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Examiners' Report/
Principal Examiner Feedback

Summer 2014

Pearson Edexcel GCE
Chemistry Unit 6CH02 Paper 01R
Appl. of Core Principles

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Summer 2014
Publications Code US038313

General

The number of entries for this paper was very low and so the validity of comments as applying to other candidates is questionable. However, there are a number of regular reminders that can be made and with some similarities between this paper and other comparable paper further relevant points can be made.

The paper included questions that enabled the whole ability range to gain credit while at the same time allowing for differentiation. The topics covered by this paper are not heavily mathematical but where such exist the general performance by candidates was good with most gaining at least half marks.

The questions on practical techniques continue to prove problematic for many candidates, likely reflecting the need for more emphasis on this aspect of the subject.

Question 17

The opening dot and cross diagram was a very challenging one for AS candidates but with 3 marks available it did allow for discrimination across the ability range. The application of principles from simple examples and the additional instruction to expand the octet of chromium meant that the more able were successfully able to complete this diagram. On the WCH02 paper a similar question elicited similar-type responses and the advice to candidates to write the electrons in pairs as one way of ensuring that the correct number of electrons is given, certainly is a good one.

The calculations in parts (b)(i)-(iii) were usually well done. As usual candidates that give units must be sure that they are correct but incorrect units were not ignored. The meaning of the numbers in real life was tested in part (ii) when a suitable excess mass was required. As in the WCH02 paper this proved challenging for some in that the value of 2.50g was frequently seen but as this is only 0.01g above the minimum needed it is insufficient to be an excess given the margin of error of common laboratory equipment. Candidates should have some appreciation of the numbers being calculated. Likewise in part (b)(iv) the awareness of the reason why the mass given in the question was the most inaccurate was only identified by the more able. It was common to see the simple statement that the mass was not accurate but no justification given. Candidates needed to refer to the single significant figure or that the percentage error is large with such a small mass. The second mark for the question relating to the reliability of the result was often ‘forgotten’ by candidates as they focussed on the first part of the question. This serves as a reminder to all to make sure that before moving on to another question the answer is reviewed to ensure that all requirements of the question have been addressed.

Ionic half equations continue to prove challenging to the majority of candidates and even this simple example was not well-answered. If candidates can be reminded to consider fundamental principles of balancing for atoms and charge then many more would have been awarded the mark for (c)(i) because often the number of chlorine atoms did not balance or the

equation given had both the negative chloride ions and the electrons on the same side.

It seemed apparent that a sizeable number of candidates confused the test for hydrogen chloride gas with the actual gas itself as many answers of 'steamy fumes' were seen. The test with ammonia produces white smoke or a white solid and this was the required answer. It was not sufficient to give the compound name, ammonium chloride, and the observation is not a white precipitate nor white fumes which were seen.

Part (d) covered the familiar topic area of silver halides and their solubility in ammonia solutions. This was generally well-known but some lack of precision with answers was evident from references to the halide ions dissolving rather than the silver halide precipitate. Also the question specifically requires the use of both dilute and concentrated ammonia and so just stating that the precipitate won't dissolve in dilute ammonia was insufficient.

Question 18

In part (a) further lack of precision with expression was seen as a statement for the first marking point that strontium simply has more electrons was insufficient since this is true of elements across a period. There needed to be statement that strontium has more electron shells or a larger atomic radius. Of course the reverse argument was acceptable. Only the more able candidates seemed to appreciate the need to mention the second key principle of shielding by the inner electron shells for the second marking point.

In (b) the standard question on flame tests was well known by the majority and resulted in a high scoring section of the exam paper. The first two marks were the easiest to gain. The third marking point proved to be the most challenging as simple reference to the production of a flame colour was insufficient. Reference to energy in the visible region or light or photons was needed.

The reaction of barium with water was well-known for the questions of part (c).

Oxidation numbers regularly are tested on this paper and they are generally used very well. There remains the issue of matching the terms 'oxidation' and 'reduction' with the appropriate oxidation number change. These terms are expected when justifying whether a reaction is redox or not.

