Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel International GCSE in Chemistry (4WCH2) Unit 1C

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link

Introduction

This is the first examination series for IGCSE Chemistry modular paper 2 (4WCH2/1C).

The content examined is the same as for the IGCSE Chemistry linear 4CH1 papers, but the total number of marks is 90. This question paper followed a broadly similar format to 4CH1 papers, with nine questions and 48 test items in total. There was a mix different types of question which included: several multiple-choice or multiple response questions; single mark questions mainly testing recall or application of knowledge; completion of diagrams to a high degree of accuracy and precision; a variety of routine and non-routine calculations; 2 or 3 mark questions requiring description or explanation of a chemical idea, process or practical procedure; and extended response questions of 4 or 5 marks, which provided candidates with the opportunity to interpret and communicate their understanding of a given scenario.

The following topics were covered:

- Question 1: group 1 (alkali metals); arrangement in the Periodic table; flame test colour; similarities in reactivity with water; knowledge of trends and prediction of properties; construct and interpret bar charts (1d, 6e, 6h)
- Question 2: ionic bonding; electrical conductivity; charges of ions; electrostatic attraction between ions and influence on melting point; predict products of electrolysis; write ionic half equations (5f, 5i)
- Question 3: covalent bonding; shared electrons and electrostatic attraction; giant covalent and simple molecular structures; similarities and differences in physical properties of covalent substances (e.g. melting point); physical test for pure water (5g, 6h)
- Question 4: rates of reaction; knowledge of the effect of changes in surface area of a solid and of the pressure of a gas; understanding of the effect of change in temperature on rate; draw and use slope of tangent to a curve; explanation of practical work for monitoring rate (7b)
- Question 5: synthetic polymers; calculation of reacting mass and relative formula mass; addition polymerisation; drawing repeat units of a polymer; understanding problems in polymer disposal and carbon dioxide as a product (1e, 8h, 6g)
- Question 6: alcohols, carboxylic acids and esters; details of the oxidation of ethanol by potassium dichromate (VI); details of the reaction between ethanoic acid and sodium carbonate; balanced chemical equation for the reaction; understanding practical work for the preparation of ethyl ethanoate (8e, 8f, 1e, 8g)
- Question 7: chemical test for oxygen; dot-and-cross diagram of oxygen; calculation using percentage by volume of oxygen in air; balanced chemical equation for formation of iron (III) oxide; charges of iron and oxide ions and formulae of these elements (6h, 5g, 6g, 5f)

- Question 8: reversible reaction of ammonium chloride; chemical equation for a reversible reaction; chemical tests for ammonium ions and chloride ions; identification of an unknown compound using the results from chemical tests; displacement reactions of the halogens (7c, 1e, 6h, 6f)
- Question 9: conditions for the manufacture of ethanol from ethene and steam; effect of a catalyst on a reaction profile diagram; effect of temperature on an equilibrium; calculation of relative formula mass, amount of substance, percentage yield and gas volume (8e, 7b, 7c, 1e)

Areas where candidates performed well were:

- recalling common characteristics and differences of group 1 metals – Q1
- prediction of group trends - Q1
- understanding and representing ionic and covalent bonding, and the effect of bonding on melting point – Q2, Q3 and Q7
- understanding the effect of common factors upon the rate of a reaction – Q4
- plotting and analysing graphs – Q1 and Q4
- calculating mass and gas volume – Q5 and Q9
- recalling tests and results for gases and ions – Q1, Q7 and Q8
- recalling conditions and reagents for organic reactions – Q6 and Q9
- recognising catalysts and understanding their effect – Q6 and Q9.

Areas where candidates did **not** perform as well were:

- suggesting reasons for practical processes – Q1, Q3 and Q4
- writing ionic half equations and chemical equations – Q2, Q6 and Q7
- knowledge of rules to predict products of electrolysis – Q2
- working out formulae and ions – Q2, Q7 and Q8
- correct and accurate use of chemical terminology – Q3
- comparison of two structures or conditions (e.g. different temperatures) – Q2, Q3 and Q4
- accurate practical observations (e.g. colour changes, solid disappearing) – Q6 and Q8
- use of percentage yield as part of a calculation – Q9
- extended line of reasoning in explanations (e.g. equilibrium) – Q3, Q4 and Q9.

