Pearson

Examiners' Report
Principal Examiner Feedback

January 2018

Pearson Edexcel International Advanced Subsidiary Level

Chemistry (WCH02)

Unit 2: Application of Core Principles of Chemistry

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Introduction

The paper was similar in difficulty to last year's January paper. Most learners attempted all the questions. There were some very well prepared learners where their centres deserve commendation for the excellence of their teaching.

There were familiar issues: failure to read the question with sufficient care; incorrect use of chemical terms like atom, molecule or functional group; lack of knowledge of practical procedures.

Many learners had insufficient knowledge to be able to relate it to unfamiliar situations.

Multiple choice questions

The easiest questions on the paper, easiest question first were:

5 Flame colours

17 Reactions of alcohols

14 oxidation products of alcohols

The hardest questions on the paper, hardest question first were:

8 Preparation of hydrogen iodide

19 Equilibrium

13 Elimination products of a halogenoalkane

Question 20

(a)(i) The two most common marks awarded were for shape and the bond angle. No attempt to show a three dimensional shape was penalised unless a correct name, pyramidal, trigonal pyramidal or tetrahedral appeared somewhere in the answer. But beware of giving additional information the shape mark could be lost for saying trigonal bipyrimadal. It was essential to give the minimum repulsion or maximum separation of **electron** pairs for the third mark and this was often not given. A common final error was to just write 'lone pairs repel more' which was deemed insufficient for the fourth mark.

(ii) Many worked out the correct equation, but although the majority knew the formula of the organic product there were often incorrect compounds of phosphorus or unbalanced equations.

(iii) The formula for 1-iodo-2-methylpropane was the most frequent missing isomer. Other common mistakes here were to give the skeletal formula for a three-carbon iodoalkane or to give displayed formulae rather than skeletal formulae.

(b)(i) Almost no learner appreciated that the attacking agent here was the water molecule, yet surely this reaction is well documented in text books and on the web. Most knew the type and mechanism but electrophilic and free radical were sometimes given for the mechanism, and addition for the reaction type was not uncommon.

(ii) There were many possible errors here. The incorrect equation or full equation was often attempted. State symbols were omitted or incorrect for AgI or for all three species. The equation for the chloride or bromide was attempted.

(c) There were a variety of incorrect organic products, including butane, butane nitrile, and butanamide. The usual by-product was given as HI. This is forgetting the test for a hydrogen halide of adding ammonia to form ammonium chloride.

Question 21

(a) This was generally answered well, though if the mark scheme insisted on 'no change in the number of **gaseous** molecules' for the justification of the effect of increased pressure the commonest score here would have been two marks, rather than three.

(b)(i) The typical Grade E learner often lost a mark here. The most common error was no or incorrect signs.

(ii) The most common error was to omit 'more molecules have energy greater than the activation energy' which was essential to gain the mark.

(iii) Again it was essential to mention 'activation energy' either by saying a catalyst provides a route with a lower activation energy' or the activation energy moves to the left on the horizontal axis.

(c)(i) There were some excellent answers scoring all three marks, but many veered off the track and gave irrelevant information about the interaction between nitrogen monoxide and ozone.

(ii) Some knew these equations well, but others struggled. Common incorrect species involved included oxygen atoms and NO_3·. For those who were on the right track the dot on NO_2 was frequently left out. Most knew the overall equation, though a few reversed it.

Question 22

(a)(i) The few who scored both marks were probably those who had learned the equation, or at least the reacting ratio. The rest struggled with all manner of incorrect balancing numbers.

(ii) Rather unusually, less than 50% of learners know this. Redox, reduction and oxidation were all common errors.

(b) A common incorrect response was 'mixture turns darker brown'. 'Grey soli' appeared frequently, as did 'purple vapour'. It left examiners wondering if these learners had ever done much practical work involving iodine.

(c) Learners appear not to realise that crystallisation is linked to the concept of solubility. The mention of melting point, boiling point, or ionic character was frequent.

(d)(i) For the few who knew that starch was the correct indicator, and remembered the techniques involved when carrying out this titration, two marks were commonly scored. However, many indicators such as phenolphthalein, methyl orange, or potassium manganate(VII). The timing of the indicator addition was often incorrect, 'at the end of', or 'before starting', the titration were common errors.

(d)(ii) A few gave the inverse colour change.

(iii) A few omitted to divide by 1000.

(iv) Multiplication by six, instead of division was very common.

(v) A surprising number of learners were unable to calculate the molar mass of KIO_3 correctly. Values exceeding 600 were common. TEs were allowed for working out the mass from the number of moles, if thus was done. Some learners did not scale up by 10 but those who did realised that a multiplication was involved.

(vi) Many seemed unaware of how to calculate percentage purity, often revering the fraction to allow for their erroneous answer to part (v). The instruction to give an answer to two significant figures was ignored many students.
(vii) 'Transfer losses' was the most common incorrect response.

Question 23

(a)(i) Most knew the three intermolecular forces involved, but the word 'permanent' was often missing from permanent dipole-dipole forces. There were some very poor descriptions of the atoms/groups involved, so that 'between OH molecules', or 'between carbon molecules', were frequently seen.

(ii) The first mark was often missed because the answer was insufficient mentioning only hydrogen bonds without the functional groups involved. Many failed to link the high solubility with the relatively large number of hydroxy groups in a glucose molecule.

(b) It was surprising to see incorrect products and incorrect balancing so frequently in this equation.

(c) Grade A learners gave two of the points in the mark scheme, showing their knowledge of some of the problems associated with high alcohol content drinks. An interesting informed response was that less fermentation produces less carbon dioxide and less global warming.

(d)(i) Many learners were unable to apply their knowledge of proportions to this calculation. 57.15 Was the frequent incorrect answer.

(ii) The first step of the calculation converting volume and density to mass was impossible for most learners. The division by the molar mass of ethanol was the common 'rescue' mark. Few could scale up the number of moles to a concentration.

(e) Learners seemed unable to apply their knowledge of the solubility of .nitrates to this situating.

(f) Although an unfamiliar equation most learners were successful here. Some omitted one of the balancing numbers.

(g) Better learners found this easy, states were often incorrect in the equation. Conditions were usually correct.

Advice to learners

- Read the question underlining key words and ensure the answer given relates to it.
- Learn practical details as experiments are carried out, including observations made like colour changes.
- Revise and practice mole calculations, especially in the context of titrations.
- Learn the organic reactions thoroughly, practising writing all types of formulae and names for all reactants and products.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx