Mark Scheme (Results)

November 2021

Pearson Edexcel GCE
In Chemistry (9CH0)
Paper 1: Advanced Inorganic and Physical Chemistry

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication
Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Mark
1(a)	**The only correct answer is D** (Na^+ and Mg^{2+}) **A** *is not correct because the chloride ion has an extra shell of electrons compared to the nitride ion* **B** *is not correct because the sulfide ion has an extra shell of electrons compared to the oxide ion* **C** *is not correct because the potassium ion has an extra shell of electrons compared to the sodium ion*	**(1)**

Question Number	Answer	Mark
1(b)	**The only correct answer is B** (the mass of one atom of an isotope relative to one twelfth of the mass of an atom of the isotope carbon-12) **A** *is not correct because this is the relative atomic mass definition* **C** *is not correct because this is part of the relative atomic mass definition and because of the comparison of one atom to 12 g* **D** *is not correct because of the comparison of one atom to 12 g*	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)	• correct expression **(1)** • evaluation of calculation and answer to 2 dp **(1)**	Example of calculation RAM= $\frac{(50.52 \times 78.918) + (49.48 \times 80.916)}{100}$ (= 79.9066104) = 79.91 ALLOW units of g mol^{-1} only Do not award units of % Correct answer without working scores (2)	**(2)**

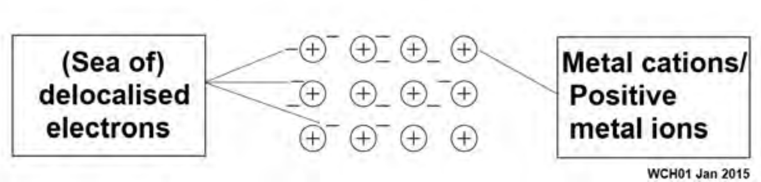
(Total Question 1 = 4 marks)

Question Number	Answer	Mark
2(a)	**The only correct answer is D** (nichrome wire and concentrated hydrochloric acid) **A** *is not correct because iron wire is not used* **B** *is not correct because iron wire is not used* **C** *is not correct because concentrated hydrochloric acid and not water is needed*	**(1)**

Question Number	Answer	Mark
2(b)	**The only correct answer is A** (green) **B** *is not correct because this is the colour for potassium ions* **C** *is not correct because this is the colour for lithium, calcium and strontium ions* **D** *is not correct because this is the colour for sodium ions*	**(1)**

Question Number	Answer	Mark
2(c)	**The only correct answer is C** (there is no change) **A** *is not correct because magnesium ions have no effect on flame colour* **B** *is not correct because the elemental magnesium and not the metal ions give a white colour* **D** *is not correct because magnesium ions have no effect on flame colour*	**(1)**

(Total Question 2 = 3 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	An answer that makes reference to the following points • metal cations in a ‘sea’ of delocalised electrons **(1)** • (metallic bonding is the strong) **electrostatic** attraction between (cations and electrons) **(1)**	ACCEPT suitable annotated diagram ALLOW reference to metal ions IGNORE ‘free’ electrons/positive nucleus Do not award reference to molecules Example diagram  Approximately equal numbers of positive ions and negative electrons	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	An answer that makes reference to the following points • **adsorption** of CO and/or NO molecules on the catalytic surface **(1)** • weakening of bonds (and chemical reaction between CO and NO) **(1)** • desorption of CO_2 and/or N_2 /product (molecules) from the catalytic surface **(1)**	Allow 'active site' for surface Do not award **ab**sorption Do not award weaken the bonds between molecules Allow bonds break (within CO and NO) Allow de-adsorption for desorption Do not award desorption of the reactants Do not award reference to incorrect products such as H_2/O_2/C/NO_2 Penalise omission of catalytic surface once only	**(3)**

(Total Question 3 = 5 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	An answer that makes reference to the following points • (energy) released **(1)** • energy is required to overcome the (electrostatic) attraction from the nucleus for the electron **(1)**	Allow energy is required to remove an electron Allow (the removal of an electron) is endothermic	**(2)**

