Examiners' Report
June 2018

IAL Chemistry 1 WCH01 01

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Introduction

This Unit revisits important knowledge and skills needed in science for Chemistry, like writing formulae and equations, simple mole calculations, and simple structures of atoms, ions and molecules. In addition, electronic structure, enthalpy changes and organic chemistry of alkanes and alkenes are examined for the first time.

There were many well prepared candidates from centres deserving high commendation for the excellence of their teaching and learning. At the same time, there were significant numbers of candidates who struggled with basic skills like writing chemical formulae and equations.

Failure to read the question was a common problem, as was lack of knowledge of the techniques and results of practical work. Lack of knowledge of organic chemistry was also evident.

The multiple-choice questions on which candidates were least successful, in order of decreasing difficulty, were:

8 – enthalpy changes

19 – alkane isomers

10a – ionization energy graphs.

The items on which candidates were most successful, in order of increasing difficulty, were:

15 – electrical conductivity

5 – signs of enthalpy changes

1 – types of formulae.

Question 20 (a) (i)

A common error was to answer only one part of the question, either the identification or the purpose.

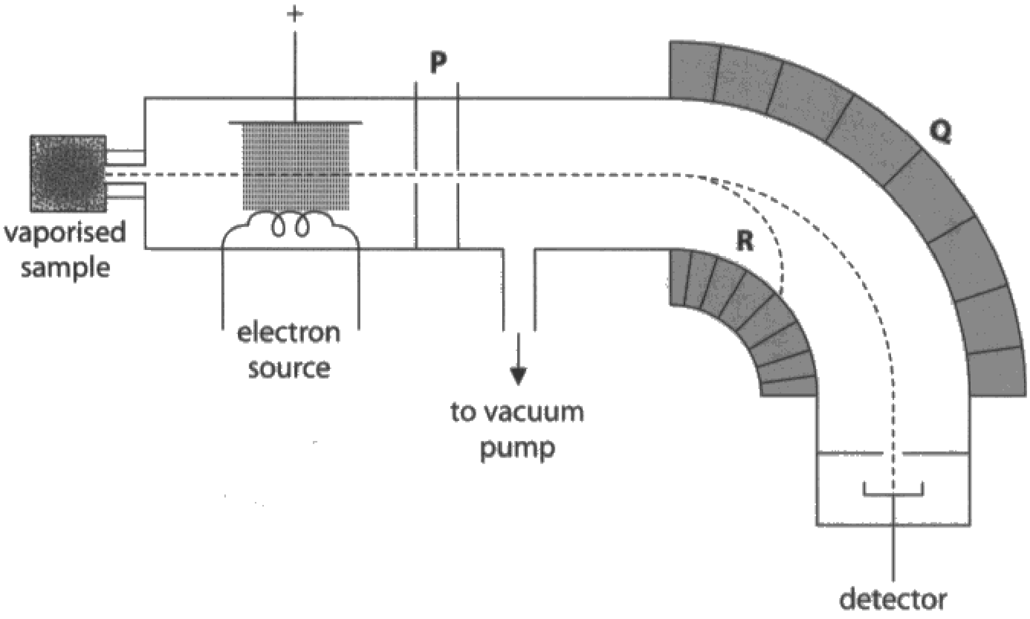
Some gave magnet(s) or electromagnet.

There was confusion about what is accelerated, often the term ion was omitted.

Some thought ionisation took place.

20 This question is about mass spectrometery.

(a) A diagram of a mass spectrometer is shown.



(i) Identify **P** and state its purpose.

(2)

Velocity selector. Makes sure thall all the ions are moving with the same or proper velocity.

ResultsPlus
Examiner Comments

There is no identification of **P** as either electrically charged plates or an electric field, so no first mark.

Though it is not really a velocity selector, the idea that all the ions gain the same velocity is sufficient for the second mark.

ResultsPlus
Examiner Tip

Read the question carefully – note the word ‘identify’.

Be wary of using specialist terms inaccurately.

Question 20 (a) (ii)

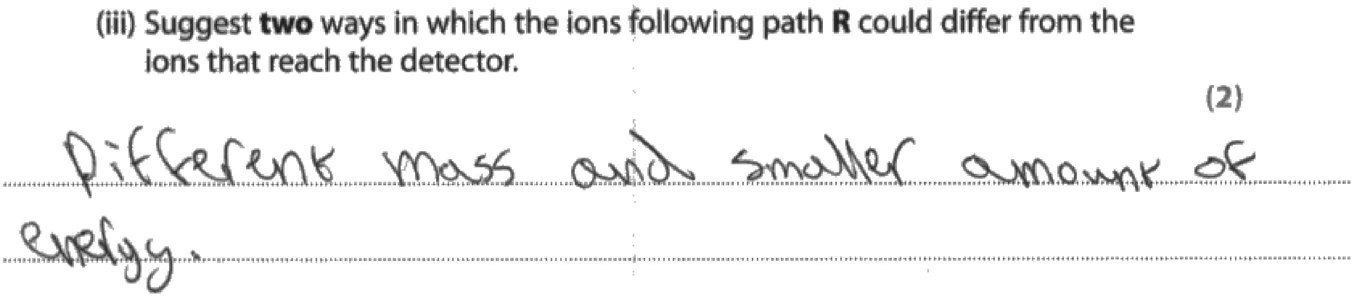
There were some weak answers like ‘magnet’ which were allowed as a near miss.

The common error was to give other elements of the mass spectrometer.

Question 20 (a) (iii)

It was common to see only one suggestion.

Insufficient answers mentioning mass and/or charge, but not how they differed, were common.



(iii) Suggest **two** ways in which the ions following path **R** could differ from the ions that reach the detector.

(2)

Different mass and smaller amount of energy.

ResultsPlus
Examiner Comments

This did not get a mark as there is no indication of whether the mass is lower or higher.

Though technically correct, the second suggestion that energy differs is merely a consequence of the first, so receives no credit.

ResultsPlus
Examiner Tip

When a question says explain how something differs it is essential to say ‘**how** it differs’.

Question 20 (b) (i)

There were a surprising number of incorrect answers to this part.

Some confused neutrons with electrons.

Some did not read the word 'atom' in the question so tried to give the number of electrons in the magnesium ion often incorrectly as 11.

Question 20 (b) (ii)

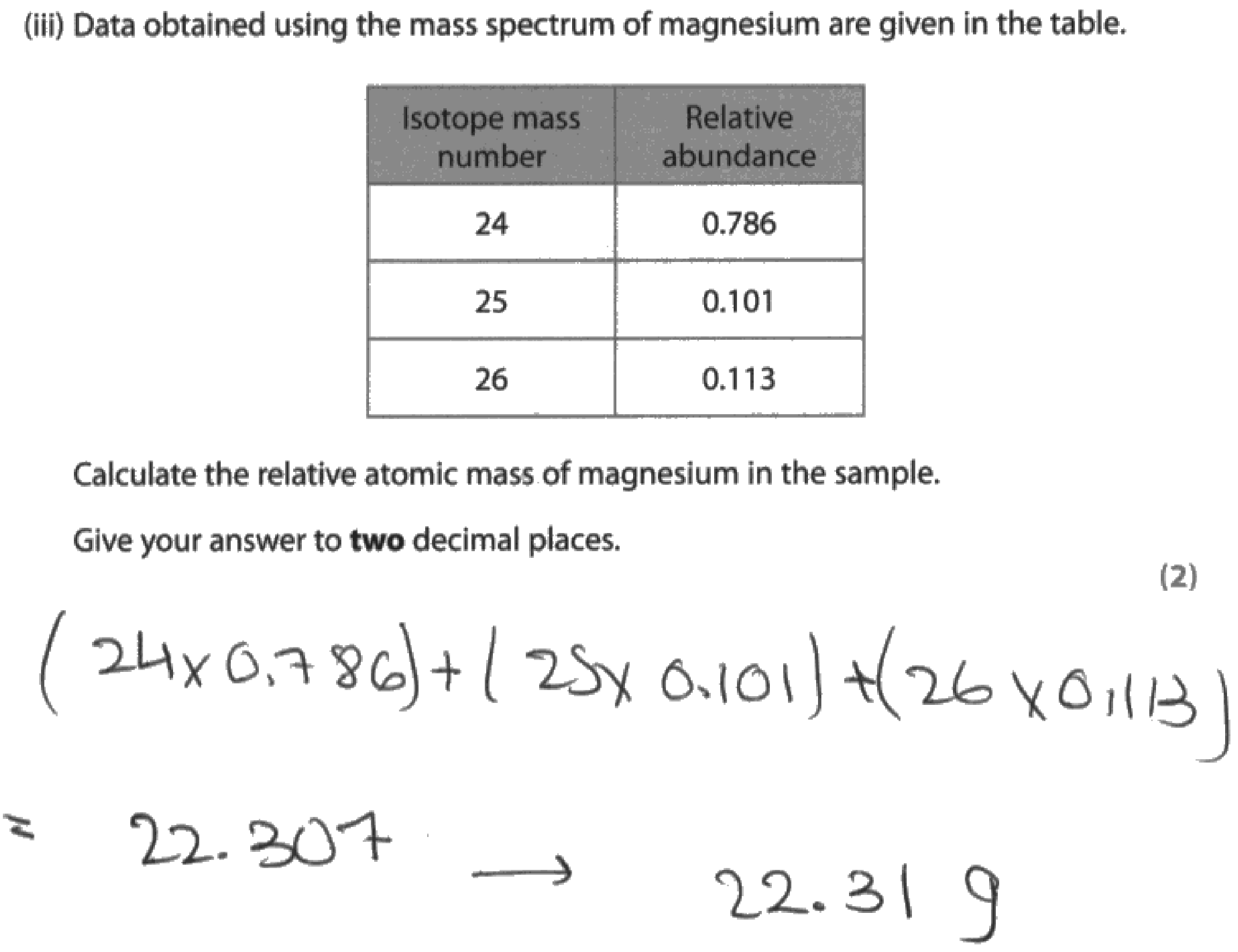
Only very weak candidates did not get the first mark for the generic statement 'atoms with the same number of protons but different number of neutrons'. They often confused neutrons and electrons.

