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Examiners' Report
January 2012

GCE Chemistry 6CH01 01

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Introduction

Section A of the paper contained a suitable balance of straightforward and higher demand questions. The majority of candidates scored more than half marks on this section of the paper. The structured questions in Section B offered opportunities for candidates across the ability range to exhibit their skills. Every question in Section B provided evidence for differentiation.

Calculations were, in general, well laid-out. A minority of answers were difficult to follow because only numbers were written without any accompanying words of explanation.

There was no evidence that candidates found it difficult to complete the paper in the ninety minutes allowed.

Question 20 (a) (i)

The majority of candidates were able to calculate the moles of carbon dioxide. If the volume of the gas used was left in units of cm^3 (as in the question), then the molar volume had to be converted from 24 dm^3 mol^{-1} into 24 000 cm^3 mol^{-1}. If the answer given was incorrect, the reason was that the candidates had not worked with consistent units.

SECTION B

Answer ALL the questions. Write your answers in the spaces provided.

20 (a) An impure sample of sodium hydrogencarbonate, $NaHCO_3$, of mass 0.227 g, was reacted with an excess of hydrochloric acid. The volume of carbon dioxide evolved was measured at room temperature and pressure and found to be 58.4 cm^3.

$$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$$

The molar volume of any gas at the temperature and pressure of the experiment is 24 dm^3 mol^{-1}. The molar mass of sodium hydrogencarbonate is 84 g mol^{-1}.

(i) Calculate the number of moles of carbon dioxide given off.

(1)

$mol = \frac{58.4}{24000} = 0.00243 mol$

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Examiner Comments

This is a correct answer, clearly set out.

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Examiner Tip

If the volume of gas is in cm^3, then the molar volume must be converted from 24 dm^3 mol^{-1} to 24 000 cm^3 mol^{-1}.

Question 20 (a) (ii-iii)

Many candidates were able to calculate the mass of sodium hydrogencarbonate present in the sample. The most frequent error in (a)(ii) was to calculate the moles of impure sodium hydrogencarbonate instead of the mass required by the question. Under these circumstances, however, the two marks in (a)(iii) could be retrieved by using the moles in (a)(i) in the subsequent calculation. A mark was often lost in (a)(iii) by not giving the final answer to two significant figures.

$$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$$

0.827

The molar volume of any gas at the temperature and pressure of the experiment is 24 dm^3 mol^{-1}. The molar mass of sodium hydrogencarbonate is 84 g mol^{-1}.

(i) Calculate the number of moles of carbon dioxide given off. **(1)**

58.4 ÷ 24000

~~0.00243 moles~~

~~0.002283~~

0.00243 moles

(ii) Calculate the mass of sodium hydrogencarbonate present in the impure sample. **(2)**

~~0.227~~

~~0.0~~

84 x 0.00243 = 0.20412

0.204g

(iii) Calculate the percentage purity of the sodium hydrogencarbonate. Give your answer to two significant figures. **(2)**

$\frac{0.204}{0.227} \times 100$

= 89.8678

= 90%

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Examiner Comments

Working has been shown and the answer in (a)(iii) has been given to the required degree of accuracy.

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Examiner Tip

Check your final answer carefully when a specific degree of accuracy is required by the question.

Question 20 (b)

Part (b)(i) was generally well-answered. The most frequent error was to confuse a gas syringe with a burette and to double the total error given in the question.

For (b)(ii), the majority of candidates realised that carbon dioxide is slightly soluble in water. A significant number of answers, however, mistakenly thought that because water was a product of the acid-hydrogencarbonate reaction, this in itself would affect the accuracy of the experiment.

(b) (i) The total error in reading the gas syringe is ±0.4 cm³. Calculate the percentage error in measuring the gas volume of 58.4 cm³.

(1)

$\frac{0.4}{58.4} \times 100 = 0.685\ \%$

(ii) Suggest why the carbon dioxide should not be collected over water in this experiment.

(1)

as it ~~can~~ may react with water

(Total for Question 20 = 7 marks)

~~$CO_2 + H_2O \rightarrow CO_3 + H_2$~~

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Examiner Comments

Both responses (b)(i) and (b)(ii) are correct.

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Examiner Tip

Note that the total error has been given in the question for (b)(i).

(b) (i) The total error in reading the gas syringe is ±0.4 cm^3. Calculate the percentage error in measuring the gas volume of 58.4 cm^3.

