Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

October 2021

Pearson Edexcel International Advanced Subsidiary In Chemistry (WCH13)
Paper 01: Practical Skills in Chemistry I

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Introduction

Many students were well prepared for this examination and were able to demonstrate that they had a sound knowledge of the practical aspects of the specification. Nearly all papers were answered through to the last question indicating there was no difficulty with completing the paper in the time allowed.

Question 1(a)

The vast majority of students were able to state a flame test would be required, though some stated the colour incorrectly. The most common incorrect answer was brick red, confusing strontium with calcium. Other indications of a red flame such as scarlet and crimson were allowed. Incorrect answers indicating misconceptions included using hydroxide to form a white precipitate or using electrolysis as a way of identifying the cation.

Question 1(b)

The fact that the first test here was negative, and there was no visible change, confused some candidates but most answered correctly for the silver nitrate result. “White precipitate” was often seen for both answers. A few candidates gave more detail than was required and lost their mark for incorrect formulae for silver chloride. Some candidates also added to the question, commenting on the solubility of the precipitate. Solubility in ammonia was ignored but comments such as “soluble in excess” negated the mark for M2.

Question 1(c)

The mark scheme allowed for a variety of answers based on the particularly high temperature required. The most common reason for not achieving this mark was an insufficient comment along the lines of “high temperature” without referencing equipment or the extreme nature of the condition. References to safety were not allowed. Some candidates commented on the production of toxic sulfur dioxide, and these did not gain credit. References to energy and heat were not allowed in place of temperature.

Question 1(d)(i)

This question was poorly answered. Many candidates failed to reference either the heating or the weighing required so could not score. A frequent incorrect answer was to increase the temperature beyond 570°C, the next most popular incorrect answer was calculating the moles/mass of product expected. Some candidates just described what happened when strontium nitrate decomposed rather than describing how they could tell when the reaction would be complete.

Question 1(d)(ii)

The vast majority of candidates scored here.

Question 1(d)(iii)

A great variety of answers were seen here, though most candidates knew the correct test. A common reason for not gaining the mark was the implication that the splint was already alight at the start of the test, or that the splint was "burnt" but not necessarily still glowing. Some candidates also confused this test with the hydrogen test, stating there would be a "pop".

Question 1(d)(iv)

A lot of responses of "effervescence" were seen here. This answer alone did not score but was ignored when seen with a correct response. The majority of candidates knew that strontium hydroxide would be formed, though some assumed that hydrogen would also be a product, and this negated the second mark. A proportion of candidates suggested a white precipitate would be formed rather than the original solid residue dissolving. The formula SrOH was not awarded for M2.

Question 2(a)

Most candidates achieved two marks for this question. A frequent reason for losing marks, when the tests were known, was to omit the names of the groups – often only giving the bonds present. The mark scheme allowed a variety of tests, but most candidates opted for bromine water and phosphorous(V) chloride. Another common error was failing to acidify either potassium manganate(VII) for the alkene test, or potassium dichromate(VI) for the alcohol test.

Question 2(b)

Though some candidates chose to redraw the distillation apparatus, a diverse collection of separating funnels were seen. It was expected that the separating funnel would be able to be stoppered, whether or not a stopper was shown or labelled, therefore wide necked funnels were not allowed (or funnels with no opening in the top at all). The marks were awarded independently, however, so any funnel labelled as a separating funnel could gain M1. Some candidates labelled taps as stoppers, and this was penalised against M2. The third mark for the layers in the correct orientation was generally well answered.

Question 2(c)

Many incorrect drying agents were seen for M1, and candidates frequently gave a passive method of “wait for a long time” that did not score M2. The third mark was the most frequently awarded with many candidates opting to filter off the drying agent, though some seemed to think geraniol would be solid crystals by the end and drying between filter papers negated this mark. In general, answers to this question were rather muddled, with many candidates heating the geraniol to dry it (this was penalised against M2). Only the best candidates scored all three marks here.

Question 2(d)(i)

Most candidates scored 1 mark here with the exclamation mark symbol regularly being mislabelled as “health hazard” or “toxic”. Caution was not a sufficient label for this symbol, though “hazardous” was accepted. A few candidates confused the flammable sign with oxidising.

Question 2(d)(ii)

The vast majority of candidates gave the correct answer here. Types of gloves were ignored. Some answers related to using a fume hood which was not an accepted answer.

Question 2(e)

This question was poorly answered with many candidates appearing to guess random colours rather than applying their knowledge of burning large organic (alkene) molecules. The answers blue and colourless were regularly seen (probably due to the presence of an alcohol group) and many candidates also commented on the size and luminosity of the flame.

Question 2(f)(i)

Many candidates could recall the catalyst required for this reaction, though the idea of a “condition” confused some. On this occasion the temperature and pressure conditions were ignored. A frequent incorrect answer was sulfuric or phosphoric acid.