Only better candidates responded to the second sentence in the question by quoting appropriate data, for at least two isotopes.

Question 20 (b) (iii)

The most common error was to assume that relative abundances are percentages which they are not. Such answers could still gain the second mark.

There were frequent rounding errors.



(iii) Data obtained using the mass spectrum of magnesium are given in the table.

Isotope mass number	Relative abundance
24	0.786
25	0.101
26	0.113

Calculate the relative atomic mass of magnesium in the sample.

Give your answer to **two** decimal places.

(2)

$(24 \times 0.786) + (25 \times 0.101) + (26 \times 0,113)$

$= 22.307 \longrightarrow 22.31$ g

ResultsPlus
Examiner Comments

This gains the first mark for the correct numerator, but an arithmetic error meant that the second mark was not awarded in this case.

ResultsPlus
Examiner Tip

Practise question like this using relative abundances as well as percentages.

Question 20 (c)

This question is straight from the specification, but many candidates seemed to have ignored this section.

There were many weak responses failing to read the word ‘further’ and giving 'determining relative atomic/molecular masses'.

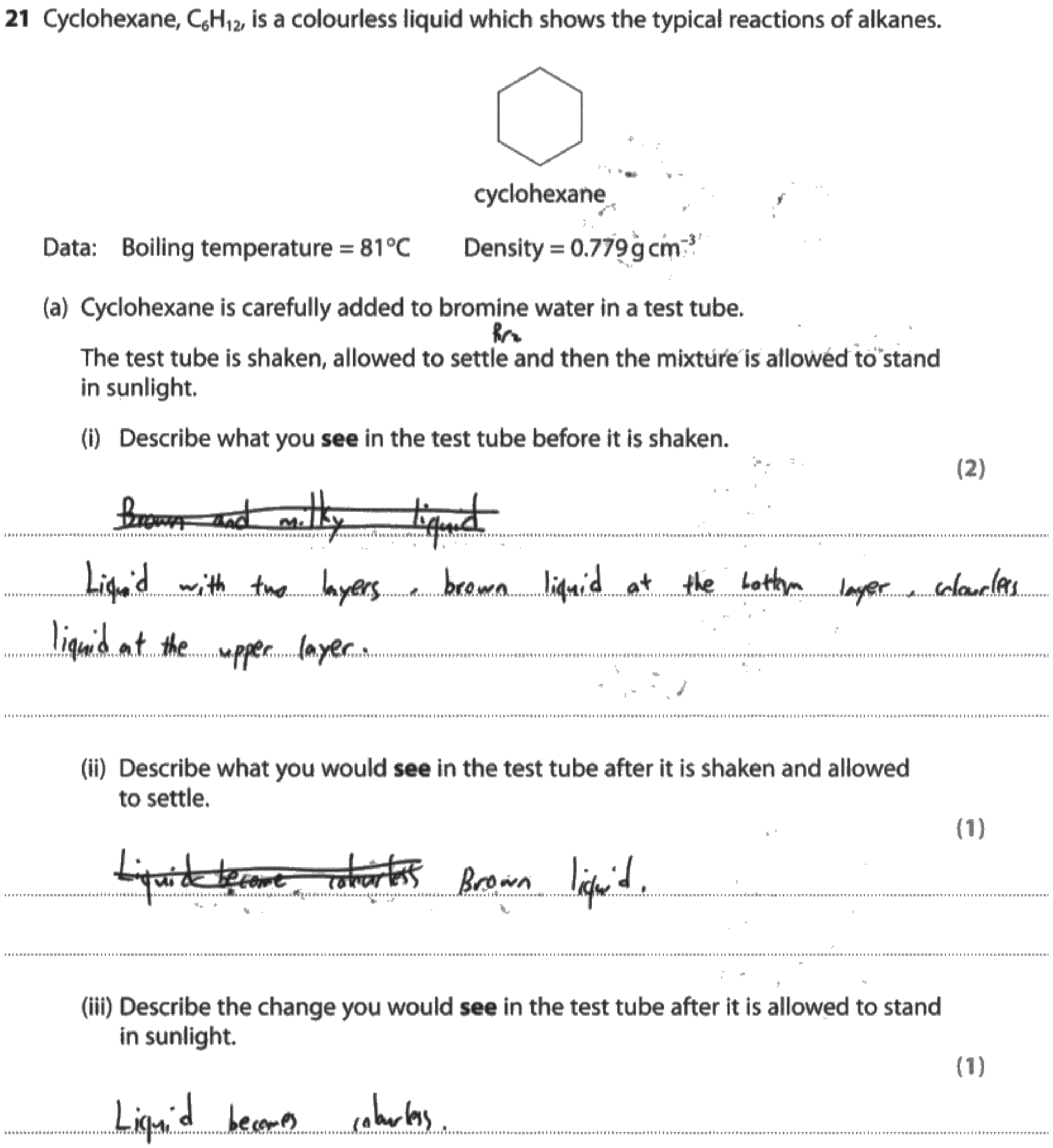
Others said to identify an unknown ‘substance’ when the word ‘compound’ was needed.

Question 21 (a)

A great many candidates could not remember this experiment. They had little idea that two layers form and the colours of the layers, despite the hint of the densities of the liquids.

Very few candidates realised that the bromine colour moves to the cyclohexane in part (ii).

The easiest mark was for part (iii) but by this stage many were totally lost and gave all sorts of strange colours.



21 Cyclohexane, C_6H_{12}, is a colourless liquid which shows the typical reactions of alkanes.

cyclohexane

Data: Boiling temperature = 81°C Density = 0.779 g cm^{-3}

(a) Cyclohexane is carefully added to bromine water in a test tube.

Br_2

The test tube is shaken, allowed to settle and then the mixture is allowed to stand in sunlight.

(i) Describe what you **see** in the test tube before it is shaken.

(2)

~~Brown and milky liquid~~

Liquid with two layers, brown liquid at the bottom layer, colourless liquid at the upper layer.

(ii) Describe what you would **see** in the test tube after it is shaken and allowed to settle.

(1)

~~Liquid become colourless~~ Brown liquid.

(iii) Describe the change you would **see** in the test tube after it is allowed to stand in sunlight.

(1)

Liquid becomes colourless.

ResultsPlus
Examiner Comments

This is a good answer, where the candidate has the correct colours for the layers in part (i).

No mark for part (ii), but part (iii) is fine.

ResultsPlus
Examiner Tip

It is good practice to record experimental observations in your notes and practise recalling them.

(i) Describe what you **see** in the test tube before it is shaken.

(2)

- Bubbles are seen.
- Mixture is clear.

(ii) Describe what you would **see** in the test tube after it is shaken and allowed to settle.

(1)

- Precipitates forms.

(iii) Describe the change you would **see** in the test tube after it is allowed to stand in sunlight.

(1)

- Vaporisation.

ResultsPlus
Examiner Comments

This is a typical response from a candidate who has very little idea of what is going on in this experiment.

(i) Describe what you **see** in the test tube before it is shaken.

(2)

On adding cyclohexane to test tube containing bromine, the colour of bromine water is brown but colour of cyclohexane is colourless so two layers of different colours are obtained

(ii) Describe what you would **see** in the test tube after it is shaken and allowed to settle.

(1)

Colour of the whole content in test tube become same ie brown coloured solution

(iii) Describe the change you would **see** in the test tube after it is allowed to stand in sunlight.

(1)

The brown colour of solution starts disappearing and become colourless

ResultsPlus
Examiner Comments

This candidate has recognised there are two layers and given both colours correctly, but unfortunately failed to indicate which layer is which in part (i).

Part (ii) is incorrect but part (iii) is fine.

ResultsPlus
Examiner Tip

Always try to answer each question as fully as possible.

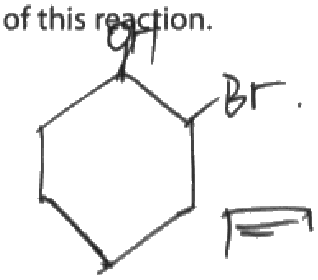
Question 21 (b) (i)

There was much confusion between the reaction of bromine or bromine water with cyclohexene, or hex-1-ene.

(b) The reaction that occurs in (a)(iii) is a free radical substitution.

(i) Draw the **skeletal** formula and give the name of the monosubstitution product of this reaction.

(2)



Name ~~1-cyclic~~ ~~1-cyclo~~ 2- bromocyclohexan-1-ol

ResultsPlus

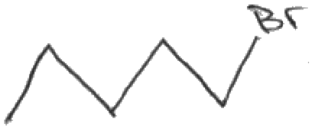
Examiner Comments

This candidate has made a common error of confusing the reaction of cyclohexane with bromine with the reaction of cyclohexene with bromine.

(b) The reaction that occurs in (a)(iii) is a free radical substitution.

(i) Draw the **skeletal** formula and give the name of the monosubstitution product of this reaction.

(2)



Name 1, Bromohexane

ResultsPlus
Examiner Comments

This is a typical error caused by failure to read the whole question. The term ’cyclo’ in the name cyclohexane has been disregarded.

ResultsPlus
Examiner Tip

Practise drawing skeletal formulae – this formula is actually bromopentane.

Question 21 (b) (ii)

Common errors were the addition of charges to the bromine atoms formed; the omission of arrows or use of full-headed arrows; use of HOBr rather than bromine.

(ii) Write the equation for the initiation step of the reaction. Include appropriate curly arrows.

(2)

ResultsPlus
Examiner Comments

The equation is fine but full-headed, instead of half-headed curly arrows have been used.

ResultsPlus
Examiner Tip

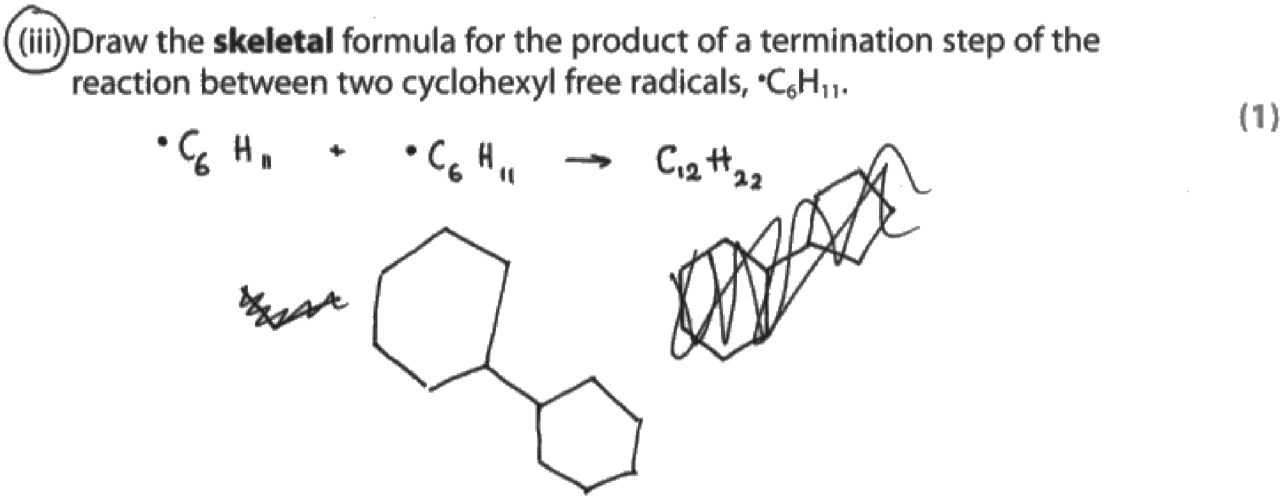
A half-headed arrow refers to the movement of one electron.

A full-headed arrow refers to the movement of a pair of electrons.

Question 21 (b) (iii)

Despite the emboldened ‘skeletal’ in the question, structural and molecular formulae were often given.

Many drew two fused rings.



(iii) Draw the **skeletal** formula for the product of a termination step of the reaction between two cyclohexyl free radicals, $\cdot C_6H_{11}$.

(1)

$\cdot C_6H_{11} + \cdot C_6H_{11} \rightarrow C_{12}H_{22}$

ResultsPlus

Examiner Comments

The first answer is regarded as working, so it is ignored by the markers. The slightly distorted bond angles between the rings were allowed.

ResultsPlus

Examiner Tip

It is best learners label their working to make this clear enough for the examiner to mark.

Question 21 (c)

Very weak answers did not give the correct products of combustion.

Balancing for oxygen caused some problems.

States gave all sorts of problems, despite the clear condition of room temperature. Cyclohexane was given in all three states. Water was limited to liquid and gas.

(c) Write the equation for the reaction when cyclohexane burns **completely** in air.

Use molecular formulae and give the state symbols for the reactants and products at room temperature.

(2)

$$C_6H_{12(l)} + 9O_{2(g)} \longrightarrow 6CO_2 + 6H_2O$$

ResultsPlus
Examiner Comments

Despite the reminder to give state symbols for reactants and products, only reactant state symbols have been given.

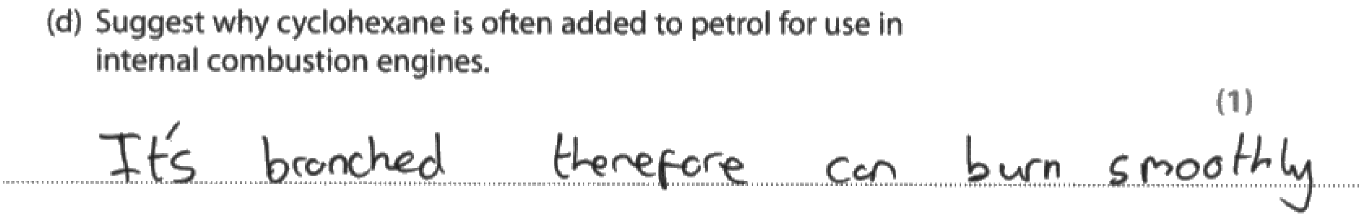
ResultsPlus
Examiner Tip

Always check your response has answered the whole question.

Question 21 (d)

There were many ways of gaining credit here as the mark scheme shows.

One excellent response explained compression ignition perfectly as ‘the mixture explodes under pressure without the need for a spark’.



(d) Suggest why cyclohexane is often added to petrol for use in internal combustion engines.

(1)

It's branched therefore can burn smoothly

ResultsPlus
Examiner Comments

This answer is saved by the second part.

A cycloalkane is not branched but it does lead to smoother burning.

ResultsPlus
Examiner Tip

Beware of giving quick unthinking responses, based on learning.

Branching does increase octane number but clearly there is no branching in cyclohexane.

(d) Suggest why cyclohexane is often added to petrol for use in internal combustion engines.

(1)

To be more efficient.

ResultsPlus
Examiner Comments

This is an instructive error. The response lacks sufficient precision and detail. If burning had been mentioned with efficiency it would have been fine.

ResultsPlus
Examiner Tip

Answer each question in as much detail as possible.

Question 21 (e) (i)

There were many errors here. Some confused atomisation with boiling.

Some formed the elements, including carbon (graphite).

(e) (i) Complete the equation, including state symbols, for the atomisation of gaseous cyclohexane.

(1)

$C_6H_{12}(g) \rightarrow$ $6C(g) + 6H_2(g)$

Examiner Comments

This response was all too common. The carbon has been atomised but the hydrogen has not.

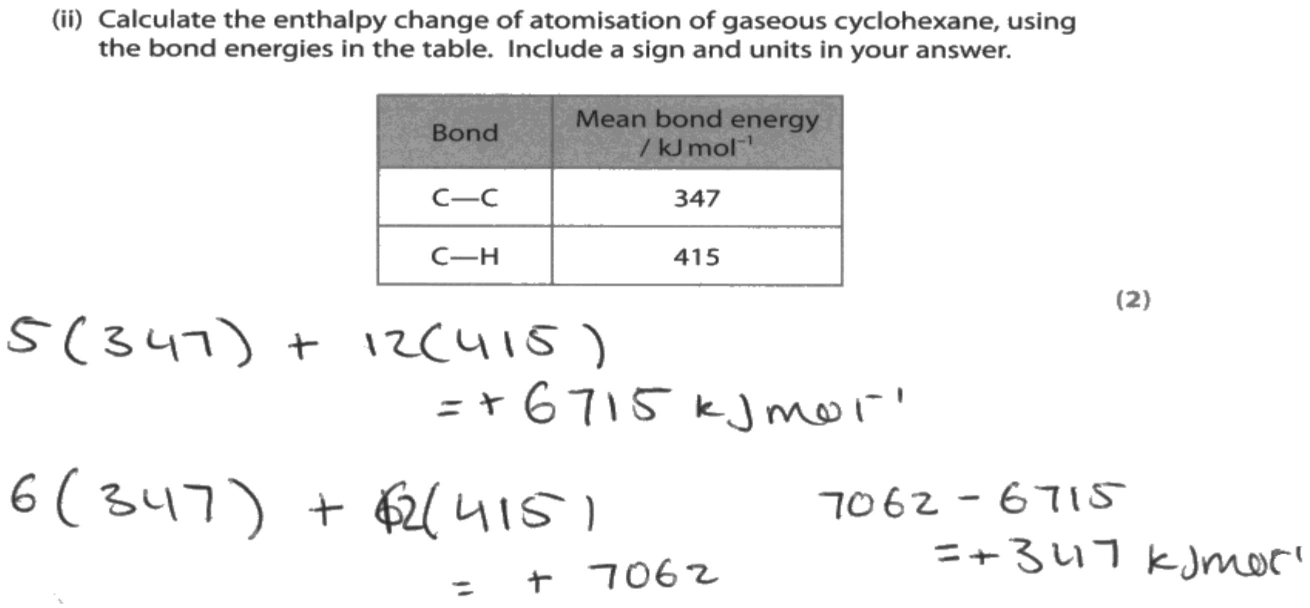
Examiner Tip

Learn the enthalpy change definitions thoroughly. Atomisation is conversion of one mole of a compound to its gaseous atoms.

Question 21 (e) (ii)

The common error was to confuse cyclohexane with hexane, so to have five carbon-carbon values and fourteen carbon hydrogen values.

Some gave the incorrect sign suggesting bond breaking is exothermic.



(ii) Calculate the enthalpy change of atomisation of gaseous cyclohexane, using the bond energies in the table. Include a sign and units in your answer.

Bond	Mean bond energy / kJ mol^{-1}
C—C	347
C—H	415

(2)

5(347) + 12(415)

= + 6715 kJ mol^{-1}

6(347) + ~~6~~12(415)

= + 7062

7062 − 6715

= + 347 kJ mol^{-1}

ResultsPlus
Examiner Comments

This response illustrates two common errors.

First, five C-C bond values have been used.

Then, six C-C bond values have been used.

Then the two values have been combined!

Fortunately for the candidate they have shown their working in the second calculation which gains the first mark.

ResultsPlus
Examiner Tip

Always show your working clearly.

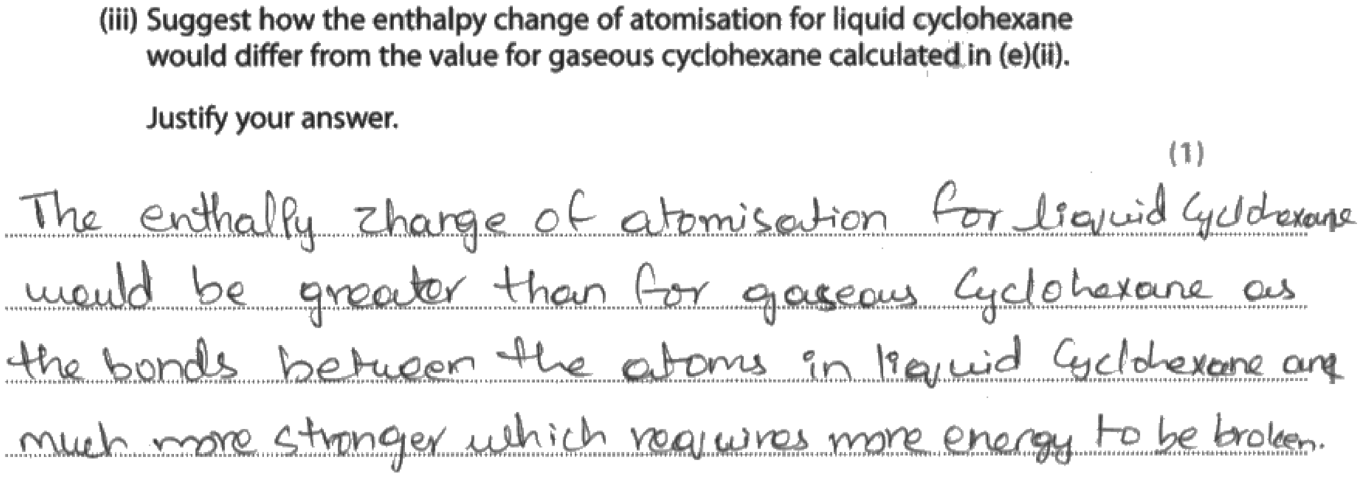
Question 21 (e) (iii)

The question is clearly looking for two things: how the enthalpy change would differ and the reason for this difference.

Some did one or the other.

There was much imprecise language in response to the first part.

The best terms are ‘more positive’ or ‘less negative’ rather than greater or higher.



(iii) Suggest how the enthalpy change of atomisation for liquid cyclohexane would differ from the value for gaseous cyclohexane calculated in (e)(ii).

Justify your answer.

(1)

The enthalpy change of atomisation for liquid Cyclohexane would be greater than for gaseous Cyclohexane as the bonds between the atoms in liquid Cyclohexane are much more stronger which requires more energy to be broken.

ResultsPlus
Examiner Comments

This response makes a classic error. Bonds between atoms do not break on vaporisation of a liquid.

ResultsPlus
Examiner Tip

Be clear on the difference of bonds between molecules, which break on boiling, and bonds between atoms, which break on atomisation.

(iii) Suggest how the enthalpy change of atomisation for liquid cyclohexane would differ from the value for gaseous cyclohexane calculated in (e)(ii).

Justify your answer.

(1)

It would be greater as the cyclohexane would have to change from liquid to gas.

ResultsPlus
Examiner Comments

Notice the loose language here, of 'It would be greater' which was allowed here but might not be allowed in future.

ResultsPlus
Examiner Tip

Use precise language: 'more positive' or 'less negative' when referring to enthalpy changes.

Question 22 (a) (i)

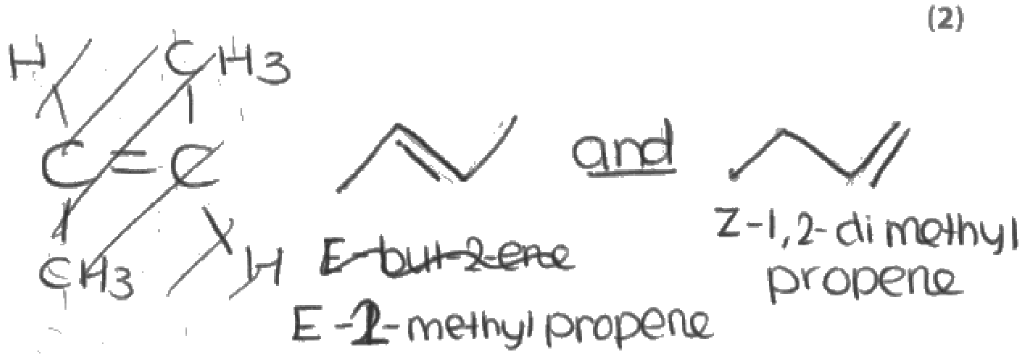
Many candidates were able to give recognisable correct structures but were unable to name them as ‘but-2-ene’s. The E and Z were usually correct.

22 This question is about alkenes.

(a) But-2-ene has two geometric isomers. C_4H_8

(i) Draw the skeletal formulae of these two isomers and give their names.

(2)



~~E-but-2-ene~~

E-2-methyl propene

and

Z-1,2-dimethyl propene

ResultsPlus
Examiner Comments

This response shows some common errors.

The question refers to the two but-2-ene isomers. But-1-ene is an isomer of but-2-ene, but not one of this pair of but-2-ene isomers.

Though the candidate has recognised the ‘E’ isomer, the name is incorrect.

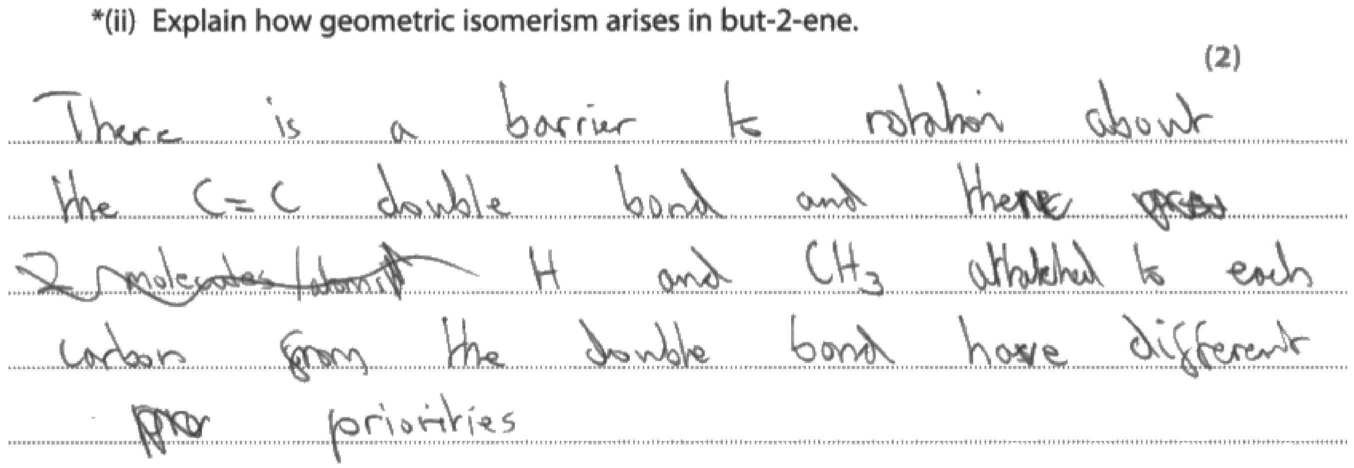
ResultsPlus
Examiner Tip

Learn the naming system and practise naming different structures.

Question 22 (a) (ii)

Many responses included the phrase ‘restricted rotation’ but some omitted to mention the carbon-carbon double bond.

The need for two different groups on each double bond carbon was omitted more frequently.



*(ii) Explain how geometric isomerism arises in but-2-ene.

(2)

There is a barrier to rotation about the C=C double bond and there [illegible] ~~2 molecules / atoms~~ H and CH_3 attached to each carbon from the double bond have different ~~prior~~ priorities

ResultsPlus
Examiner Comments

This is a perfect answer.

Note the reference to ‘a barrier to rotation’ about the double bond.

Also the precise description of the double bond carbons and the mention of priorities.

Question 22 (b) (i)

There were many good responses to this question.

Care and precision were needed.

There were many omissions, despite reminders in the question:

- omission of the dipole on the H-Br bond;

- omission of charges or confusion between full and partial charges.

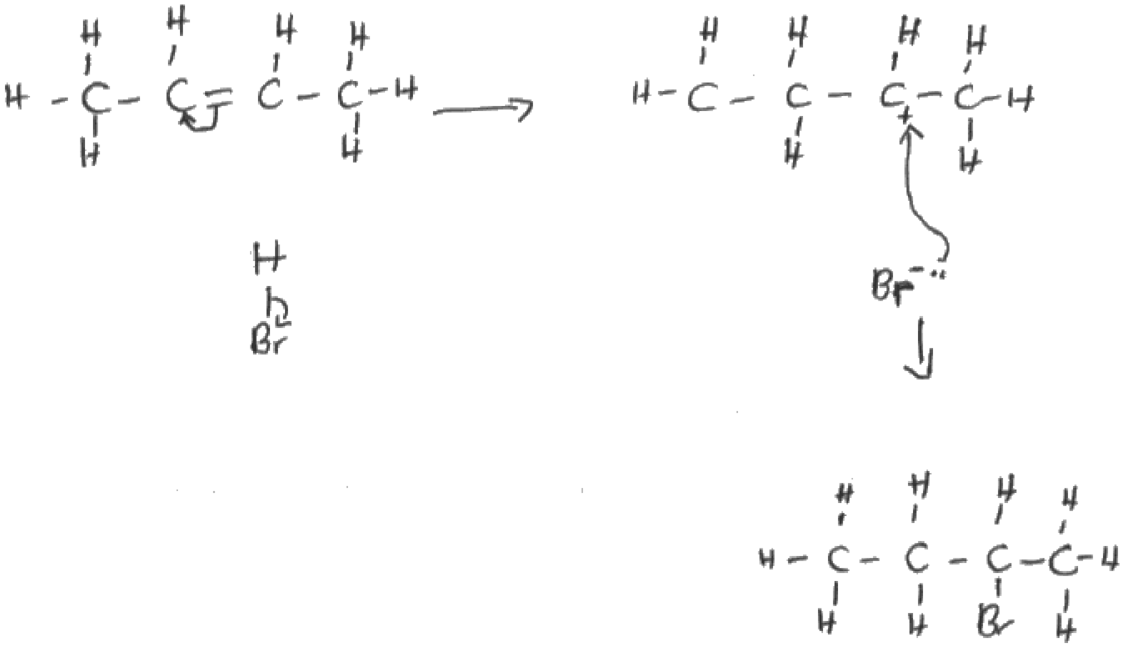
Many used the incorrect alkene.

Many omitted hydrogens from formulae.

Arrows frequently started or finished in incorrect places.

(b) (i) Give the mechanism for the reaction between hydrogen bromide and but-2-ene. Use appropriate curly arrows and include relevant dipoles and lone pairs.

(4)



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Examiner Comments

The first mark could be given for the double bond breaking and the electrons going through the carbon to the H of hydrogen bromide, but not just to the carbon.

The response shows the correct breaking of the H-Br bond, but no polarity is given, so no second mark.

The carbocation is missing a hydrogen so no third mark.

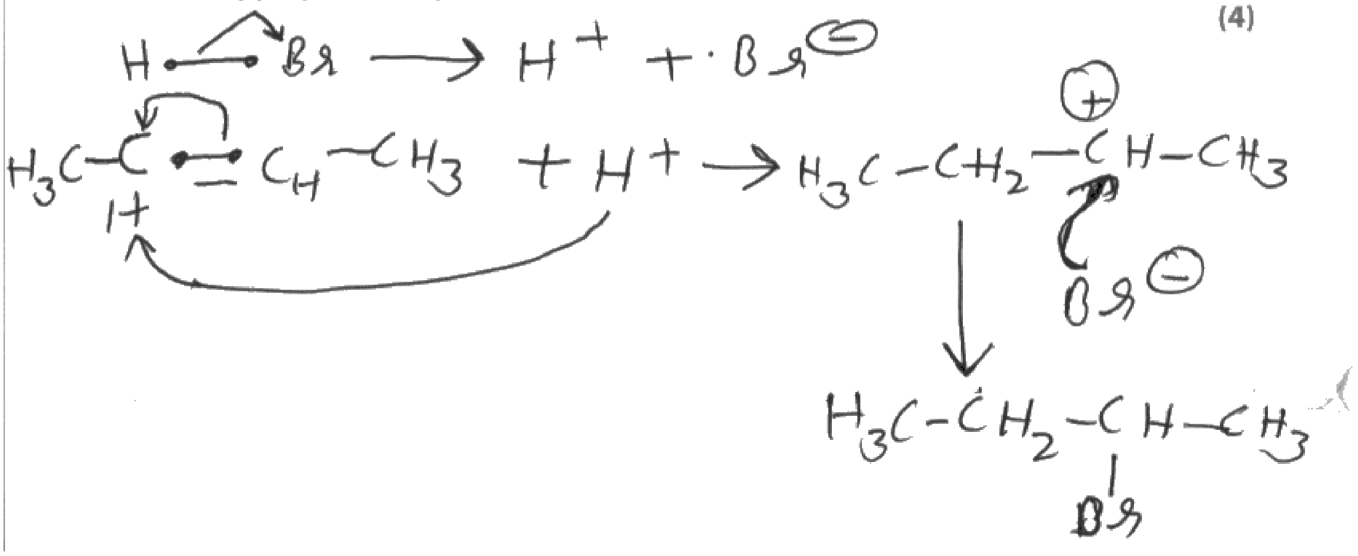
The attack by the bromide ion, with its negative charge and lone pair is correct as is the final product so the fourth mark is awarded.

ResultsPlus
Examiner Tip

Practise drawing this mechanism.

(b) (i) Give the mechanism for the reaction between hydrogen bromide and but-2-ene. Use appropriate curly arrows and include relevant dipoles and lone pairs.

(4)



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Examiner Comments

The first mark could be given for the double bond breaking and the electrons going through the carbon to the H of hydrogen bromide, but not just to the carbon.

The response shows the correct breaking of the H-Br bond, but no polarity is given, so no second mark.

The carbocation is correct so the third mark is awarded.

The lone pair of electrons is missing from the bromide ion in the final step, which is otherwise correct.

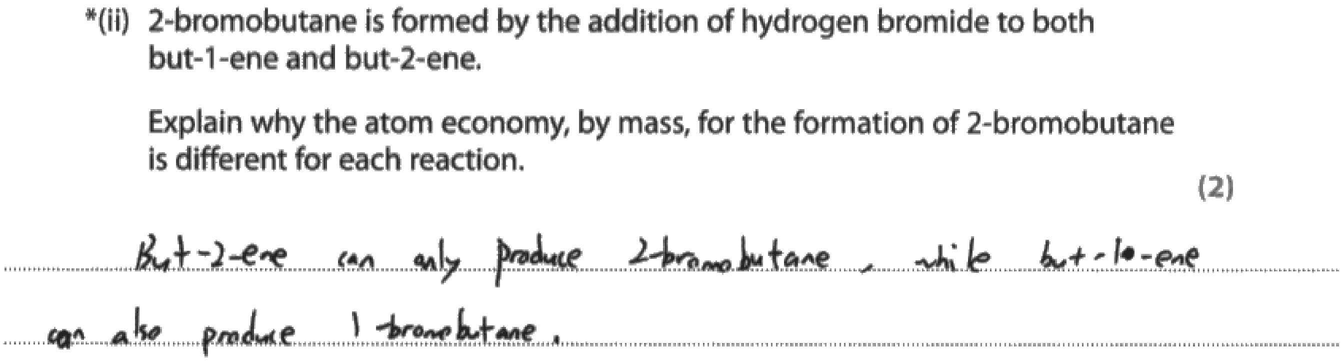
ResultsPlus

Examiner Tip

Remember that mechanisms show movement of electrons, not protons.

Question 22 (b) (ii)

The common error was only to mention one of the reactions. It is good practice whenever 'explain the difference' is seen to write about both substances. This was essential here to gain both marks.



*(ii) 2-bromobutane is formed by the addition of hydrogen bromide to both but-1-ene and but-2-ene.

Explain why the atom economy, by mass, for the formation of 2-bromobutane is different for each reaction.

(2)

But-2-ene can only produce 2-bromobutane, while but-1-ene can also produce 1 bromobutane.

ResultsPlus
Examiner Comments

A perfect and concise answer.

ResultsPlus
Examiner Tip

Notice how both compounds are clearly mentioned.

Question 22 (c)

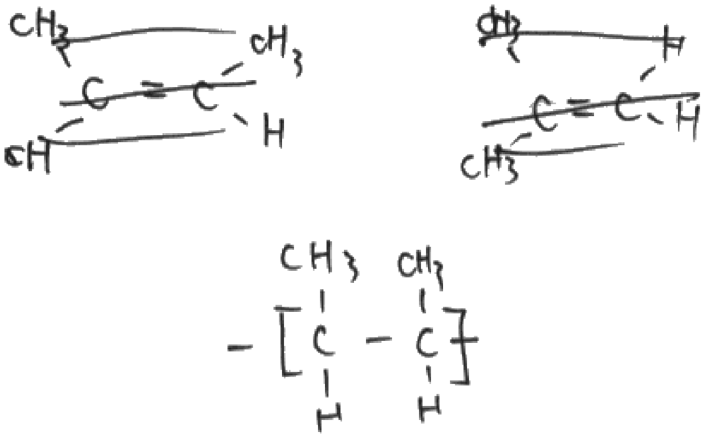
Common errors were the omission of 'an' from the name, giving the incorrect numbers, and omitting 'di' from the name.

Question 22 (d) (i)

The examples given show the common errors.

(d) (i) Draw the structure of poly(but-2-ene). Show **two** repeat units.

(2)



ResultsPlus
Examiner Comments

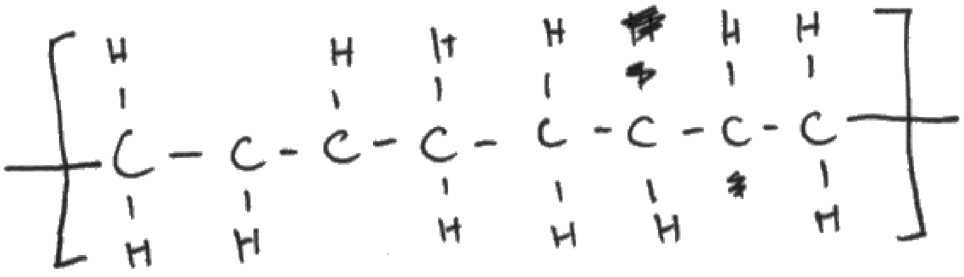
This response has only one unit. As it is otherwise correct, it gains one mark.

ResultsPlus
Examiner Tip

Candidates should make sure to fully read the question.

(d) (i) Draw the structure of poly(but-2-ene). Show **two** repeat units.

(2)



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Examiner Comments

This response illustrates several common errors.

Two complete four carbon chains have been joined end to end.

Hydrogens are omitted from the formulae.

All the methyl groups have been lost.

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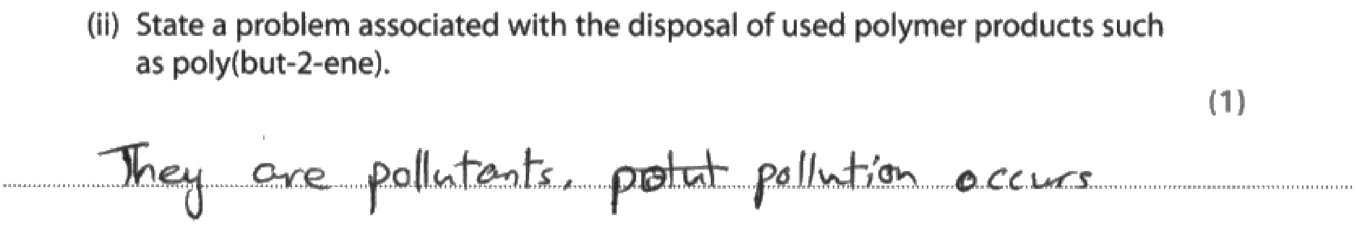
Examiner Tip

Always check that each carbon forms four bonds.

Question 22 (d) (ii)

There were many good, thoughtful answers to the question. The common correct response was 'They are not bio-degradable'.



(ii) State a problem associated with the disposal of used polymer products such as poly(but-2-ene).

(1)

They are pollutants, ~~potut~~ pollution occurs

ResultsPlus
Examiner Comments

An insufficient answer.

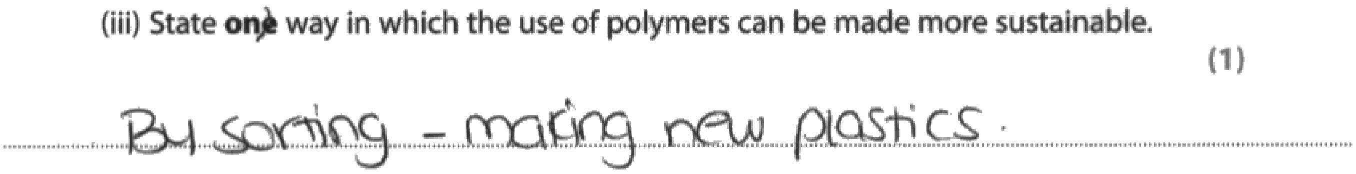
ResultsPlus
Examiner Tip

Learn the key problem here which is 'non-biodegradable'.

Question 22 (d) (iii)

Recycling or reusing were the most common correct responses.

There were many insufficient responses like 'using other chemicals'.



(iii) State **one** way in which the use of polymers can be made more sustainable.

(1)

By sorting - making new plastics.

ResultsPlus
Examiner Comments

An insufficient response.

Question 23 (a) (i)

Many responses formed sodium sulfate instead of sodium hydrogensulfate which had been clearly mentioned in the question.

Others gave an incorrect formula for sodium nitrate, with two or four oxygen atoms.

Question 23 (a) (ii)

A common incorrect response was ‘so it can be seen’.

There were many insufficient answers like ‘to prevent it reacting’, failing to mention ‘insunlight’.

Question 23 (a) (iv)

The opportunity to show off practical knowledge was usually squandered, with most responses gaining no marks at all.

Those with the correct idea, often missed the need to add **excess** nitric acid after the initial weighing.

Some tried to make the nitrates of copper and silver and find their mass, but this method would not work.

Some failed to wash and dry the gold precipitate left, before the final weighing.

*(iv) Silver and copper react with concentrated nitric acid to form soluble salts but pure gold does not react. Gold is often alloyed with silver and/or copper. Use this information to outline the steps required to determine the percentage of gold in an alloy of gold, silver and copper. Do **not** include practical details or an explanation of the calculation.

(3)

To determine the percentage of goldin an alloy of gold, ~~react~~ silver and copper react the alloy with nitric acid ~~Before~~ after ~~and then~~ weighing the alloy. Then once the acid is added and the alloy reacts, filter it and then heat it to concentrate it, ~~After~~ this will remove the soluble salts and water. Then collect the remaing gold and wash it with warm water to make sure all the soluble salts are removed. Weigh the gold and then Calculate the percentage of goldin the alloy. Repeat the experiment and find the average

ResultsPlus
Examiner Comments

This is a good attempt but misses two key points:

'Excess' (nitric acid) must be added;

The gold must be filtered and dried.

ResultsPlus
Examiner Tip

Always give as many points as you can.

*(iv) Silver and copper react with concentrated nitric acid to form soluble salts but pure gold does not react. Gold is often alloyed with silver and/or copper. Use this information to outline the steps required to determine the percentage of gold in an alloy of gold, silver and copper. Do **not** include practical details or an explanation of the calculation.

(3)

Alloys' are metals that consist of Composites of two or more elements. The Percentage of gold in an alloy Can be determined by reacting Silver and Copper with Concentrated nitric acid, the Product formed is Soluble in water, the Solution is then heated which also Contains water, the heating Cause the liquid to evaporate, the Solution is then dried and is left to be cooled, as the solution is Cooled hydrated Silver or Copper Crystals are formed. The water is removed from the Crystals and the mass of the Crystals can now be used to calculate the Percentage of gold.

ResultsPlus
Examiner Comments

A typical response based on measuring the mass of the nitrates formed.