(1)

$\frac{0.8}{58.4} \times 100 =$ ~~[illegible]~~ 1.37

(ii) Suggest why the carbon dioxide should not be collected over water in this experiment.

(1)

because ~~[illegible]~~ carbon dioxide can dissolve in water

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Examiner Comments

In (b)(i), the total error has been doubled and so no mark has been awarded.

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Examiner Tip

Consider error in measurements when carrying out experiments in the laboratory.

Question 21 (a) (i)

This part was generally well-answered. The most frequent error, however, was to omit the "2" in front of the HCl in the equation.

21 (a) On strong heating, calcium carbonate decomposes to calcium oxide and carbon dioxide:

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

Owing to the conditions under which the reaction occurs, it is not possible to measure the enthalpy change directly.

An indirect method employs the enthalpy changes when calcium carbonate and calcium oxide are neutralized with hydrochloric acid.

(i) Write the equation for the reaction of calcium carbonate with hydrochloric acid. State symbols are **not** required.
[ΔH_1 is the enthalpy change for this reaction]

(1)

$CaCO_3 + HCl \longrightarrow CaCl_2 + H_2O + CO_2$ ΔH_1

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Examiner Comments

Incorrect, as the "2" is missing from in front of the HCl.

ResultsPlus
Examiner Tip

Check that your equations are balanced!

Question 21 (a) (ii-iii)

Answers to (a)(ii) showed that many candidates have a good understanding of energy cycles. The most common error in (a)(ii) was to omit one of the products in the box on the cycle.

21 (a) On strong heating, calcium carbonate decomposes to calcium oxide and carbon dioxide:

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

Owing to the conditions under which the reaction occurs, it is not possible to measure the enthalpy change directly.

An indirect method employs the enthalpy changes when calcium carbonate and calcium oxide are neutralized with hydrochloric acid.

(i) Write the equation for the reaction of calcium carbonate with hydrochloric acid. State symbols are **not** required.
[ΔH_1 is the enthalpy change for this reaction]

(1)

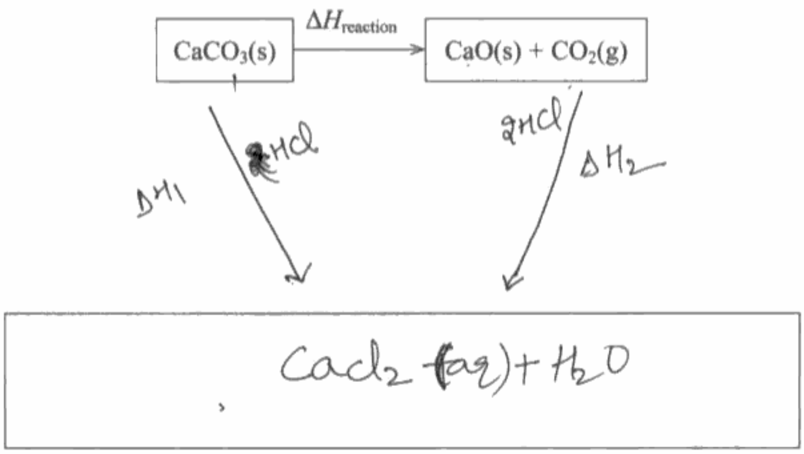
$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$ ΔH_1

(ii) The reaction of calcium oxide with hydrochloric acid is

$$CaO(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) \qquad \Delta H_2$$

Use the equations in parts (i) and (ii) to complete the Hess's Law cycle below to show how you could calculate the enthalpy change for the decomposition of calcium carbonate, $\Delta H_{reaction}$. Label the arrows in your cycle.

(3)



(iii) Complete the expression for $\Delta H_{reaction}$ in terms of ΔH_1 and ΔH_2.

(1)

$\Delta H_{reaction} =$ $\Delta H_1 - \Delta H_2$

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Examiner Comments

Note "CO_2" is missing from the box in the Hess cycle in (a)(ii).

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Examiner Tip

Check that all relevant species are included in your Hess cycles.

Question 21 (b)

The most frequently seen correct answer related to heat losses from the apparatus. Many incorrect answers referred to "incomplete combustion", despite the fact that the question referred to the thermal decomposition of calcium carbonate.

(b) Suggest **two** reasons why the value obtained by carrying out these two experiments and using the equation gives a value different to the data booklet value for the decomposition reaction of calcium carbonate.