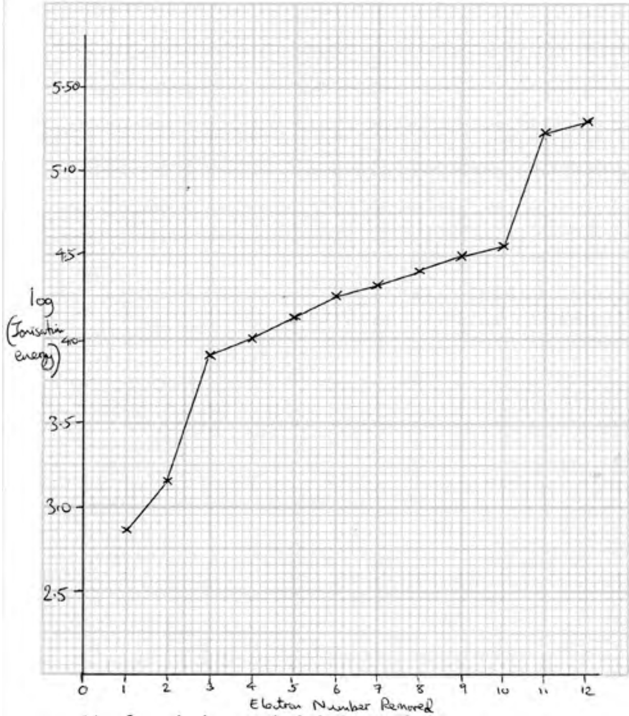
Question Number	Answer	Additional Guidance	Mark
4(b)	An answer that includes • species in suitable equation **(1)** • state symbols **(1)**	<u>Example of equation</u> $O^{+}(g) \rightarrow O^{2+}(g) + e^{(-)}$ ALLOW $O^{+}(g) - e^{(-)} \rightarrow O^{2+}(g)$ Ignore state symbols on electron Do not allow multiples for M1 M2 dependent on M1 or near miss	**(2)**

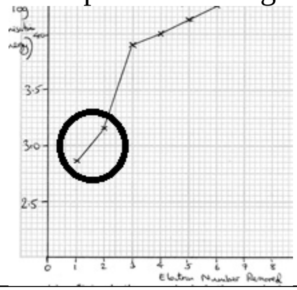
Question Number	Answer	Additional Guidance	Mark
4(c)	An explanation that makes reference to the following points • the outer electron in a sodium atom is closer to the nucleus (than that in potassium) **(1)** • (and) less shielding from inner electron shells **(1)** • these outweigh the greater nuclear charge / number of protons in potassium **(1)**	Accept reverse arguments throughout Allow sodium atoms are smaller (than potassium) Allow sodium has electron in 3s whereas potassium has electron in 4s Allow diagram to illustrate Do not award reference to ionic radius Do not award if reference given to both have a +1 charge/ same nuclear charge	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(d)(i)	• completed table	4.26 and 5.28	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(d)(ii)	An answer that includes • the range of numbers / 738 to 189 371 is too large (to fit on a graph / axis) **or** logarithms make it easier to plot the numbers	Allow: a (very) long y axis would be needed (some of) the numbers are too large the difference between the ionisation energies is too large so the numbers will fit on the graph logs give smaller (range of) numbers Ignore simpler to read Do not award reference to averages	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(d)(iii)	An answer that includes one of the following points • the same number of protons is attracting a decreasing number of electrons **or** electron is removed from an increasingly positively charged ion **or** electron removed is closer to the nucleus **or** the electron removed is experiencing less electron-electron repulsion	Do not award each electron is removed from shells closer to the nucleus	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(d)(iv)	An answer that includes a suitable graph • labelled axes **(1)** • suitable scale **(1)** • plotting of points and lines joining points **(1)**	 Do not award if any units given on y axis Plotted points must cover at least ½ the graph paper on each axis Allow ±½ square Do not award line going from point 1 to the origin Ignore plotting of electron 6 and 12 Exemplar graph 	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(d)(v)	An answer that includes • circle around the first two points/circles around individual points	Exemplar circle on graph 	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(e)	An answer that includes • (estimated value) between 1100 – 1380 (kJ mol^{-1})		**(1)**