One mark could still have been gained if 'excess' nitric acid had been added.

ResultsPlus
Examiner Tip

Practise applying practical methods to unfamiliar situations.

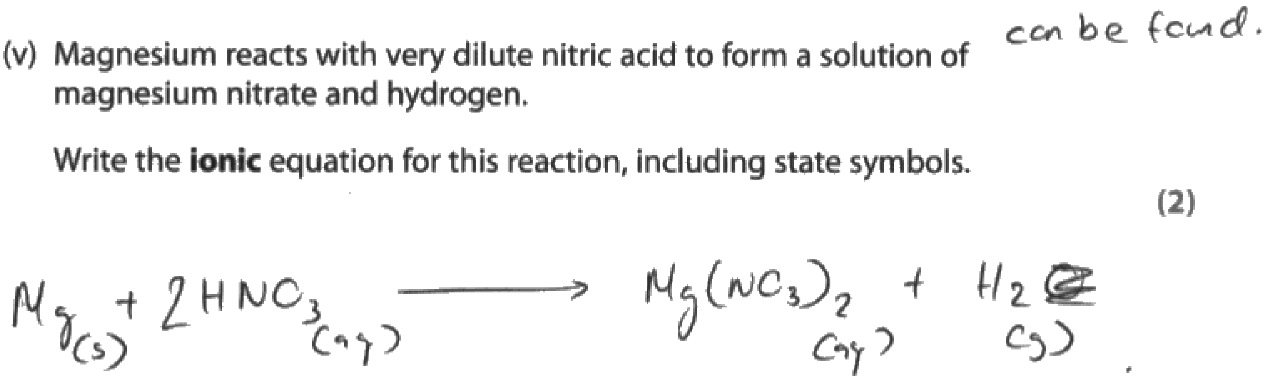
Question 23 (a) (v)

As has often been the case in previous papers, writing ionic equations proves a stumbling block.

It is important to practise writing both full and ionic equations for all inorganic reaction types.

Many unbalanced equations were seen.

Some thought $Mg^{+}(aq)$ ions form.



can be found.

(v) Magnesium reacts with very dilute nitric acid to form a solution of magnesium nitrate and hydrogen.

Write the **ionic** equation for this reaction, including state symbols.

(2)

$$Mg_{(s)} + 2HNO_{3(aq)} \longrightarrow Mg(NO_3)_{2(aq)} + H_{2(g)}$$

ResultsPlus
Examiner Comments

A perfect overall equation.

ResultsPlus
Examiner Tip

Read the question carefully.

(v) Magnesium reacts with very dilute nitric acid to form a solution of magnesium nitrate and hydrogen.

Write the **ionic** equation for this reaction, including state symbols.

(2)

$$Mg(s) + H^+(aq) \rightarrow Mg^+(aq) + \frac{1}{2}H_2(g)$$

ResultsPlus
Examiner Comments

Balanced ionic equation with correct symbols but the incorrect charge on the magnesium ion.

ResultsPlus
Examiner Tip

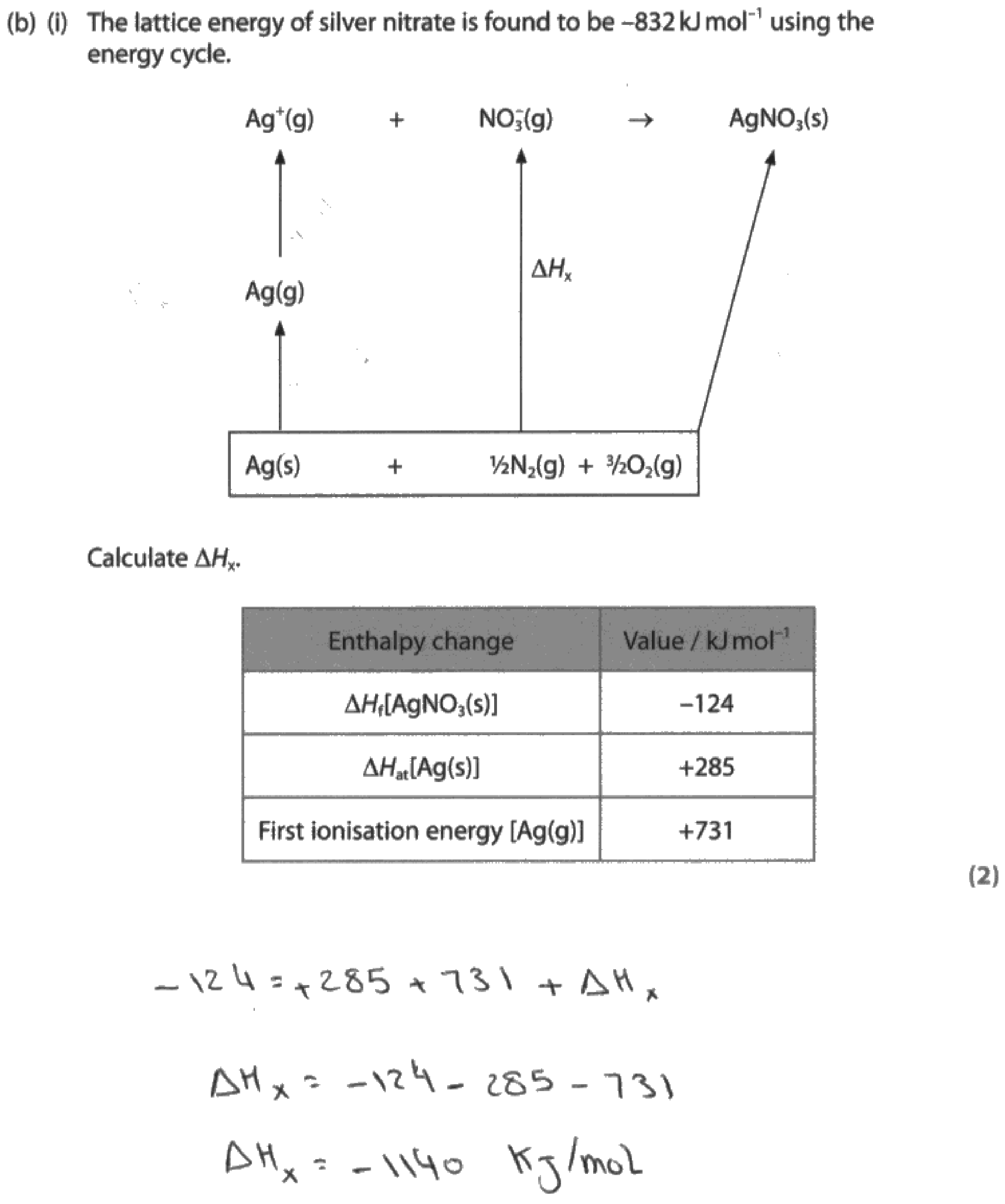
Learn the charges on common ions.

Question 23 (b) (i)

Many candidates omitted one or more values from their calculation.

Others used incorrect signs or applied Hess's law incorrectly.

Some made transcription errors – it is good advice to always check each figure in a calculation.



(b) (i) The lattice energy of silver nitrate is found to be −832 kJ mol^{-1} using the energy cycle.

Calculate ΔH_x.

Enthalpy change	Value / kJ mol^{-1}
$\Delta H_f[AgNO_3(s)]$	−124
$\Delta H_{at}[Ag(s)]$	+285
First ionisation energy [Ag(g)]	+731

(2)

$-124 = +285 + 731 + \Delta H_x$

$\Delta H_x = -124 - 285 - 731$

$\Delta H_x = -1140$ KJ/mol

ResultsPlus
Examiner Comments

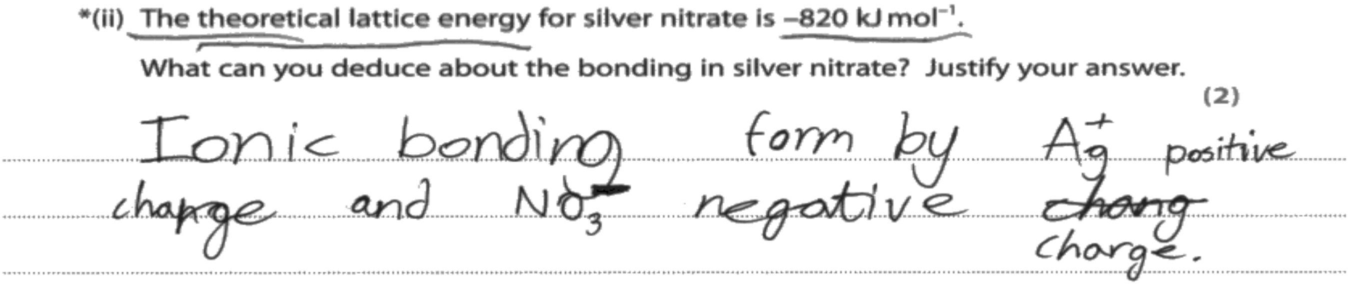
The lattice energy has been omitted.

ResultsPlus
Examiner Tip

It is usually correct to use all values given in this type of calculation.