(2)

1 Hess' Law doesn't include heat loss.

2 The experiment used for the data booklet could have used inaccurate measurements.

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Examiner Comments

Part (b) scored the mark for "heat loss". References to inaccuracy of measurements or the equipment did not earn a mark.

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Examiner Tip

Remember that data book values for reaction enthalpy changes are normally given under standard conditions.

Question 22 (a) (i)

The idea of bombardment of the gaseous atoms with high-energy electrons was generally well-understood.

22 (a) State how the following processes are achieved in a mass spectrometer.

(i) Ionization of the sample.

(1)

High energy electrons are fired at the sample which knock off electrons making the sample positive

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Examiner Comments

The mention of high-energy electrons was sufficient for this mark.

Question 22 (a) (ii)

The idea of using an electric field to accelerate the positive ions was generally well-known. However, a minority of candidates incorrectly stated that "positively-charge plates" would attract the positive ions.

(b) Suggest **two** reasons why the value obtained by carrying out these two experiments and using the equation gives a value different to the data booklet value for the decomposition reaction of calcium carbonate.

(2)

1 Hess' Law doesn't include heat loss.

2 The experiment used for the data booklet could have used inaccurate measurements.

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Examiner Comments

The ions in the mass spectrometer are positively charged. Negatively-charged plates are therefore required to attract, and hence accelerate, the ions.

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Examiner Tip

Remember that opposite charges attract!

Question 22 (a) (iii)

The use of a magnet to deflect the ions in a mass spectrometer was recalled correctly by the vast majority of candidates.

(iii) Deflection of the ions. (1)

magnetic field

ResultsPlus
Examiner Comments

The use of a magnetic field to deflect the positive ions was appreciated by the vast majority of candidates.

ResultsPlus
Examiner Tip

Make sure you understand all the processes that take place in a mass spectrometer.

Question 22 (b)

A significant number of candidates confused the use of a mass spectrometer to determine relative atomic mass of a sample of an element with that of finding the relative molecular mass of a molecule.

(b) State how you could find the molecular mass of a substance from its mass spectrum. (1)

The molecular mass of a substance ~~is the~~ will be the ion with the ~~highest~~ largest mass on the mass spectrum.

ResultsPlus
Examiner Comments

Mention of the "ion with largest mass" gets the mark here.

(b) State how you could find the molecular mass of a substance from its mass spectrum. (1)

times the mass found by the peak percentage and divide by 100.

ResultsPlus
Examiner Comments

Answers referring to the calculation of relative atomic mass did not earn any credit.

ResultsPlus
Examiner Tip

Don't confuse the use of mass spectrometry to determine relative atomic masses with that of finding the relative molecular mass of a molecule.

Question 22c

Section 1.5(c) of the specification requires candidates to be aware of some uses of mass spectrometry.

(c) Living things take up the radioactive isotope carbon-14 from the atmosphere. In recent years a particular linen cloth was shown, using mass spectrometry, to have been made from flax grown in the early 14th century. Suggest how mass spectrometry can be used to estimate the age of the cloth.

(2)

Using mass spectrometry you can see how many Carbon-14 atoms are in the sample, therefore as Carbon-14 decays into a more stable isotope over time, you can ~~determine~~ determine the age, by the number of Carbon-14's in the sample

(Total for Question 22 = 6 marks)

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Examiner Comments

This response scored two marks. The first mark was awarded for stating that the amount of ^{14}C has to be determined and the second for realising that the ^{14}C decays over time.

ResultsPlus
Examiner Tip

Be aware of some applications of mass spectrometry.

Question 23 (a)

The candidates' quality of written communication was thoroughly tested in (a)(i). The words "atom", "ion" and "molecule" were used interchangeably by a significant number of candidates.

*23 The melting temperatures of the elements of Period 3 are given in the table below. Use these values to answer the questions that follow.

Element	Na	Mg	Al	Si	P (white)	S (monoclinic)	Cl	Ar
Melting temperature / K	371	922	933	1683	317	392	172	84

(a) Explain why the melting temperature of sodium is very much less than that of magnesium.

(3)

Na^+ ions are ~~smaller~~ bigger in radius than Mg^{2+} ions. Mg^{2+} ions have a higher charge compared to Na^+ ions. There are more delocalised electrons per Mg^{2+} ion compared to Na^+ ions. The force of attraction between the Mg^{2+} ions and delocalised electrons is greater than ~~Na^+ ions~~ in Na metal. More heat energy is needed to overcome the stronger metallic bonds in Mg.