(Total Question 4 = 15 marks)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	• sum of bonds broken **(1)** • and sum of bonds made **(1)** • answer **and** with negative sign **(1)**	<u>Example of calculation</u> bonds broken = (6 x 198) + (10 x 243) = 3618 (kJ mol^{-1}) bonds made = (20 x 326) = (−)6520 (kJ mol^{-1}) enthalpy change = Bonds broken – bonds made = (3618 − 6520) =−2902 (kJ mol^{-1}) Correct answer with no working scores (3) TE on bonds broken and made	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	• bond breaking requires energy or by convention bond enthalpies refer to dissociation and so are endothermic	ALLOW bond breaking is endothermic ALLOW bond making is exothermic Ignore just ‘bonds are broken’ / ‘it is endothermic’	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	• chlorine is oxidised **and** from 0 to +1 (in NaClO) **(1)** • chlorine is reduced **and** from 0 to -1 (in NaCl) **(1)**	Check the equation Allow (1) for three correct oxidation numbers if no other mark is awarded. Allow (1) max for general definition of disproportionation	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	• equation	$\mathbf{6}\ NaOH + \mathbf{3}\ Cl_2 \rightarrow NaClO_3 + \mathbf{5}\ NaCl + \mathbf{3}\ H_2O$ Allow multiples	**(1)**

Question Number	Answer	Mark
5(b)(iii)	**The only correct answer is C** (hot alkali) **A** *is not correct because high temperature is required* **B** *is not correct because high temperature is required* **D** *is not correct because high temperature and not excess chlorine is required*	**(1)**

Question Number	Answer	Mark
5(c)	**The only correct answer is D** (pale green – orange - purple) **A** *is not correct because chlorine is not orange and the colour stated for bromine is for the pure liquid state and solid iodine can appear black but not in an organic solvent* **B** *is not correct because solid iodine can appear black but not in an organic solvent* **C** *is not correct because chlorine is not orange and the colour stated for bromine is in the pure liquid state*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(d)(i)	• ionic equation **(1)** • state symbols **(1)**	<u>Example of equation</u> $Ag^+(aq) + I^-(aq) \rightarrow AgI(s)$ Allow multiples M2 dependent on M1 or near miss	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(d)(ii)	An answer that includes • halide ion with some justification attempt **(1)** • calculation of expected mass of silver halides **(1)**	Incorrect halide scores (0) Bromide (ion)/Br^- Do not award 'bromine (ion)' 0.01 mol of AgCl = 1.43 (g) AgBr = 1.88 (g) AgI = 2.35 (g) OR Mass of 1.0 mol is 188 g so subtraction of 107.9 for Ag means X = 80.1 so closest is Br TE on incorrect formula silver halide in d(i)	**(2)**

(Total Question 5 = 13 marks)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	An answer that makes reference to the following points: • there is an increase of number of moles **(1)** • change of state as gas / liquid / solution are produced from solids **(1)**	Allow particles for moles 3 to 13 moles Do not award 11 to 13 moles Do not award reference to 'more types' of products than reactants Ignore references to ΔH	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	An explanation that makes reference to the following points: • the reaction is endothermic **(1)** • (and so) freezes the water (which attaches the wooden block to the flask) **(1)**	Allow description of endothermic	**(2)**

Question Number	Answer	Mark
6(b)	**The only correct answer is D** (-216.6) **A** *is not correct because the values for magnesium and magnesium oxide have not been doubled and the entropy for the products has been incorrectly subtracted from the reactants entropy* **B** *is not correct because the values for magnesium and magnesium oxide have not been doubled* **C** *is not correct because the entropy for the products has been incorrectly subtracted from the entropy of the reactants*	**(1)**

(Total Question 6 = 5 marks)

Question Number	Answer	Additional Guidance	Mark
7(a)	An answer that makes reference to one of the following points • the loss of a hydrogen from the O−H group is made possible by the delocalisation of charge of/stabilisation on the carboxylate ion **or** the loss of a hydrogen from a methyl group would produce a carbanion with no stabilisation **or** similar electronegativies of carbon and hydrogen means that there is a lack of C−H bond polarity **or** the enthalpy of hydration of the ions outweighs the energy needed to break the O−H bond	Allow the C−H bond is not polar but the O−H bond is/ O−H bond is more polar Do not award the O−H bond is weaker than the C−H bond	**(1)**

Question Number	Answer	Mark
7(b)	**The only correct answer is C (**H_2O and OH^-**)** **A** *is not correct because ammonia is acting as a base and not an acid* **B** *is not correct because this is the base – conjugate acid pair* **D** *is not correct because water and the ammonium ion are not an acid-conjugate base pair*	**(1)**

Question Number	Answer		Additional Guidance	Mark
(7c)	• **(M1)** calculation of concentration of diluted acid • **(M2)** calculation of pH	**(1)** **(1)**	Example of calculation c=(15 x 15.9 / 100) = 2.385 (mol dm^{-3}) pH=−log(2.385) = −0.377/−0.38 / −0.4 TE on M1 provided answer is <7 Final answer without working scores (2) Ignore SF	**(2)**

Question Number	Answer		Additional Guidance	Mark
7(d)(i)	• expression for K_a • calculation of $[H^+]$ • calculation of pH to 2/3 SF	**(1)** **(1)** **(1)**	Example of calculation $K_a = \frac{[H^+] \times [A^-]}{[HA]}$ $[H^+] = \sqrt{(K_a \times [HA])} = \sqrt{(1.35 \times 10^{-6})}$ $= 1.16... \times 10^{-3}$ (mol) pH= -log(1.16... x 10^{-3}) = 2.93/2.9 TE on M2 provided answer <7 Final answer without working scores (3)	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(d)(ii)	An answer which makes reference to the following points • (assumption 1) $[C_2H_5COOH]_{initial}=[C_2H_5COOH]_{eqm}$ **(1)** • (assumption 2) $[H^+]=[C_2H_5COO^-]$ **(1)**	ACCEPT assumptions in any order Allow HA for C_2H_5COOH Allow A^- for $C_2H_5COO^-$ Dissociation of propanoic acid is negligible Ignore propanoic acid is a weak acid ALLOW for M2 "Negligible $[H^+]$ from water" Ignore reference to standard conditions	**(2)**

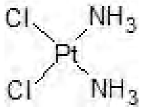
Question Number	Answer	Additional Guidance	Mark
7(e)(i)	• calculation of acid concentration **(1)** • calculation of salt concentration **(1)** • calculation of hydrogen ion concentration **(1)** • calculation of pH **(1)**	<u>Example of calculation</u> [Acid] = ((0.100 x (20 ÷ 50)) = 0.04 (mol dm^{-3}) [A^-] = ((0.305 x (30 ÷ 50)) = 0.183 (mol dm^{-3}) [H^+] = 1. 52 x 10^{-5} mol x (0.04 ÷ 0.183) = 3.322 x 10^{-6} (mol dm^{-3}) pH= -log(3.322 x 10^{-6}) = 5.48/5.5 Correct answer without working scores (4) Ignore SF except 1SF Allow M3 and M4 if just moles and no volumes are used Accept use of the Henderson-Hasselbalch equation	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(e)(ii)	An answer which includes • suitable equation(s) **(1)** • The pH stays approximately constant because there is a large reservoir of undissociated acid and so the ratio of acid:salt does not change **(1)**	<u>Example equation</u> $C_3H_7COOH + NaOH \rightarrow C_3H_7COONa + H_2O$ OR $C_3H_7COOH + OH^- \rightarrow C_3H_7COO^- + H_2O$ Allow $OH^- + H^+ \rightarrow H_2O$ followed by $C_3H_7COOH \rightarrow C_3H_7COO^- + H^+$ Allow use $\rightleftharpoons$ of in all of above equations Allow (The pH stays approximately constant) as the hydroxide ions react to form water and butanoic acid dissociates to replace the hydrogen ions used up	**(2)**

(Total Question 7 = 15 marks)