Individual Questions

Question 1

This question was about group 1 metals and the prediction of properties for members in the group.

Q1(a)(i) and (ii)

Both parts were answered well. In part (i), a minority of candidates mistakenly identified francium as the element in period 6.

In part (ii), a minority of candidates selected lithium as the ion that gave a yellow flame test colour.

Q1(b)

Many candidates were able to score one or both marks on this question. Answers mainly responded to the command verb (“describe” an experiment) giving “addition to water” and a relevant observation. However, it was not uncommon for candidates to forget to mention addition to water. Some observations could be too vague, such as reference to “vigorous” or “fast reaction”. It was common to see candidates going beyond a description with detailed explanations of reactivity or trend in reactivity, referring to electronic configuration. Other candidates identified products or provided equations, which did not replace the observation.

Q1(c)(i) and (ii)

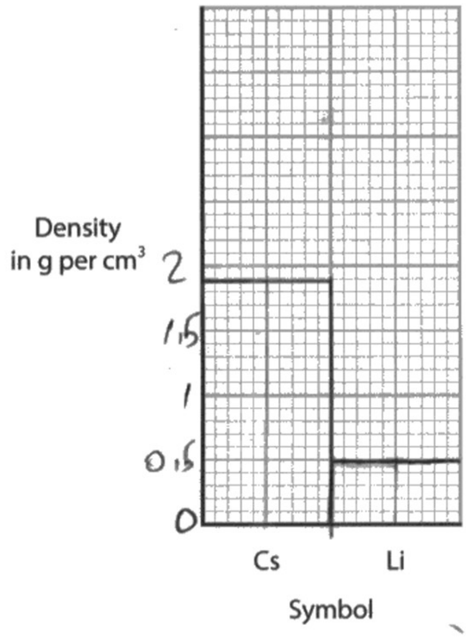
For part (i), the majority of candidates were able to provide a good bar chart for the densities of caesium and lithium. Candidates needed to make full use of the grid to give the largest bars possible, so a scale on the y axis where one small box was 0.05 allowed for this. However, a number of candidates only made use of half of the grid. Bars were generally well plotted, although caesium was incorrectly drawn on occasion when the scale was misread or the bars for the two elements were mixed up.

For part (ii), it was good to see that candidates recognised that potassium was the middle element and that it’s density should be somewhere between lithium and caesium. The majority of predictions were within the allowable range.

(i) Plot a bar chart to show the densities of caesium and lithium.

Include an appropriate scale for the y-axis.

(2)



(ii) Estimate a value for the density of potassium.

(1)

density = 1.2 g per cm³

Principal Examiner comment:

Part (i) scores 1 mark. The scale is too small, with 2 being the mid-point of the y axis so the bars occupy less than half of the available grid. The bars are plotted correctly however, so a mark is scored.

Part (ii) scores 1 mark. The estimated value for potassium is the mean of the densities of the other two elements and is a suitable prediction.

Question 2

This question was about ionic compounds, formulae of ions, the strength of bonding and electrolysis.

Q2(a)(i)

Many candidates were able to use the diagram and knowledge of ionic compounds to identify why NaCl could not conduct electricity. However, some indicated that this was due to a lack of delocalised electrons and did not score. Others gave poorly worded responses such as ions were not “free” rather than were not “free to move”.

Q2(a)(ii)

This question was answered reasonably well by candidates. Most candidates either recalled that the sulfide ion had a charge of -2 or worked this out from the formulae of MgS and the magnesium ion. Occasionally there was confusion with the sulfate ion or inferring that sulfide had a charge of -1, possibly taken from the NaCl diagram.

Q2(a)(iii)

This was one of the more challenging questions for candidates. When candidates did score on this question, it was normally the second marking point, not the first. The electrostatic force of attraction between ions being strong was well known, but the question required a comparison, so candidates needed to show understanding that for MgS this was "stronger" than for NaCl. It was relatively rare that candidates would point out that the charges of ions in MgS were greater than in NaCl, which diagrams in part (a) showed.