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Examiner Comments

This is an excellent answer, with clear communication evident.

ResultsPlus
Examiner Tip

Make sure you can explain trends across the Periodic Table as required in section 1.5(k) of the specification.

Question 23 (b)

The giant structure of silicon was well-known, as was the simple molecular structure in phosphorus. However, it was often incorrectly stated that covalent bonds between phosphorus atoms were broken on melting.

(b) Explain why the melting temperature of silicon is very much greater than that of white phosphorus.

(3)

~~Silicon~~ Silicon has ~~four~~ one more electrons than phosphorus so it fills another subshell which needs more energy to remove the electrons because it is more stable.

ResultsPlus
Examiner Comments

There was often confusion in candidates' answers between the processes of melting and ionization. This response scored no marks.

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Examiner Tip

Do not muddle up the processes of melting and ionization!

(b) Explain why the melting temperature of silicon is very much greater than that of white phosphorus.

(3)

- ~~The phosporus~~ Silicon ~~is~~ has a giant-molecular structure. Each Si ~~mot~~ atoms are held together by strong covalent bond.
- White phosphorus is a simple molecules. ~~The~~ The molecules are held together by weak Var Der Waals force.
- More energy is required to break the strong covalent bond than the weak Van Der Waals Force.
- Hence melting temperature of silicon is greater than that of white phosphoru.

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Examiner Comments

Three marks were awarded for this response.The first mark was earned for mentioning that covalent bonds are broken in silicon.The second mark was gained for recognition that silicon has a giant molecular structure.The third mark was awarded for stating that weak van der Waals' forces exist between phosphorus molecules.

ResultsPlus
Examiner Tip

Remember to use key terms correctly and to consider carefully whether it is either covalent bonds or weak intermolecular forces being broken on melting non-metals.

Question 23 (c)

This proved to be a highly discriminating question as candidates had to appreciate that it is because argon is monatomic that it has such a low melting temperature.

(c) Explain why the melting temperature of argon is the lowest of all the elements of Period 3.

(1)

Argon is a single atom which is held by very weak Van der Waal's forces.

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Examiner Comments

This candidate realises that argon is monatomic and so scores a mark here.

ResultsPlus
Examiner Tip

Remember that an argon atom has one more electron than a chlorine atom. However, because chlorine exists as diatomic Cl_2 molecules and argon as single Ar atoms, the melting temperature of chlorine is higher than that of argon.

Question 23 (d)

Many candidates scored both marks for this part. If one mark was scored, however, it was nearly always because the candidate forgot to mention the sulfur by way of comparison with magnesium.

(d) Explain why magnesium is a good conductor of electricity whereas sulfur is a non-conductor.

(2)

Magnesium consists a sea of delocalized electrons which are free to move in an electric field. Sulfur does not consists any electrons in it.

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Examiner Comments

The presence of delocalised electrons in magnesium is suggested, so the first mark was awarded. No second mark was credited as this response suggests that there are no electrons (at all) in sulfur. Had, for example, "there are no free electrons in sulfur" been written, the second mark would have been awarded.

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Examiner Tip

Remember to check carefully what you have written.

(d) Explain why magnesium is a good conductor of electricity whereas sulfur is a non-conductor.

(2)

Magnesium is a good conductor of electricity ~~has~~ as when molten, it has a strong metallic structure ~~due to the fact~~ whereas sulfur has a giant molecular structure. Also sulfur is a non-metal and magnesium is a metal.

(Total for Question 23 = 9 marks)

ResultsPlus

Examiner Comments

This response did not score any marks. There was no mention of delocalised/mobile/free electrons in magnesium. Sulfur is described as giant molecular, which is incorrect.

Question 24 (a)

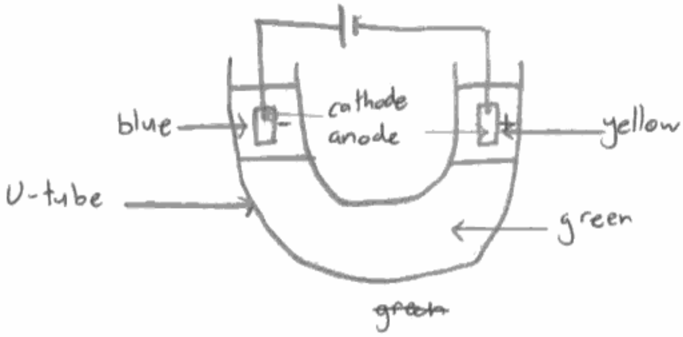
The majority of candidates described a method involving electrolysis.