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	• ammonium ions do not have a lone pair (of electrons for bonding)	Allow ammonium ions are positive and so are repelled (by the positive metal cation) Ignore reference to it already having a dative/coordinate bond	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	An answer that makes reference to • d orbitals/d sub-shell split (into two different energies) **(1)** • difference in energy depends on the ligands **(1)** • difference in energy leads in different frequencies/wavelengths/photons of light absorbed **(1)** • (so) the unabsorbed frequencies/wavelengths/photons are reflected/transmitted **(1)**	Ignore 'distort' Do not award splitting of singular d orbital Allow 'colour seen' for reflected/transmitted Do not award 'emission' Do not award M3 nor M4 if reference to electron 'falling' releases energy is stated	**(4)**

Question Number	Answer	Mark
8(b)	**The only correct answer is C** () **A** *is not correct because water is not one of the ligands and the configuration of chloride ions should be cis not trans* **B** *is not correct because water is not one of the ligands* **D** *is not correct because the configuration should be cis not trans for the chloride ligands and one of the other ligands is a water molecule rather than ammonia*	**(1)**

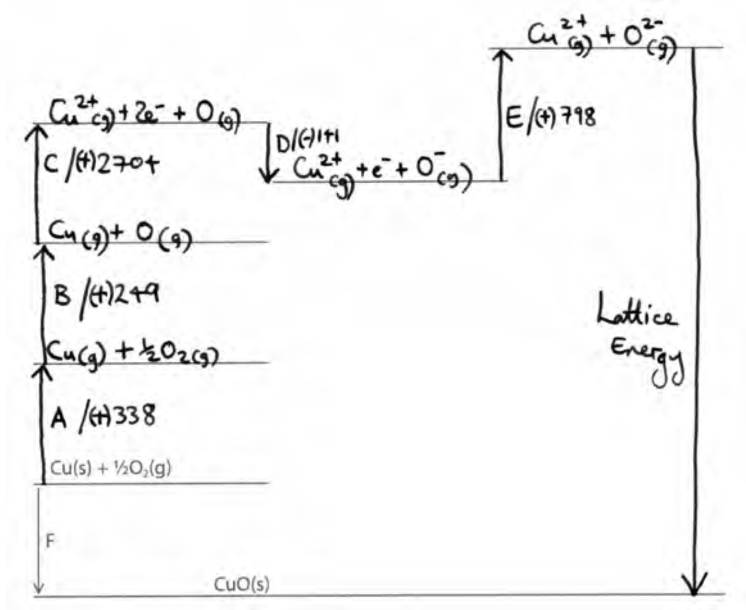
Question Number	Answer	Additional Guidance	Mark
8(c)	An answer that makes reference to (Similarities) At least one from • both ligands form dative covalent bonds with the cobalt(III) ions **(1)** • both have coordination number 6 **(1)** • both complex ions will be octahedral **(1)** (Differences) At least one from • EDTA is hexadentate, ethane-1,2-diamine is bidentate OR ratio of cobalt(III) to EDTA is 1:1, with ethane-1,2-diamine it is 1:3 **(1)** • complex with EDTA will be anionic / negatively charged, with ethane-1,2-diamine will be cationic / positively charged **(1)** • complex of EDTA is more stable than the complex with ethane-1,2-diamine because there is an increase in entropy **(1)**	There must be some comparison. Hence two separate paragraphs on each complex without this scores max (3) Allow both donate lone pairs of electrons to cobalt(III) ions Allow both have 6 coordinate bonds Accept EDTA forms 6 bonds and ethane-1,2diamine forms 2 Ignore multidentate/polydentate ALLOW EDTA is an anion, ethane-1,2-diamine is neutral Allow molar ratios to illustrate, even if incorrect	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(d)	An answer that makes reference to the following points (Justification) • two moles of chloride ions in aqueous solution so one mole of chloride ion is in the complex **(1)** • complex ion formula **(1)**	 $[Cr(H_2O)_5(Cl)]^{2+}$	**(2)**

