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Examiners' Report October 2025

Pearson Edexcel International Advanced Level in Chemistry
WCH14/01

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Introduction

This paper proved challenging for many learners with some questions left blank. Some learners were well prepared and could apply their knowledge and understanding in unfamiliar contexts.

Section A – Multiple Choice Questions 1 to 8

The mean for this section was 0.56.

Question 06(b) on the prediction of the chiral properties of nucleophilic subsitution products of a halogenoalkane given a combination of reaction mechanisms was found difficult by most learners. Questions 01 and 02 on reaction kinetics and Question 05 on pH values of nitric acid were answered correctly most often.

Section B

Question 09

This question was a familiar calculation and many learners found it a comfortable start to the paper. Over a fifth scored full marks but it was disappointing when marks were lost by failing to include units or justifying the answer as instructed. Learners who calculated a minimum temperature of room temperature or below should have realised that they had made a mistake as the question mentions that heating is required.

The most common errors were:

(a)(i) forgetting to multiply the standard entropy value of water by six

(a)(ii) relating the sign of the entropy change of the system to the positive enthalpy change of the reaction given in (b) e.g. it is as expected since the reaction is endothermic

(b) failing to convery the value of the enthalpy change to J mol^{-1} and quoting incorrect units

(c) relating the feasibility to the entropy change of just the system or the surroundings

(d) using incorrect expressions, including the Gibbs free energy equation. Applying $\Delta G= \Delta G - T \Delta S$ correctly was awarded full credit. It should also be noted that truncation of 474.7K to 474K was not penalised as this is more logical than the correctly rounded answer of 475.

Question 10

(a) The calculation was familiar and many learners correctly found the pH of ethanoic acid, even though they did always not supply the intermediate steps in the correct places. The most common error was failing to include water in the equation in (i), despite the dissolution in water being mentioned in the question.

(b) Learners found this part more difficult. Explanations were rarely seen with many responses merely restating the data given. Many learners compared the strength of the two acids e.g." HCl is stronger than ethanoic acid" without making it clear that one is strong and the other is weak. In some responses where it was clear that the partial dissociation of ethanoic acid was known, there was no appreciation that the additional water in the diluted solution would cause a change in the position of equilibrium and this reduce the effect of the decrease in acid concentration.

(c) Some responses suggested that citrate ions would neutralise citric acid and failed to score. The two most common scoring points seen were a reference to the formation of a buffer solution or the prevention of deterioration of the marmalade. It was unfortunate that in some cases a description of the action of a buffer was not included.

Question 11

The first part of this question was well answered. Unfortunately, in many cases few marks were scored in the remaining parts.

(b)(i) Many learners stated that reason for the low concentration of iodine was so that it would be used up i.e. a limiting reagent. Few stated clearly that, in a kinetic investigation, only one reagent concentration should change appreciably, with others being in such an excess that their change in concentration during the reaction is very small.

(bii) This question referred to the results of the procedure but many responses linked the order of the reaction with respect to iodine to its absence from the rate equation.

(b)(iii) The ionic equation was not well known, despite this being a named reaction in Topic 8.

(b)(iv)Less than 20% of the responses were correct with many incorrect reasons e.g. sodium hydroxide is a weak base or even acidic seen.

(c) Fully correct answers were seen in only 10% of responses. Many learners misinterpreted the question and compared the reactivities of the hydrogen ion with the chloride ion or changed the hydrochloric acid concentration.

(d) Very few learners were able to offer any logical explanations or suggestions linking the suggested mechanisms to the given rate equation.

Question 12

(a) The naming of 1-hydroxy-4-methylpentan-2-one was unexpectedly difficult. Many responses showed that learners had recognised that the molecule had an alcohol and a carbonyl group but then decided that **Q** was a carboxylic acid.

(b) Many learners identified that both compounds have the same number of carbon environments but there seemed to be considerable confusion with other spectroscopic techniques e.g.proton NMR. There were also vague references to similar spectra or peaks with little additional detail.

(c)This was correctly answered by over 30% of learners. It was surprising to see that the labelling of carbons 1 and 3 was frequently ignored in the peak area for compound **P**. In data for compound **Q**, doublet was frequently given for the CH_2 adjacent to the OH group and triplet was given as the splitting pattern for the OH group itself, forgetting that the proton in the OH group is not affected by spin-spin coupling.

Question 13

(a) This extended response question was low scoring with a mean of 1.5.

Many learners ascribed the result of the first reaction given, the production of bubbles of gas with the addition of sodium hydrogen carbonate solution, to the presence of an alcohol group rather than a carboxylic acid group.

There was also confusion of the iodoform test with that of a test for a halogen group.

The esterification reactions in the production of **W** and **X** were thought to be dehydration reactions with the production of cyclic alkenes.

Responses that failed to justify the selection of functional groups with no reference to any of the tests were seen.

(b) It was unsuprising that the level of confusion seen in responses to (a) led to a failure to deduce structures in (b). Some learners attempted suggestions but failed to include two functional groups in each structure.

Section C –Question 14

(a)(i) This introductory part of Q14 revealed some common misconceptions.

- concentrations of reactants and products are equal (rather than constant).
- reaction rates are constant (rather than equal)

Some learners described the conditions required e.g.a closed system, constant temperature rather than the meaning of 'dynamic equluilibrium'. Statements involving Le Chatelier's principle were also seen.

(ii) Many learners understood the effect of high pressure on the position of equilibrium and scored the first two marks of this part but then thought that a change to a lower pressure would result in the shift in the equilibrium to the left.

(iii) Many learners understood that a ctalyst does not affect the value of K_c but failed to score a mark the mark for the explanation by neglecting to state that the effect on the rates of the forward and reverse reactions are equal.

(b) The evaluation of K_p was correct in many responses, but it was frustrating to see a correct answer which was not compared to the equilibrium value given, thus losing a mark. Common errors seen were:

- using the initial amounts of reactant moles and the amount of product moles
- failing to use the value given for the total pressure to calculate the partial pressures

(c)(i) Responses showed that the effect of temperature change on the position of equilibrium was understood. The most common errors were to only consider the partial pressures of the reactant or the products. Some learners thought that the partial pressures of both reactants and products would increase.

(ii) The first mark was most often scored. Many learners failed to appreciate that the **change** in entropy values as the temperature increased was required and just gave the expected entropy change of the reaction.

(d) The expression for K_c was often correct, although a significant minority included terms for the solid reactant and product. K_c was accurately evaluated by the majority of learners but the absence of or incorrectly stated units lost marks in some cases.

Summary

To improve their performance, learners should:

- practice writing ionic equations, balancing both species and charges and including state symbols
- note carefully the requirements stated in the questions e.g. justification, significant figures
- check the number of marks available for each question so that points made in the response match
- leave time at the end of the paper to check that numerical answers are reasonable and quoted to the number of significant figures