Question 2(f)(ii)

Responses to this question were varied. Some candidates only removed one double bond, leaving the other, despite the excess hydrogen. Frequently, the alcohol group was also (incorrectly) removed and occasionally the methyl groups were rearranged or added. Candidates need to practise applying reaction conditions to different molecules. However, very few candidates drew displayed formulae so most had understood the question.

Question 3(a)

Many candidates only achieved two marks for plotting the graph, as they did not make good use of the space to allow the data to be clearly presented. Axes should be used to allow the data points to occupy more than half of the grid. A few candidates inverted their axes also losing M1. The y-axis does not need to start at 0°C as some candidates assumed. Some candidates also failed to label their axes with units, but the majority could plot the points accurately. Candidates should be encouraged to use crosses to mark points rather than dots so that their plotting can still be clearly seen when a best fit line is added.

Question 3(b)

Candidates could still access both marks for 3(b) if they did not gain full marks on 3(a). However, both marks were rarely awarded. Many failed to extrapolate both lines correctly and more did not read the temperature change at 2.5 minutes. The most common incorrect answer was 16.6, the difference between the initial and the highest temperature values. A significant proportion of candidates showed no working on their graph, despite the instruction to do this.

Question 3(c)

The majority of candidates could state that the difference would be due to heat loss. Wrong answers covered a range of possibilities such as non-standard conditions, transfer losses, experimental errors and incomplete reaction.

Question 3(d)(i)

This question was well generally answered, with the majority calculating the correct answer. Of those who did not score the mark, most candidates had the incorrect sign on the correct value.

Question 3(d)(ii)

This question was poorly answered with less than half of candidates gaining the mark. Many candidates gave vague answers about “not being able to measure enthalpy change”. Most of the credit awarded was for the generic idea that it’s hard to measure the temperature change in a solid. Some candidates attempted to address the problem caused by the solubility of the salt but did not manage to link it to the notion of incomplete hydration. Candidates need to practise expressing complex ideas in concise sentences.

Question 4(a)(i)

The most commonly awarded mark here was M1. Many candidates also achieved M3 but M2 was often not awarded as candidates regularly gave their response to 3SF instead of 1 or 2SF. Some candidates did not understand the information in the question about the rate being proportional to 1/t. These candidates performed more complex calculations involving gradient and scored zero. Some answers were missing units completely, so could not score M3, or included °C in their answer.

Question 4(a)(ii)

The mark was rarely awarded, most candidates did not use the data from the previous graph to inform their sketch and drew a logistic curve rather than an exponential curve, though the vast majority showed a rate increase with temperature. Linear graphs were not credited.

Question 4(b)

Most candidates could identify the anomaly for M1, but the majority then went on to say that this meant that the experiment needed to be repeated. Very few recognized that as a pattern could be seen from the data there was no need to repeat the experiment – or even the anomalous point.

Question 4(c)

This question was poorly answered. Many candidates did not use the graph to find the current time at 22°C so did not realise the rate needed to decrease rather than increase. This led to many incorrect answers about increasing concentrations and adding catalysts. Responses stating that the opaque solution should be decreased in concentration were not allowed as this would lead to the cross being seen earlier in this particular experiment. Other common mistakes were linked to not understanding what the question was asking, leading to regularly seen responses such as changing the time interval or changing the temperature.

Question 5(a)

Very few incorrect responses for this question were seen.

Question 5(b)(i)

Most candidates gained credit here though some lost the mark for words to the effect that concordant results had to be within 0.5cm^3 of each other. A variety of spellings were seen but all were accepted. Vague answers such as the answer being too high, or an anomaly were not sufficient for the mark.

Question 5(b)(ii)

The majority of candidates did well on this question. M1 was usually awarded; very few candidates failed to correctly calculate the mean. A substantial number used $c_1v_1 = c_2v_2$ as a method but it was not clear if all candidates were aware that this method only worked as the stoichiometry was 1:1. The most frequent error that led to less than full marks being attained was a confusion over which solution was in the burette (or the pipette). The resulting answer, 0.587 mol dm^{-3}, was awarded three marks.

Question 5(c)

Most candidates knew how to calculate the uncertainty, though some failed to consider the readings at both the start and end of the titration. The common answer of 0.234% did not score the mark.

Question 5(d)

Answers to this question were more varied than expected. Candidates needed to infer from the question the direction of the colour change. Where candidates had the correct colours in the wrong order one mark was awarded. Red, purple or clear are not accepted colours for the phenolphthalein end point change.

Summary

In order to improve their performance, students should:

- read the question carefully and make sure that they are answering the question that has been asked
- write formulae and numbers carefully, checking their legibility
- practise applying reaction conditions to different molecules
- ensure the axes allow the data to fill the whole graph paper
- use crosses to mark points rather than dots when plotting graphs
- show all working for calculations and give final answers to an appropriate number of significant figures
- consider suitable precautions when working with hazardous substances
- make sure they understand the difference between reagents and conditions, including when catalysts are involved
- practise calculating units for rate experiments
- practise % uncertainty calculations for different experiments
- reread questions and answers, where time permits, to avoid careless mistakes.

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https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html