In magnesium sulfide, each ion has a higher charge than in sodium chloride. In magnesium sulfide, stronger ~~TA~~ electrostatic forces of attraction between positive and negative ions which need higher energy to overcome than in sodium chloride.

Principal Examiner comment:

This response scores both marks.

The difference in charge is clearly identified, followed by a good explanation of how the difference in the strength of electrostatic attraction affects the melting points.

Q2(b)(i)

Candidates generally scored at least one mark if not both marks on this question. Typically, the most common incorrect answers were "oxygen" at the positive electrode and "sodium" at the negative electrode. Occasionally, candidates would get chlorine and hydrogen round the wrong way. It is recommended that candidates are well prepared on the rules for predicting the products of electrolysis.

Q2(b)(ii)

Only the most able candidates tended to get the half equation correct for both marks. Where only one mark was scored, this tended to be because there was an incorrect charge on the hydrogen ion or no charge at all. Other errors observed were not showing hydrogen gas as diatomic, giving the wrong number of electrons or adding the electrons to the wrong side of the equation. Completely incorrect answers tended to be for half equations for the discharge of the chloride ion or some other oxidation process. Candidates often showed resilience in trying to answer this question, but few could actually write a coherent half equation.

Question 3

This question was about covalent bonding and the comparison of properties of diamond and ice.

Q3(a)

Candidates were generally able to identify that the diagram showed the structure of diamond.

Q3(b)

The majority of candidates were able to describe covalent bonding in detail, including the electrostatic attraction for the shared electrons between nuclei. Some candidates only achieved one mark because their answer was imprecise (no reference to "electrostatic" attraction) or technically inaccurate (reference to attraction to the nucleus or nuclei of an atom).

Q3(c)

Some candidates were able to identify a physical property that both ice and diamond shared. A common misunderstanding was to describe the similarities in structure in the diagrams. Some suggestions that related to physical property were too vague, such as shininess, or were not valid, such as solid or high melting / boiling points. A common answer that was imprecise was to indicate that both were poor conductors of electricity rather than they were both nonconductors.

Q3(d)

The question showed candidates scoring the full range of marks. A number of candidates were able to articulate fully why ice had a lower melting point than diamond to achieve all available marks. Many students missed out on standalone marks such as the identification of the type of structure – this was more common for ice than for diamond, possibly as this was less well known. Even the identification of structure type was not always clear or accurate and references to "giant covalent bonding" or "simple covalent" were common.

Responses that only scored few or no marks tended to be for inaccurate premises, such as comparing the strength of covalent bonds in both substances or assuming both had intermolecular forces. Some students missed out on full marks if there was no comparative between the two substances, which was more likely when ice and diamond were written about separately.

(d) Explain why ice has a much lower melting point than this type of carbon.

(5)

Ice has a simple molecular structure.
Weak intermolecular forces of attraction between molecules
which requires a low amount of heat energy to overcome.
For the carbon, it has a giant covalent structure.
Each carbon atom is bonded together with 4 other carbon
atoms. Strong covalent bonds which require a large amount
of heat energy to overcome.

Principal Examiner comment:

This response scores all 5 marks. The different structure types are clearly identified at the start of each paragraph. The candidate identifies weak intermolecular forces only in ice and makes their understanding clear that it is "between molecules". The candidate achieves M4 but could have described that there were many carbon atoms and therefore many covalent bonds that need to be broken. The comparison is only just met by reference to "low" and "large" amount of heat energy in each respective paragraph, and candidates should be encouraged to use comparatives such as "more" and "less" to ensure that they have met the question clearly.

Ice has fewer intermolecular forces so it is easier to
break them down. Thus the low boiling and melting
point.
Diamond has more Intermoleaular forces so more energy is needed.
Diamond has a higher electrostatic 'attraction between
e⁻ and ~~nuct~~ nuclei.
Diamond is a larger covelent structure so more surface
area

Principal Examiner comment:

This response scores 0 marks. The structure types are not identified or are poorly expressed ("larger covalent structure"). Intermolecular forces are not identified as weak and are quantified as fewer / more instead. It is indicated that these are responsible for the difference in melting point in both substances, as well as some implied comparison of covalent bond strength.