(Total Question 8 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
9(a)(i)	An answer that includes • barium iodide has (almost) 100% ionic (bonds)	Allow small amount of/zero covalency Ignore just it is 'ionic'	**(1)**

Question Number	Answer	Additional Guidance	Mark
9(a)(ii)	An answer that includes • the magnesium ion is small and highly charged **(1)** • the iodide ion has a large ionic radius **(1)** • the iodide ion is **polarised** by the magnesium ion **(1)** • (so) the bonding in magnesium iodide has (partial) covalent character (which is why the lattice energy values are different) **(1)**	Allow magnesium ion has a high charge density Allow iodide ion has a much larger radius Ignore reference to atomic radius ALLOW description of polarisation such as distortion of the iodide electron cloud by the magnesium ion Do not award magnesium iodide **is** covalent Do not award 'MgI' Penalise once only reference to magnesium/iodine/iodide without 'ion' in marking points 1 to 3	**(4)**

Question Number	Answer	Additional Guidance	Mark
9(b)(i)	An answer that includes • species on lines **(1)** • state symbols **(1)** • energy changes / values **(1)** • arrows indicating direction **(1)**	<u>Example of Born-Haber cycle and calculation</u> Allow omission of electrons but if included then must be correct A and B can be drawn in either order or A then C followed by B Exemplar cycle:  Each different species error can be penalised so four different species errors scores (0)	**(4)**

Question Number	Answer	Additional Guidance	Mark
9(b)(ii)	• calculation of lattice energy	LE= −4105 (kJ mol^{-1})	**(1)**

Question Number	Answer	Additional Guidance	Mark
9(c)	• application of Hess's law **(1)** • evaluation of lattice energy **(1)**	<u>Example of calculation</u> LE = (−1577 + (2 × −336) – (−73)) = = −2176 kJ mol^{-1} Final answer without working scores (2) (+) 2176 kJ mol^{-1} scores (1) for TE on incorrect application of Hess's law −1840 kJ mol^{-1} scores (1) for use of single −336 instead of double	**(2)**

(Total Question 9 = 12 marks)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr>
<td>*10</td>
<td>This question assesses the student’s ability to show a coherent and logically structured answer with linkages and fully sustained reasoning.

Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.

The following table shows how the marks should be awarded for indicative content.
<table>
<tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr>
<tr><td>6</td><td>4</td></tr>
<tr><td>5-4</td><td>3</td></tr>
<tr><td>3-2</td><td>2</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>0</td><td>0</td></tr>
</table>

The following table shows how the marks should be awarded for structure and lines of reasoning
<table>
<tr><th></th><th>Number of marks awarded for structure of answer and sustained lines of reasoning</th></tr>
<tr><td>Answer shows a coherent logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr>
<tr><td>Answer is partially structured with some linkages and lines of reasoning</td><td>1</td></tr>
<tr><td>Answer has no linkages between points and is unstructured</td><td>0</td></tr>
</table>
</td>
<td>Guidance on how the mark scheme should be applied:
The mark for indicative content should be added to the mark for lines of reasoning. For example, a response with four indicative marking points that is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning).
If there were no linkages between the points, then the same indicative marking points would yield and overall score of 3 marks (3 marks for indicative content and zero marks for linkages).

Accept any six indicative content points</td>
<td>(6)</td>
</tr>
</table>

	Indicative content • ΔG needs to be negative for a reaction to be feasible • if ΔS_{system} and ΔH are both negative then a reaction is feasible if the magnitude of ΔH > (magnitude of) $T\Delta S_{system}$ • if ΔS_{system} and ΔH are both positive then a reaction is feasible if the magnitude of $T\Delta S_{system}$> (magnitude of) ΔH • if ΔS_{system} is positive and ΔH is negative then the reaction is (always) feasible • if ΔS_{system} is negative and ΔH is positive then the reaction is never feasible • even if it is feasible the reaction may not occur because of kinetic factors	More than one indicative marking point may be made within the same comment or explanation High activation energy/energy barrier/physical barrier e.g. oxide layer Ignore just reference to slow rate of reaction Ignore reference to non-standard conditions	

(Total Question 10 = 6 marks)

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