

Aga Khan University Examination Board
Notes from E-Marking Centre on SSC II Chemistry Examination May 2012

Introduction

This document has been produced for the teachers and candidates of the SSC II course in Chemistry. It contains comments on candidates' responses to the 2012 Secondary School Certificate II Examination, indicating quality of the responses and highlighting their relative strengths and weaknesses.

General Comments

Teachers and candidates should be aware that examiners may ask questions that address the syllabus outcomes in a manner that requires candidates to respond by integrating knowledge, understanding and skills they have developed through studying the course.

Candidates need to be aware that the mark allocated to the question and the answer space, are a guide to the length of the required response. A longer response will not itself lead to higher marks. Writing far beyond the indicated space may reduce the time available for answering other questions.

Candidates need to be familiar with the command words in the student learning outcomes which contains some terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the key words from the glossary. Questions such as 'how', 'why' or 'to what extent' may be asked as well.

Question 1a:

Better responses showed the correct equilibrium constant expression for the given chemical reaction.

Average responses wrote the equilibrium constant expression for the given chemical reaction but didn't show the exponents of the terms of concentrations in the equilibrium constant expression.

Weaker responses were not able to write the correct equilibrium constant expression. They wrote reactants over products and without exponents.

Question 1b:

Better responses showed the correct equation of dissociation of water on the basis of its self ionization and identified the amphoteric nature of water.

Average responses gave the equation of dissociation of water but were unable to identify the amphoteric nature of water. They determined it as neutral.

Weaker responses, rather than giving the equation, determined the dissociation constant of water which was not required at all. They were also not able to identify the nature of water that enables it to undergo self ionization.

Question 2a:

Better responses mentioned tetravalency, catenation and isomerism as the properties of carbon that allow it to form different organic compounds.

Average responses could only exhibit the catenation property of carbon.

Weaker responses showed irrelevant properties of carbon and wrote about stability, melting and boiling point etc.

Question 2bi:

Better responses constructed the correct balanced chemical equation with the help of the information provided in the stimulus.

Average responses showed either the correct formula of the reactants or the products. Few also gave one correct reactant and one correct product.

Weaker responses gave the wrong formula of reactants and products. A few wrote CO_2 or water only on the product side but with no correct formula of reactants producing it.

Question 2bii:

Better responses were able to interpret the test shown in the picture that it is used for the determination of carboxylic acid functional group. The students justified their identification by stating that on reaction of sodium bicarbonate with vinegar bubbles of carbon dioxide gas are observed.

Average responses identified the correct functional group but could not provide a logical reason.

Weaker responses couldn't identify the correct functional group and the related reason. This could be because this question was related to question **2bi**. Students were unable to write the correct balanced equation with the help of the information provided in the stimulus could not identify the functional group with proper justification.

Question 2c:

Better responses provided the correct balanced chemical equation for the reaction of methane with steam. They also mentioned the suitable conditions such as use of nickel as a catalyst or heating at 425°C .

Average responses wrote the correct equation but didn't write the appropriate conditions required for the reaction. They mentioned conditions such as very, very high temperature or 1000°C temperature, etc.

Weaker responses gave only the formula of methane and water but couldn't provide the complete balanced equation. This showed student's lack of practice of chemical formula and construction of chemical equations.

Question 3a:

Better responses differentiated well between fats and oils. The students displayed in-depth knowledge about the properties of fats and oils such as saturation, bonding, source, state, boiling point, test for unsaturation, etc.

Average responses distinguished fats and oils mostly on the basis of saturation or bonding or the number of hydrogen atoms. The students were able to provide only one valid point for each.

Weaker responses showed lack of appropriate knowledge about lipids. They either wrote common uses of fats and lipids or just mentioned that they were the triester of glycerol without stating the degree of unsaturation.

Question 3bi:

Better responses correctly defined the term fractional distillation and in addition gave example of refining of petroleum.

Weaker responses were unable to define the given term and described it as a process in which a substance is fractionally distilled without elaborating it further.

Question 3bii:

Better responses described that natural gas is a mixture of low boiling point hydrocarbons containing methane as the major portion. They also mentioned small amounts of other organic components i.e. ethane, propane, and butane and inorganic components such as carbon dioxide, oxygen, nitrogen, rare gases and smelly sulphur compounds. This showed the grip of students over the concept of the composition of natural gas.

Average responses mentioned the presence of methane and small quantities of other organic compounds only.