24 (a) Briefly describe an experiment, with a diagram of the apparatus you would use, which shows that there are oppositely charged ions in copper(II) chromate(VI), $CuCrO_4$. Describe what you would expect to see.

Formula of ion	Colour
$Cu^{2+}(aq)$	blue
$CrO_4^{2-}(aq)$	yellow

(4)

Diagram



A ~~ł~~ u-tube would be used in which the copper (II) chromate (VI) would be kept. At each end would be an electrode to pass a current through. The liquid is green, but after some time a blue ~~liquide~~ and yellow liquid will be seen at opposite electrods.

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Examiner Comments

This response scored three marks out of four.Both a negative and a positive electrode are shown (although the fact that the longer terminal was shown incorrectly as being negative and the shorter terminal was shown incorrectly as being positive was not penalised). The yellow colour has been shown to migrate towards the positive electrode and the blue colour is shown migrating towards the negative electrode. The only omission is that the movement of ions has not been specifically mentioned in the answer.

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Examiner Tip

Always draw diagrams that are fully labelled, thereby relaying the maximum amount of information.

Question 24 (b)

Part (b)(i) was very well-answered. The most common error was to omit the word "ions". Very few scored both the marks in (b)(ii). The repulsion between like-charged ions was acknowledged, but the repulsion between electron clouds around the ions (regardless of their charge) was frequently overlooked.

(b) The ions in an ionic lattice are held together by an **overall** force of attraction. at negative c

(i) Describe the forces of attraction in an ionic lattice.

(1)

These are electrostatic forces of attraction between ions. ie between cations (+ve ions) and anions (−ve ions).

(ii) Suggest **two** forces of repulsion which exist in an ionic lattice.

(2)

1. Forces of repulsion between positive metal ions. OR cations.

2. Forces of repulsion between electrons clouds of anions.

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Examiner Comments

Part (b)(i) scores the mark as both positive and negative ions are included in the response.Part (b)(ii) scores both marks: the first mark for mention of ions of the same charge repelling and the second mark for acknowledging that electron clouds repel.

ResultsPlus
Examiner Tip

Consider the forces of attraction and of repulsion in an ionic lattice.

(b) The ions in an ionic lattice are held together by an **overall** force of attraction.

(i) Describe the forces of attraction in an ionic lattice.

(1)

electrostatic between the cations and the anions.

(ii) Suggest **two** forces of repulsion which exist in an ionic lattice.

(2)

magnetic repulsion between the +ve cations and repulsion between the -ve anions.

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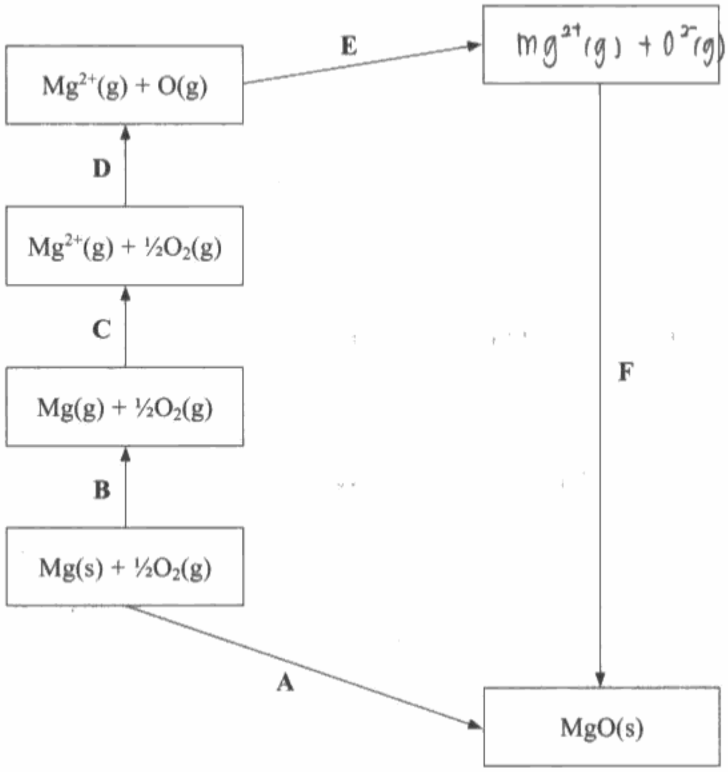
Examiner Comments

Part (b)(i) scores the mark for mention of both positive and negative ions.Part (b)(ii) did not score. One mark is negated by the mention of "magnetic" repulsion between ions of the same charge.The second scoring point in (b)(ii) is not addressed in this response.