Q3(e)

Candidates were generally able to score on this question, with most achieving at least one mark. However, clearer statements were sometimes needed that ice would have a melting point of 0 ^{o}C (or boiling point of 100 ^{o}C) if it was pure. Some candidates did not score full marks as they neglected to say that the ice would need to be heated, and instead just that it should be “tested” or “the melting / boiling point measured”.

Question 4

This question was about rate of reaction and the effect of temperature.

Q4(a)(i) and (ii)

In the main, candidates were able to identify the particle diagrams that led to an increase and decrease in reaction rate in comparison to the original diagram.

Q4(b)(i)

The majority of candidates were able to identify temperature 2 as being 25 ^{o}C but were not able to give a full justification to support this. Most responses were able to identify a feature of the graph to support this judgement, such as being less steep or showing a lower rate of reaction – such statements should be more precise as to which part of the graph is being compared, however. A number of candidates only linked this to a specified temperature rather than indicate that the temperature had to be lower.

Q4(b)(ii) and (iii)

In part (ii), the majority of candidates were able to show good judgement in where and how an appropriate tangent was drawn on the graph of temperature 1. A few tangents were observed that clearly did not make contact with the curve or were drawn at the wrong angle. Centres are advised to encourage candidates to draw tangents as far as possible to meet x and y axes, as the accuracy of their calculation in part (iii) will improve.

In part (iii), most candidates were able to determine a value close to 1.3 cm^3 per second, although again depending on accuracy of the tangent or of its reading, the calculated answer could fall outside of the permitted 1.2-1.4 range. Although some working was typically given, it was not always clear that the tangent had in fact been used. Values used could be verified often, but where it could not, marks were not awarded. Some excellent evidence seen were candidates showing the x and y steps on the graph or giving co-ordinates that were being used. Some candidates unnecessarily provided units of cm^3 with their rate which meant that M2 was not met.

Q4(b)(iv)

Not all candidates were able to attempt this question, as some lateral thinking was required. A number of candidates were able to deduce a valid value for the increased rate, but were unable to articulate exactly how they had determined this. Whilst they were able to identify that there was a difference of 30 ^oC, candidates often struggle to realise that the rate doubled 3 times (i.e. 2^3). However, there was also some excellent reasoning also in evidence by some candidates, with the change in temperature analysed as bringing about a threefold change in rate. Weaker attempts tended to try to calculate rate from mass lost and time or were exceptionally complicated and difficult to follow.

Q4(b)(v)

A range of marks were awarded to responses for this question, but the award of 4 marks was rare. Generally, candidates were able to discuss the effect of temperature on collision frequency but could be inconsistent when describing this for both a higher and a lower temperature. An increase or decrease in energy was also often noted but could be unspecified and needed to reference the particles. Candidates had some difficulty explaining convincingly how the temperature being too high or too low would affect the practicalities of performing the investigation, which was the focus of the question, so responses worth 3 or more marks were only occasionally seen.

At temperature 65°C, rate will be too high to measure, gas volume to measure would be too large in small time as particles gained kinetic energy, more particles have energy greater than activation energy, more frequent successful collisions. High temperature, hard to maintain temperature
At temperature -5°C, very hard to obtain temperature, rate of gas produced would be too slow to measure, small volume of gas produced over long time. Particles would have little kinetic energy, less particles have energy greater than activation energy, less frequent successful collisions.

Principal Examiner comment:

This response scores all 4 marks. The candidate provides a consistently worded discussion which covers the theoretical side i.e. frequency of collisions and amounts of particles with the activation energy at both 65 ^oC and at -5 ^oC. The consequences of temperatures that are too high or too low upon the rate of reaction and in terms of the observer’s ability take meaningful measurements are clearly explained.

Question 5

This question was about reacting masses, addition polymerisation and the problems of disposing of addition polymers.

Q5(a)

Most candidates were able to solve the calculation, although not all remembered to convert their answer into standard form. It was rare for a candidate to not score any marks, as the calculation of relative formula masses for propane and propene typically yielded a mark.

