed	(b)  allowed
(c)  allowed	(d)  allowed

- In most cases, the use of "sticks" to represent C ─ H bonds in a structure should **not** be penalised. The exceptions will include structures in mechanisms when the C ─ H bond is essential (e.g. elimination reactions in haloalkanes) and when a displayed formula is required.

- Some examples are given here of **structures** for specific compounds that should **not** gain credit

CH_3COH	for	ethanal
CH_3CH_2HO	for	ethanol
$OHCH_2CH_3$	for	ethanol
C_2H_6O	for	ethanol
CH_2CH_2	for	ethene
$CH_2.CH_2$	for	ethene
$CH_2:CH_2$	for	ethane

N.B. Exceptions may be made in the context of balancing equations

- Each of the following **should gain credit** as alternatives to correct representations of the structures.

$CH_2 = CH_2$	for	ethene, $H_2C=CH_2$
$CH_3CHOHCH_3$	for	propan-2-ol, $CH_3CH(OH)CH_3$

J. Organic names

As a general principle, non-IUPAC names or incorrect spelling or incomplete names should **not** gain credit.
Some illustrations are given here.

but-2-ol	should be **butan-2-ol**
2-hydroxybutane	should be **butan-2-ol**
butane-2-ol	should be **butan-2-ol**
2-butanol	should be **butan-2-ol**
2-methpropan-2-ol	should be **2-methylpropan-2-ol**
2-methylbutan-3-ol	should be **3-methylbutan-2-ol**
3-methylpentan	should be **3-methylpentane**
3-mythylpentane	should be **3-methylpentane**
3-methypentane	should be **3-methylpentane**
propanitrile	should be **propanenitrile**
aminethane	should be **ethylamine** (although aminoethane can gain credit)
2-methyl-3-bromobutane	should be **2-bromo-3-methylbutane**
3-bromo-2-methylbutane	should be **2-bromo-3-methylbutane**
3-methyl-2-bromobutane	should be **2-bromo-3-methylbutane**
2-methylbut-3-ene	should be **3-methylbut-1-ene**
difluorodichloromethane	should be **dichlorodifluoromethane**

UMS conversion calculator www.aqa.org.uk/umsconversion