Question 24 (c)

The majority of answers to (c)(i) were correct. In (c)(ii), however, although the enthalpy change of formation was well-known, the next answer often simply referred to "ionization energy" or just "second ionization energy" instead of the sum of the first plus second ionization energies (of magnesium). If the answer to (c)(iii) was incorrect, then normally the signs were all the wrong way round.

(c) Part of the Born-Haber cycle for magnesium oxide, MgO, is shown below.



(i) Complete the empty box with the appropriate formulae and state symbols. **(2)**

(ii) Identify the enthalpy changes represented by the letters **A** and **C**. **(2)**

A Enthalpy of formation of magnesium oxide.

C ~~Second ioni~~ first and second ionisation energy of magnesium.

(iii) Give the expression for the enthalpy change **F** in terms of the other enthalpy changes **A** to **E**. **(1)**

F = A - (B + C + D + E)

= A - B - C - D - E

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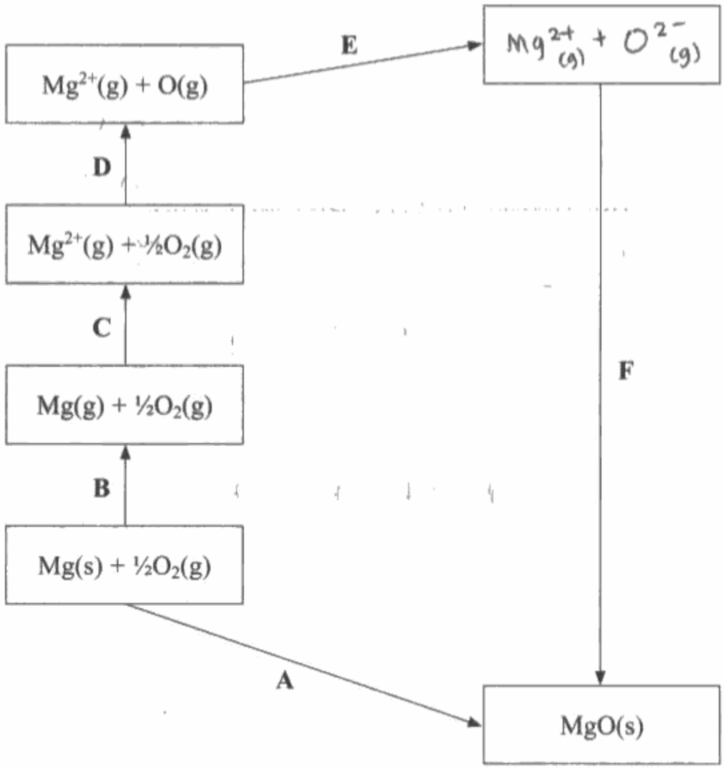
Examiner Comments

This is a correct response, clearly laid out.

(c) Part of the Born-Haber cycle for magnesium oxide, MgO, is shown below.



(i) Complete the empty box with the appropriate formulae and state symbols.

(2)

(ii) Identify the enthalpy changes represented by the letters **A** and **C**.

(2)

A ΔH°_{f} [MgO(s)] enthalpy change of formation.

C ΔH°_{2i} [Mg(g)] · second ionisation of magenisium

(iii) Give the expression for the enthalpy change **F** in terms of the other enthalpy changes **A** to **E**.

(1)

B+C+D+E+F ~~⇒~~ = A

F = A−B−C−D−E

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Examiner Comments

In (c)(i), both the two species and the two state symbols are correct. In (c)(ii), 'formation' scores a mark, but 'second ionization energy' is incorrect. The answer should have stated that this enthalpy change is the sum of the first two ionization energies. Part (c)(iii) is correct.

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Examiner Tip

Practise questions such as (c)(iii) so that you can work your way round a Born-Haber cycle.

Question 24 (d) (i)

Unfortunately, many candidates did not read the question carefully and mention the effect on the ionic bonding of changing the charge on both the cation and anion. The fact that the Mg^{2+} cation is smaller than a Mg^{+} cation was appreciated by the majority of candidates.