Question 23 (b) (ii)

Many candidates failed to give a numerical justification with their description of bond type, though this is the important measure of the accuracy of the ionic model.



*(ii) The theoretical lattice energy for silver nitrate is –820 kJ mol^{-1}.

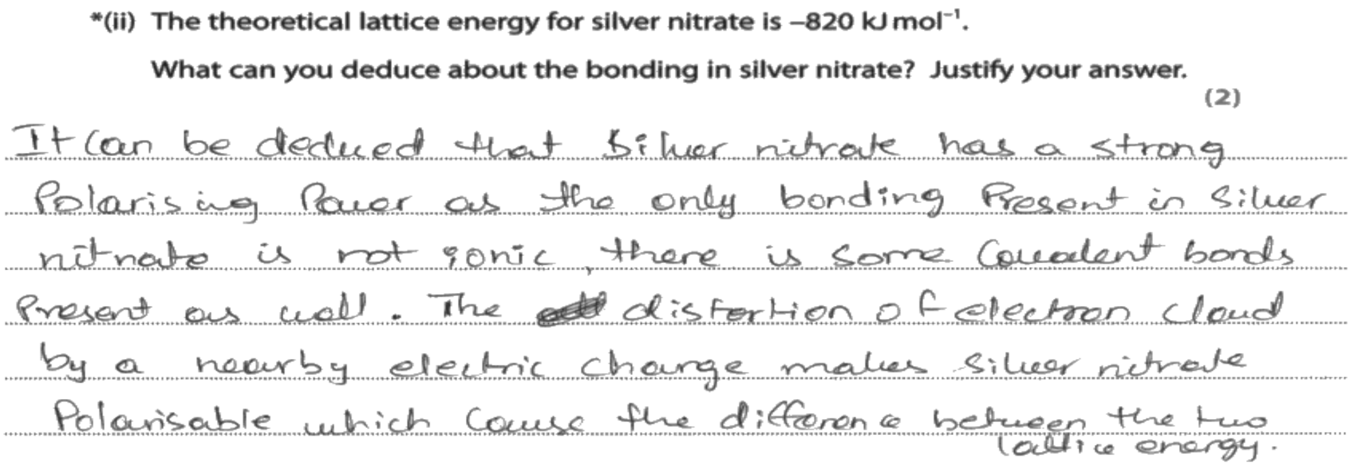
What can you deduce about the bonding in silver nitrate? Justify your answer.

(2)

Ionic bonding form by Ag^+ positive charge and NO_3^- negative ~~chang~~ charge.

ResultsPlus
Examiner Comments

Ionic bond is sufficient for the first mark but requires justification for the second mark.



*(ii) The theoretical lattice energy for silver nitrate is –820 kJ mol^{-1}.

What can you deduce about the bonding in silver nitrate? Justify your answer.

(2)

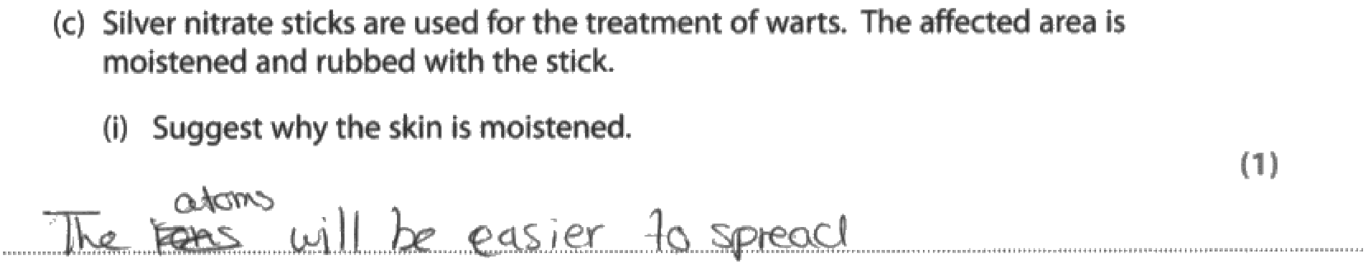
It can be deduced that silver nitrate has a strong Polarising Power as the only bonding Present in Silver nitrate is not ionic, there is some Covalent bonds Present as well. The ~~ed~~ distortion of electron cloud by a nearby electric charge makes silver nitrate Polarisable which Cause the difference between the two lattice energy.

ResultsPlus
Examiner Comments

This is a very good one-mark response. The only problem is the absence of reference to numerical values.

Question 23 (c) (i)

Fewer than half the candidates applied their knowledge of salt solubilities in water correctly here.



(c) Silver nitrate sticks are used for the treatment of warts. The affected area is moistened and rubbed with the stick.

(i) Suggest why the skin is moistened.

(1)

The ~~ions~~ atoms will be easier to spread

ResultsPlus
Examiner Comments

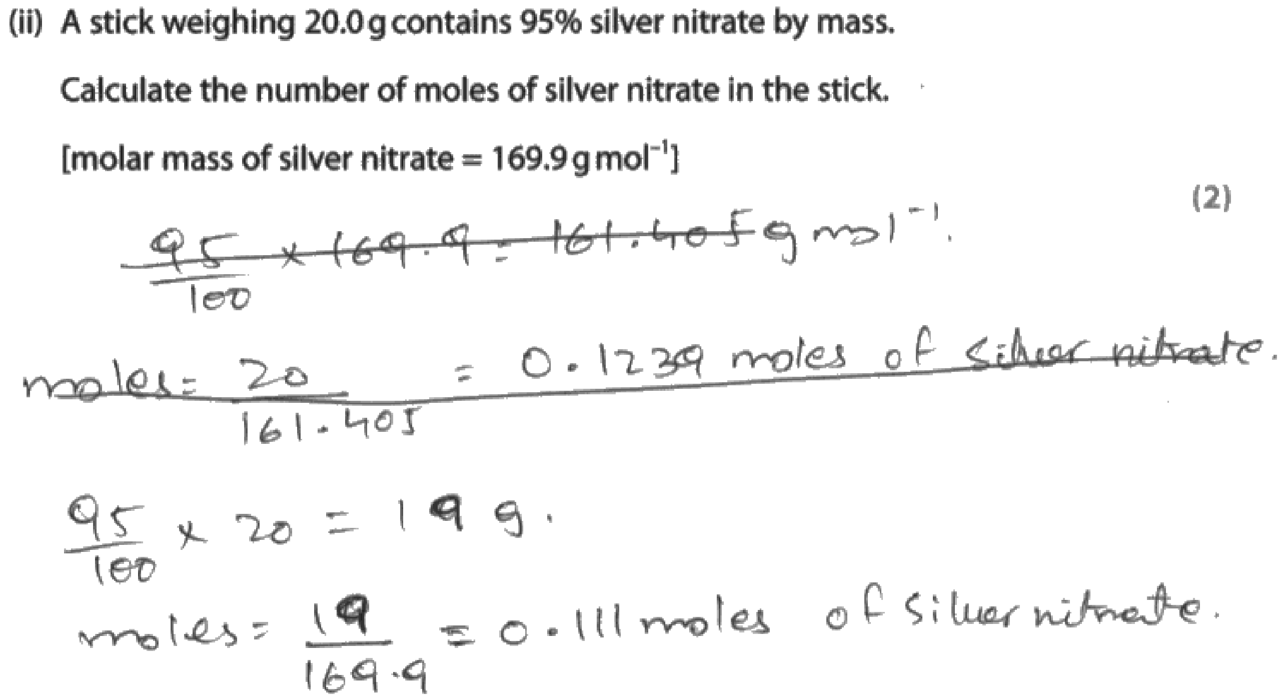
An insufficient response.

ResultsPlus
Examiner Tip

Learn and apply salt solubilities.

Question 23 (c) (ii)

Many candidates ignored the factor of 95%, but could still gain 1 mark if they correctly divided by 169.9 and correctly rounded the answer to any number of significant figures except one.



(ii) A stick weighing 20.0 g contains 95% silver nitrate by mass.

Calculate the number of moles of silver nitrate in the stick.

[molar mass of silver nitrate = 169.9 g mol^{-1}]

(2)

~~$\frac{95}{100} \times 169.9 = 161.405$ g mol^{-1}.~~

~~moles = $\frac{20}{161.405}$ = 0.1239 moles of silver nitrate.~~

$\frac{95}{100} \times 20 = 19$ g.

moles = $\frac{19}{169.9}$ = 0.111 moles of silver nitrate.

ResultsPlus

Examiner Comments

The candidate has crossed out their initial incorrect attempt, so the second response is marked.

This is fine until the incorrect rounding in the final answer: to three significant figures it is 0.112.

ResultsPlus

Examiner Tip

Practise correct rounding of numerical answers.

Paper Summary

To improve their performance candidates should:

- Practise writing the different types of formulae and equations
- Read the question carefully, underlining or highlighting key words
- Fully engage with practical work, understanding and learning the techniques and the results
- Understand and learn the organic chemistry, the formulae and names of reactants and products, and the conditions for reactions

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