Ionic equations are often problematic for candidates but in this instance there were more correct answers than seen previously. The state symbols mark was relatively easy to achieve although it was not uncommon for barium sulfate to be described as aqueous.

It was very rare to see a correct answer for the reason why hydrochloric acid is added before barium chloride solution. Candidates should always

know why various chemicals are used and what their purpose is for any diagnostic test.

Almost everyone correctly wrote the equation for the reaction in (e)(i) but the explanation of two factors affecting reaction rate was much more challenging for candidates. Marks were often lost by careless use of language. Many candidates did not read the question and discussed the effect of temperature. Many others talked about decreasing the concentration of magnesium carbonate. The explanations of how the different factors altered rate were poorly expressed. Candidates thought rate would decrease because less of a substance was present and did not distinguish this from a decrease in concentration, where there are fewer particles in the same volume.

A common mistake was to say a larger surface area would increase the rate. Some thought that the kinetic energy of particles would decrease when the concentration decreased. A significant number of answers also discussed how changes in concentration would affect equilibrium position.

In part (f) the vast majority realised that pressure only affects gases but a minority incorrectly referred to equilibrium.

Question 19

In part (a) candidates struggled to provide a definition for the term "functional group". Some showed the idea that it gives specific reactivity but were unable to say what the group actually was. Many candidates instead described a homologous series. Others said the functional group was a molecule attached to the carbon chain which gave particular properties, and this was not given the mark.

It was quite common for candidates to start with the explanation of the term "functional group" and then forget to classify the type of alcohol. Those who did start with the alcohol often simply said it had a functional group –OH.
This proved a very challenging question. Many candidates counted the number of carbon atoms correctly, but then made an error with the number of hydrogen atoms. The answer $C_{10}H_{18}(OH)_2$ was seen regularly and it showed that the candidates did not understand the meaning of the term "molecular formula".

The reasons for practical steps of an experiment continue to challenge candidates who, if they carry out these experiments, do not seem to understand what and why they are doing such activities, which is disappointing as chemistry is such a practical subject. In part (c)(i) Sand is an effective abrasive agent and allows the cell walls to be broken open so that the oil can be released but does not react with the substances present. However the more common questions requiring the stating of a drying agent and how to separate a mixture in part (iii) and (iv) were well-known.
Likewise the familiar description of London forces for part (c)(ii) was very well-answered and many responses scoring maximum marks were seen.

The adjustment of the apparatus drawn to that required for a successful separation was very challenging for the majority of candidates. Frequently reference was made to the condensation of the cyclohexane back to the flask but rarely was it stated that it would evaporate in the first instance on heating. The third marking point of converting the apparatus to distillation was stated by many but only the more able candidates made it clear that this would result in the cyclohexane being collected as opposed to the *p*-menthane-3,8-diol.

Candidates performed much better than previous series on the questions on spectroscopic identification in part (d). The reference to the O-H absorption in infrared and the inclusion of a positive charge on the mass spectrum fragments were pleasing to see.

Skeletal formulae remain very challenging to all but the most able of candidates. Common errors were (i) to draw the OH group on the top left carbon of the ring but this is the same as the bottom left carbon due to free rotation about the bond; (ii) the drawing of the OH group directly on to the end of any of three methyl groups in the structure but without drawing a bond and so the carbon is in effect replaced by the OH group rather than bonded to it which is clearly what was intended.

The final question on sustainability in the chemical industry resulted in the full spread of marks on the paper and gave all the opportunity to gain credit but also for the more able to stretch ahead. It can be difficult at times to clearly decide whether something stated is a principle or an explanation of a principle. Wherever possible, candidates were credited.

Summary

Make sure you know the meaning of frequently used terms such as functional group, homologous series and molecular formula.

Practice using skeletal formulae and make sure you know where the C atoms are in them.

Show all of your working in calculations so that if you make a mistake you have a chance of scoring part marks.

Read the question very carefully! This advice is given for every exam but careless reading is one of the most common reasons for losing marks.

Finally double-check and even triple-check your answers because oftentimes simple errors can be quickly identified and fixed and thus improve the overall score.

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