(d) The lattice composed of the ions Mg^{2+} and O^{2-} is stronger than a lattice composed of the ions Mg^{+} and O^{-}.

(i) Explain, in terms of the charges on the ions and the size of the cations, why this is so.

(2)

There is a higher charge density and the ions are smaller in a lattice composed of Mg^{2+} and O^{2-}; meaning the lattice is stronger ~~thus requiring more energy~~ than a lattice composed of Mg^{+} and O^{-}

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Examiner Comments

This answer scored both marks. Any comparison between the size of the O^{-} and the O^{2-} ions was ignored, as the question only required a comparison between the size of the Mg^{2+} and the Mg^{+} cations.

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Examiner Tip

Always read the question carefully so as to ascertain exactly what you are required to consider in your answer.

Question 24 (d) (ii)

This was generally well-answered, except when candidates did not realise that this was requiring a comparison of the magnitude of the lattice energies rather than just stating that "the $Mg^{2+}O^{2-}$ lattice is stronger".

Question 25a

This question was, in general, very well-answered. Candidates were able to apply their knowledge of the reaction between methane and chlorine to work out the mechanism for the reaction between ethane and chlorine. A few candidates included hydrogen free radicals or equations that did not balance.

(ii) Suggest how the lattice energy of $Mg^{2+}O^{2-}$ would differ from that of $Mg^{+}O^{-}$.

(1)

lattice energy of $Mg^{2+}O^{2-}$ will be more exothermic than $Mg^{+}O^{-}$

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Examiner Comments

An excellent, unambiguous response.

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Examiner Tip

As lattice energies are quoted as negative numbers, use of terms such as "more exothermic" or "more negative" are much better than just stating "bigger" or "larger".

25 Chloroethane can be made from ethane and chlorine in the gas phase in the presence of ultraviolet light. The equation for the reaction is

$$CH_3CH_3 + Cl_2 \rightarrow CH_3CH_2Cl + HCl$$

(a) Complete the mechanism for the reaction. Two of the steps have been given for you.
(4)

Initiation: $Cl_2 \rightarrow 2Cl\cdot$

Propagation (two steps)

(i) ~~CH₃~~ $C_2H_6 + Cl^{\bullet} \rightarrow C_2H_5^{\bullet} + HCl$

(ii) $C_2H_5^{\bullet} + Cl_2 \rightarrow$ ~~[crossed out]~~ $C_2H_5Cl + Cl^{\bullet}$

Termination (three steps)

$2Cl\cdot \rightarrow Cl_2$

(iii) $C_2H_5^{\bullet} + Cl^{\bullet} \rightarrow C_2H_5Cl$

(iv) $C_2H_5^{\bullet} + C_2H_5^{\bullet} \rightarrow C_4H_{10}$

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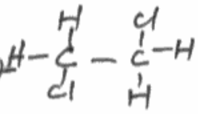
Examiner Comments

Four marks were awarded here as all the required steps are correct.

Question 25 (b)

Only about 30% of the candidates were aware that further chlorination of the chloroethane can occur.

(b) This reaction gives a poor yield of chloroethane. Give the structural formula and name of another organic product, not included in your mechanism for part (a), which could be produced in the reaction. (2)

Formula 

Name ....

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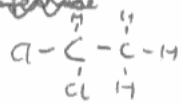
Examiner Comments

This answer scored one mark as a correct structure has been drawn. No attempt, however, has been made to name the structure shown.

(b) This reaction gives a poor yield of chloroethane. Give the structural formula and name of another organic product, not included in your mechanism for part (a), which could be produced in the reaction. (2)

Formula 

Name 1, 1 dichloroethane

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Examiner Comments

Two marks were awarded, as both the formula and the name are correct.The missing hyphen between the second "1" and the "d" of dichloroethane was not penalised.

Question 25 (c) (i)

The responses to this question indicated that many candidates appreciated the difference between hazard and risk.

(c) Chlorine gas is extremely toxic and is therefore a significant hazard. The preparation must be performed so as to minimise the risk to the experimenter.

(i) Explain the difference between **hazard** and **risk**.

(2)

A hazard is a source of possible danger which has been identified whereas a risk is the chance of a hazard happening (becoming an event)

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Examiner Comments

This answer acknowledges the difference between risk and hazard.

Question 25 (c) (ii)

This question was very well-answered, with the vast majority of candidates giving a suitable precaution.