Weaker responses stated that the other name of natural gas is methane and described its formation rather than the composition. Few candidates considered natural gas as air and mentioned its percentage composition.

Question 4a

Better responses gave the correct damages which are caused by the acid rain.

Average responses mentioned only the deterioration of buildings made of marble and lime stone. The students failed to give any other damage.

Weaker responses included illogical description of the damages caused by acid rain such as acid rain gives birth to bacteria and viruses that cause diseases.

Question 4b

Better responses gave the correct effects of given air pollutants on the human health such as

Average responses gave the correct effects of carbon monoxide and sulphur dioxide on human health but majority failed to describe the effect of ozone as an air pollutant.

Weaker responses mentioned about acid rain for sulphur dioxide but didn't write its impact on human health. For carbon monoxide, students wrote about death but didn't mention how it reacts with hemoglobin in our blood and stop it from carrying oxygen to the body cells as eventually every disease leads to death. Similarly, they failed to write the effect of ozone on human health.

Question 4c

Better responses gave the correct reason of using more detergent in hard water as it contains sulphates, chlorides and bicarbonates of calcium and magnesium ions that fail to produce lather due to the formation of precipitates/ scum/ curds with detergent.

Weaker responses couldn't justify the given statement as they lack information about scum formation by hard water with detergents that resists the washing of clothes.

Question 5a

Better responses described the effect of catalyst and temperature on an equilibrium reaction in detail. The students explained the effect of temperature with reference to exothermic and endothermic reactions that showed their in-depth knowledge about the variations caused by different conditions on reversible reactions at equilibrium. They further gave balanced chemical equation for the given reversible reaction.

Average responses gave the correct effect of catalyst with a balanced chemical equation for the given reversible reaction. However, the students failed to describe the effect of temperature with respect to exothermic and endothermic reactions and they just wrote a rise or decrease in temperature increases the rate of reaction.

Weaker responses determined only the unbalanced chemical equation of the given reversible reaction but failed to provide the effects of catalyst and temperature.

Question 5b

Better responses classified the given substances i.e. boron trifluoride as Lewis acid and trimethylamine as Lewis base and wrote the correct reason for their identification. They also showed the formation of adduct using chemical equation.

Average responses showed adduct formation and gave the correct description of Lewis acid and Lewis base. However, in some cases they wrongly identified trimethylamine as Lewis acid and boron trifluoride as Lewis base or vice versa i.e. gave correct identification but with no proper reasoning.

Weaker responses classified the given substances as Arrhenius / Bronsted-Lowry acid and bases. They gave justifications w.r.t. to proton donor or acceptor that showed their lack of conceptual clarity w.r.t. theories of acids and bases and their applications.

Question 6a

Better responses described the conversion of vegetable oil to margarine and test with bromine water.

Average responses gave the conversion of vegetable oil to margarine but missed the conditions required for the process and didn't write the bromine water test.

Weaker responses were not able to show the conversion of vegetable oil to margarine and the test with bromine water.

Question 6b

Better responses drew the correct flow chart of the ammonia Solvay process and wrote the balanced chemical equations for the reactions involved in the process. The students also wrote the by-products which are formed in the process.

Average responses drew the correct flow chart of the ammonia Solvay process but didn't write all the chemical reactions of the process and by-products which are formed.

Weaker responses failed to illustrate the ammonia Solvay process through a flow chart and chemical equations. They haphazardly mentioned few of the raw materials (lime stone/ water/ sodium chloride) or name of processes (heating of calcium carbonate/ ammonia recovery) but couldn't show the link.

Question 7a

Better responses wrote the correct definition of incineration and its contribution to air pollution.

Average responses didn't write the correct definition of incineration but gave the general harmful effects of air pollution.

Weaker responses related incineration with the dumping of waste material in landfills and sea. Thus, described the effects of such pollution.

Question 7b

Better responses described the given stages of the sewage treatment plant. The students gave detailed explanation of bacterial oxidation, settling of sludge, production of methane gas etc. this depicted students grip over the concept of how waste water is treated at sewage works.

Average responses described the processes occurring in sedimentation tank II, digester and the ways the waste is disposed off. However, the students could not explain production of methane and the aeration tank with reference to bacteria growing on sludge, oxidation of harmful organic compounds and continuous pumping of air in the tank.

Weaker responses gave details of sedimentation tank II or dumping of waste in landfills. These responses showed lack of students' understanding of the waste water treatment at sewage works.