Q5(b)(i)

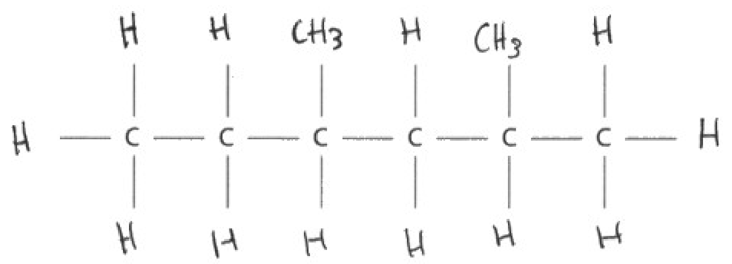
Most candidates were able to identify the type of polymerisation. Common incorrect answers included “condensation” and “synthetic”, whilst other candidates misinterpreted the question and tried to name the polymer.

Q5(b)(ii)

Some candidates were able to complete the diagram to show three repeat units of poly(propene). Common errors tended to be to complete the diagram to give an alkane or miss out all or some of the CH_3 groups.

(ii) Complete the diagram to show **three** repeat units of the polymer.

(2)



Principal Examiner comment:

This response scores 0 marks. Only two of the expected three CH_3 groups have been included and the left and right ends of the molecule have been completed with H atoms.

Q5(b)(iii) and (iv)

Most candidates were able to identify an issue associated with disposal of poly(propene) by burning or burial, but answers were often undermined by poor expression or being unable to expand upon the point being made. For example, candidates could identify that carbon dioxide was a greenhouse gas or caused an increase in global temperature, but not how this in itself would lead to a problem.

Question 6

This question was about the reactions of ethanol and ethanoic acid, and the practical considerations in making an ester.

Q6(a)(i) and (ii)

A large proportion of candidates were able to recall the name of the other reagent and the colour change that takes place when ethanol reacts with potassium dichromate solution.

For part (i), common incorrect answers were substances involved in the manufacture of ethanol, such as ethene, water or yeast. Occasionally, the reagent was identified as a different acid to sulfuric acid or that it was a catalyst.

For part (ii), responses either tended to score full marks or none at all. A wide range of different colour changes were seen, probably recalling colours associated with ion tests, although some reference to "colourless" as one of these was common.

Q6(b)(i) and (ii)

In part (i), only the best candidates were able to score both marks. Candidates found giving the expected formula for sodium ethanoate challenging, and even when the formula given was acceptable, this also needed to be balanced correctly. The mark for realising and giving the formulae for carbon dioxide and water was more accessible for the majority but could be lost if these were attempted to be balanced.

(b) Ethanoic acid reacts with solid sodium carbonate.

(i) Complete the chemical equation for this reaction.

(2)

$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa_2 + H_2O + CO_2$

Principal Examiner comment:

This response scores 1 mark. The formulae for water and carbon dioxide are correctly shown, but there is an error in the formula of sodium ethanoate.

In part (ii), most candidates were able to score at least one mark for an observation associated with this reaction, which was typically "fizzing" or "effervescence". Candidates would often not realise that the sodium carbonate was the basis of the other observation. Instead, many offered colour changes or precipitates. Candidates that did indicate that the solid was disappearing often lost the mark because they referred to it as sodium or a metal.

Q6(c)(i), (ii) and (ii)

In part (i), almost all candidates were able to identify sulfuric acid as acting as a catalyst in the reaction.

In part (ii), most candidates identified ethanol as being flammable as being the reason to use a hot water bath. Common answers that were not creditworthy were references to safety or heat distribution.

In part (iii), most candidates were able to describe a smell associated with esters for a mark. Common incorrect observations that were seen included bubbling and white precipitate forming.

Question 7

This question was about oxygen, how to test for it, the bonding in the molecule, use of percentage volume in a calculation and the reaction with iron.

Q7(a)

Most candidates were able to give the test and result for the identification of oxygen. Where a candidate did not score, it was normally for imprecise answers such as the use of a “lit” or “burnt” splint. It was rare to see a response which described the test for a different gas in error.

Q7(b)

Most candidates were able to draw a correct dot-and-cross diagram for the oxygen molecule, but it was not uncommon to see an incorrect number of electrons being shared or on the outer shell. The most commonly observed fully incorrect answer was an attempt at drawing the electronic structure for an oxygen atom.

Q7(c)(i)

This question discriminated well between candidates. Only the best were able to give the expected answer to this calculation. Some careful thinking was required in order to calculate the volume of oxygen in the whole apparatus and then to determine the reading on the gas syringe.

Q7(c)(ii)

This question also discriminated between candidates. Candidates were provided with the formula of iron(III) oxide and should have been familiar with the formulae of the reactants, but there were a variety of errors, such as atoms or ions of oxygen and molecules or ions of iron. Even amongst those that correctly gave the symbols and formulae, a number were unable to balance the equation that they had created.

Q7(c)(iii)

This question was intended for the very best candidates and the award of full marks or even 1 mark was rare. Candidates should have been able to recall that the common ions for iron are Fe^{2+} and Fe^{3+}, but in addition some careful thinking was required in order to

determine that there was a ratio of 1:2 of these ions in Fe_3O_4 and to identify that neither of the other two ions were present.

Question 8

This question was about the reversible reaction of ammonium chloride, testing for the ions in this compound and in an unknown compound, and halogen displacement.

Q8(a)(i) and (ii)

Both questions met with a mixed response by candidates. In part (i), candidates suggested cooling the mixture, but many did not fully appreciate the information in the context and "heating" was a commonly offered answer.

In part (ii), many responses showed the symbol for a reversible arrow, but the formulae of the compounds were not always correct so this mark was often not secured. State symbols were dependent upon the formulae being correct or recognisable. The most common error was the use of the aqueous state symbol.

Q8(b)(i)

Most candidates were able to give one or both confirmatory results to tests for the ions in ammonium chloride. Common errors tended to be not to give the full colour change of the litmus paper and / or to give the wrong colour of the silver halide precipitate.

Q8(b)(ii)

This question was intended for the very best candidates and the number of correct responses was consistent with this. A range of skills was required. Candidates needed to identify which ions gave the results provided in the table, recall the charges of the ions and construct the correct formula. The non-metal ion was often correctly identified as iodide, but a wide range of different metal ions were given.

Q8(b)(iii)

The question met with mixed response from candidates and a range of marks were awarded. Generally, candidates recognised that this question was about halogen displacement and correctly stated that bromine could not displace chlorine from ammonium chloride solution. However, the observation was not always expressed clearly enough as no "colour" change. The observation and test result for the displacement of the iodide ion from compound Z was better answered, although some of the colour changes proposed were too far removed from the brown colour of iodine in solution. Some candidates were imprecise of their use of halogen and halide when describing the reaction or mixing up the halogens. For example, indicating that chlorine was more reactive than bromine and so bromine could not be displaced from the compound.

(iii) The student carried out a further test on each compound.

This is the student's method.

- dissolve the compound in water
- add a few drops of bromine water
- observe any colour change

Cl > Br > I

Explain the observations that the student would make for ammonium chloride and compound Z during this test. displacement

(4)

ammonium chloride

No change: bromine cannot displace chlorine in ammonium chloride, as Bromine is less reactive than chlorine (whilst chlorine is more reactive than bromine)

compound Z CaI_2

Colour changes from orange to black/purple: ~~Iodine~~ Bromine displaced Iodine in Compound Z (calcium iodide), as Bromine is more reactive than iodine (and iodine is less reactive than bromine)

Principal Examiner comment:

This response scores 2 marks.

From the annotations it would appear that the candidate has recognised that this question is about the relative reactivity of the halogens, and this is used correctly for ammonium chloride and for calcium iodide. However, the observations are not specific enough ("no change" rather than no colour change or colour remains the same for the chloride, and "black/purple" instead of brown for reaction with iodide).