(ii) Give one precaution that you would use in this experiment to minimise the risk, other than the use of a laboratory coat and safety goggles.

(1)

fume cupboard.

ResultsPlus

Examiner Comments

The suggestion to use a fume cupboard when carrying out an experiment with chlorine gas is a suitable one.

ResultsPlus

Examiner Tip

Be aware of safe practice in the chemistry laboratory.

Question 26 (a)

Only a minority of candidates suggested a cycloalkane.

26 (a) The alkenes have the general formula C_nH_{2n}. However, a compound with this general formula is not necessarily an alkene. Suggest why this is so.

(1)

Because cyclohexanes also have that formula

ResultsPlus
Examiner Comments

The mark was awarded for this correct answer.

ResultsPlus
Examiner Tip

Cycloalkanes have the general formula C_nH_{2n} (as do alkenes).

Question 26 (b)

The answers to (b) showed that many candidates find constructing equations using skeletal formulae much more demanding than those using structural formulae.

(b) Give the equation, using skeletal formulae, for the reaction of propene with each of the following.

(i) Hydrogen:

(1)

(ii) Hydrogen bromide to form the major product:

(2)

ResultsPlus
Examiner Comments

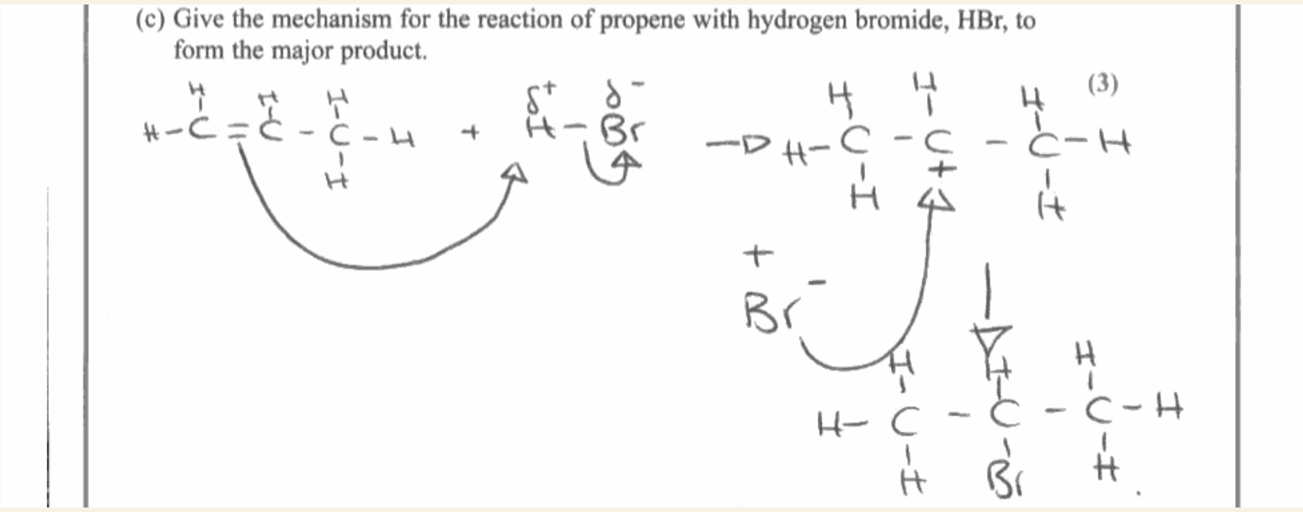
Both parts are correct.

ResultsPlus
Examiner Tip

Practise writing equations using skeletal formulae as well as structural formulae.

Question 26 (c)

The electrophilic addition mechanism in (c) was widely-known, but marks were often lost due to the omission of the positive charge on the carbocation intermediate and/or the omission of the negative charge on the bromide ion in the second step of the mechanism.



ResultsPlus
Examiner Comments

Although the clarity of the mechanism would have been improved if the hydrogen bromide molecule had been drawn closer to the propene molecule, all three marks were awarded for this answer.

ResultsPlus
Examiner Tip

Practise drawing reaction mechanisms using "curly arrows"!

Paper Summary

Make sure you understand clearly the difference between an ATOM, a MOLECULE and an ION.

Make sure you understand what you are being asked to do before you start to answer the question

Always check your answer against the question to ensure you have covered all the points asked for in the question

Make sure your writing is legible.

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