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General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2F Unit Chemistry 2

Report on the Examination

2012 examination – June series

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Additional Science / Chemistry
Foundation Tier CHY2F

General

The majority of students were able to make a good attempt at almost all the questions.

It is important that students follow the instructions in each question carefully, for example by ticking or ringing the number of answers indicated in the question.

Question 1 *(Low Demand)*

(a) (i) Many students tried to give a definition of an exothermic reaction rather than appreciating that the question had asked for the measurements needed to show that the reaction is exothermic. Many answered in terms of measuring the bubbles or gas. Of those that did realise the need to take the temperature, many just measured the temperature rather than taking the initial and final temperatures.

(a) (ii) As a consequence of the misunderstanding in part (i) there were many confused answers in part (ii) to how the measurements showed it was an exothermic reaction, such as energy was released and the test tube got colder. Again many thought that bubbles or gas was lost.

(b) This part of the question was well answered, with the most common error being to state the independent variable rather than a control variable.

(c) & (d) These questions were well answered.

Question 2 *(Low Demand)*

(a) Were well answered with students being able to interpret the information given in the atomic structure diagrams.

(b) Were well answered with students being able to interpret the information given in the atomic structure diagrams.

(c) Protons and neutrons were the most common incorrect responses given for a particle with a negative charge.

Question 3 *(Low Demand)*

Students were able to use the information given in the question and equation to complete the sentences. The least well answered parts of the question were those relating to the state symbols, which were not always known by the weaker students. The symbol for a reversible reaction was very well known.

Question 4 *(Low Demand)*

Students knew that diamond was a form of carbon and were able to link the properties of diamond to explain the hardness of diamond. The relative size of nanoparticles was also well known.

Question 5 *(Low Demand)*

(a) Students were able to identify the use of hydrochloric acid to form calcium chloride. However, the understanding of precipitation being caused by insolubility was not well understood and many thought that electrolysis rather than filtration was used to separate a solid from a solution.

(b) There were a variety of responses to this question across the full mark range. Better students were able to use the diagram to describe the movement of electrons from calcium to chlorine resulting in at least 2 marks. However, they often failed to obtain further marks failing to say how many electrons were being lost from calcium or being gained by chlorine. Some students gained one of these marks by stating that chlorine had formed a (single) negative ion.
Some students had their marks limited by mentioning covalent bonding or a reference to sharing and in some cases students failed to gain marks by misinterpreting the diagram and getting calcium and chlorine mixed up (stating calcium was gaining and chlorine losing electrons).
A relatively small number of students who did not gain any points in the mark scheme were able to score one mark for a reference to ionic bonding or gaining full outer shells.

Question 6 *(Standard Demand)*

(a) The idea of opposites attracting was well understood and most students appreciated that the chloride ion must be negatively charged.

(b) A significant proportion of students gave 2 responses instead of the required 1, including one of the statements about hydrogen that was factually correct, but not the reason why hydrogen rather than sodium was produced at the electrode.

(c) Only a small minority of students knew that the hydroxide ion is the cause of alkalinity, with many giving sodium (Na^+) or hydrogen (H^+), which had been identified earlier in the question.

(d) (i) The concept of a shared pair of electrons, one from each atom, in the overlap was well understood. The most common error was to place the hydrogen electron in the same position as shown in the diagram of the hydrogen atom rather than in the overlap.

(d) (ii) Was well known with ionic being the most likely incorrect response.

(d) (iii) That hydrogen was the ion that caused the solution to be pH1 was better known than the hydroxide ion, though a surprising number of students gave hydrogen as the response for both this and the alkalinity question.

Question 7 *(Standard Demand)*

(a) Better students were able to calculate the mass of gas used, though many weaker ones just added the masses of the canister before and after the experiment.

(b) The different technical terms are still not well known with many students confusing precision and reliability.

(c) When calculating the mean, few students remembered to discard the anomalous result. There were also poor mathematical skills on display, with many students being unable to correctly add the numbers to gain an overall total which was then divided.

(c) (ii) The most accessible marks for the causes of experimental error were gained by students who chose the temperature and pressure options either by noting in various ways there could be a change or by suggesting a leak somewhere in the equipment. Although there were a number of possible answers many students failed to gain marks due to their answers lacking in detail. For instance, they often referred to 'measuring the gas incorrectly' without stating what it was that they were actually measuring e.g. mass / volume. Many of them also relied on answers such as 'faulty equipment'.

(c) (iii) Quite well answered in terms of reliability / anomalies. The most common error was to achieve 'a more accurate result' or answer in terms of fair testing.

(d) Students are able to work out the M_r of a formula when given the relative atomic masses. The most common errors were to multiply all the numbers together or to use the incorrect relative atomic mass.

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