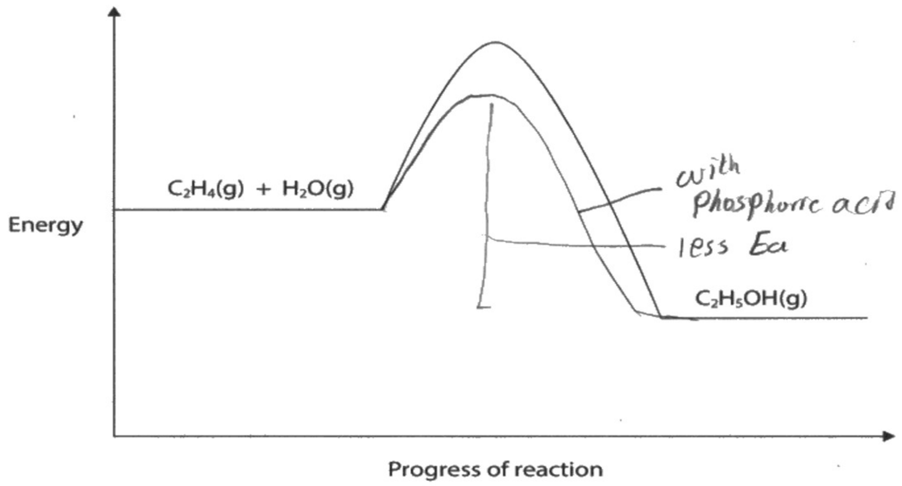
Question 9

This question was about the reaction of ethene with steam, its conditions, reaction profile diagram, equilibrium and a gas volume calculation.

Q9(a)
The majority of candidates were able to link the correct values with pressure and temperature conditions used in the manufacture of ethanol.

Q9(b)(i)
Most candidates were able to state that the addition of the phosphoric acid catalyst would decrease the activation energy and very often that this was due to the provision of an alternative reaction pathway. Candidates struggled more with being able to describe the effect on the reaction profile diagram however. Vague statements such as the curve being less steep were observed, or incorrect statements, such as the energy level of the reactants or products changing. Drawings and annotations on the reaction profile diagram did not tend to clarify or support responses, as this still required a description of the change.

(b) The reaction profile diagram for the uncatalysed reaction is shown.



(i) Explain how the reaction profile diagram would change when phosphoric acid is added to the reaction mixture.

(2)

it will be with lower activation energy as Phosphoric acid acts as a catalyst that provides alternative pathway for the reaction with lower activation energy

Principal Examiner comment:
This response scores 1 mark. The second marking point is met with a suitable description of the role of the catalyst. There is no description of how the reaction profile diagram is affected. The drawing and annotation on the diagram has some error but could have been referred to in order to provide the required description.

Q9(b)(ii)

Full marks for this question was achieved by only the best candidates. A number of candidates were able to deduce that the reaction to produce ethanol was exothermic, either from the context or the reaction profile diagram. Better responses explained how the reaction profile could be interpreted. Although responses relied upon candidates appreciating that the reaction must be in dynamic equilibrium, it was rarely stated so the first marking point was not often awarded. The final mark required very careful wording – no equation was supplied so candidates would need to refer to reverse reaction or the reaction moving to produce the reactants in response to the increase in temperature.

Q9(c)

This final question was generally well answered by candidates, with 3 or 4 marks out 5 being very common. The relative molecular mass of ethanol, the determination of moles and the calculation of the gas volume was frequently accomplished correctly. The percentage yield was the aspect which candidates tended to have trouble in understanding how to use within their calculation.

Summary

Based upon performance on this paper, it is recommended that candidates:

- use chemical terminology more often and with greater accuracy, such as when explaining the effect of structure on physical properties
- use comparative words or links within explanations where a question indicates that two substances or conditions are being considered
- develop logical explanations for extended response answers
- understand or provide the reasons for steps in practical work, particularly investigations specified in the specification
- know exact observations for standard tests and reactions, and are able to describe these fully
- practice non-routine calculations which involve additional steps, such as percentage yield or remaining volumes
- know the rules for predicting the products of the electrolysis of a given ionic compound, and write the relevant ionic half equations
- be able to recall ion charges, use these to write formulae or deduce them from given formulae
- be able to combine information from different sources to propose solutions to problems, such as chemical tests to propose a compound, and the combined themes of equilibrium, rate and energy change in a reaction.

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