Aga Khan University Examination Board
Notes from E-Marking Center on SSC I Chemistry Examination May 2014

Introduction

This document has been produced for the teachers and candidates of SSC Part I (Class IX) Chemistry. It contains comments on candidates' responses to the 2014 Secondary School Certificate (SSC-I) Examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

General Comments

This report includes overall comments on students' performance on every question and some specific examples of students' responses which support the mentioned comments. Please note that the descriptive comments represent an overall perception of the better and weaker responses as gathered from the e-marking session. Whereas, the candidates' responses shared in this document represent some specific example(s) of the mentioned comments.

Teachers and candidates should be aware that examiners may ask questions that address the Student Learning Outcomes (SLOs) in a manner that require candidates to respond by integrating knowledge, understanding and application skills they have developed during the course of study. Candidates are advised to read and comprehend each question carefully before writing the response to fulfil the demand of the question.

Candidates need to be aware that the marks allocated to the questions are related to the answer space provided on the examination paper as a guide to the length of the required response. A longer response will not in itself lead to higher marks. Candidates need to be familiar with the command words in the Student Learning Outcomes which contain terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the command words. Words such as 'how?', 'why?' or 'what?' may also be used.

Detailed Comments:

Question 1

Better responses included all the three branches of Chemistry as asked in the question.

Example

S. NO.	Interest	Branch of Chemistry
1.	**Student A** is interested in studying about the laws and principles governing the combination of atoms and molecules.	Physical Chemistry
2.	**Student B** likes to study about the compounds and metabolism of a living body.	Biochemistry
3.	**Student C** wants to learn about the changes occurring in the nuclei of atoms, accompanied by the emission of invisible radiations.	Nuclear Chemistry

Weaker responses indicated candidates' lack of knowledge with reference to different branches of Chemistry and their definitions. A few candidates guessed biochemistry correctly while the rest of the branches of Chemistry couldn't be identified.

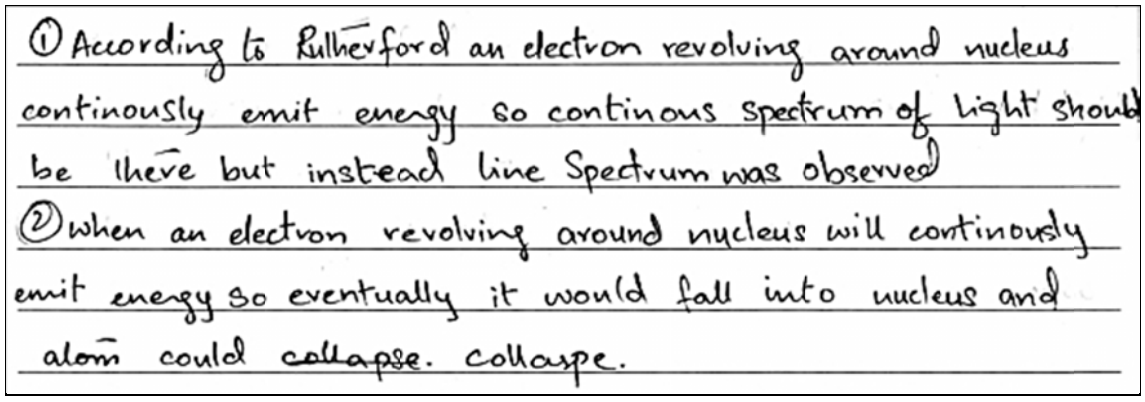
Example

S. NO.	Interest	Branch of Chemistry
1.	**Student A** is interested in studying about the laws and principles governing the combination of atoms and molecules.	Industrial chemistry
2.	**Student B** likes to study about the compounds and metabolism of a living body.	Biochemistry
3.	**Student C** wants to learn about the changes occurring in the nuclei of atoms, accompanied by the emission of invisible radiations.	Environmental chemistry

Question 2a

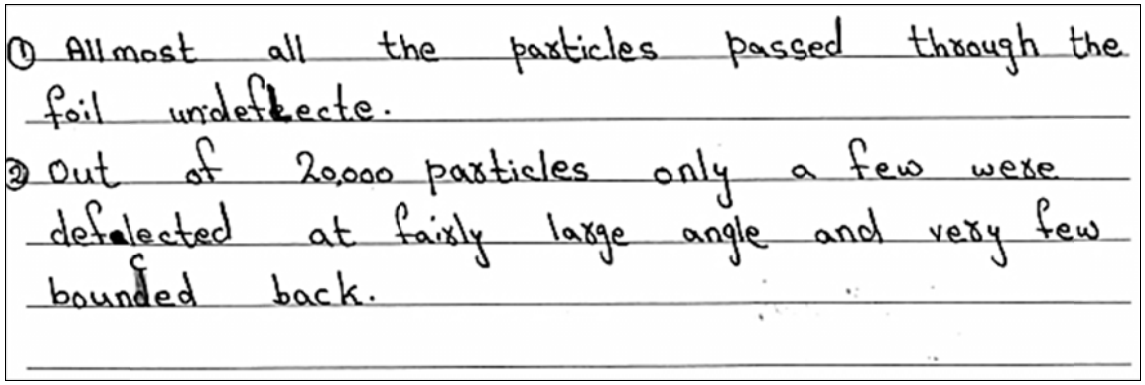
Better responses highlighted the two defects of Rutherford's atomic model. These responses precisely discussed continuous revolving of electrons around the nucleus with the loss of energy, the concept of continuous spectrum and that the idea about orbits was not introduced.

Example



Weaker responses demonstrated candidates' lack of knowledge regarding the defects of Rutherford's atomic model. They failed to identify the actual problem in the atomic model. Some of them described Rutherford's gold metal foil experiment, instead.

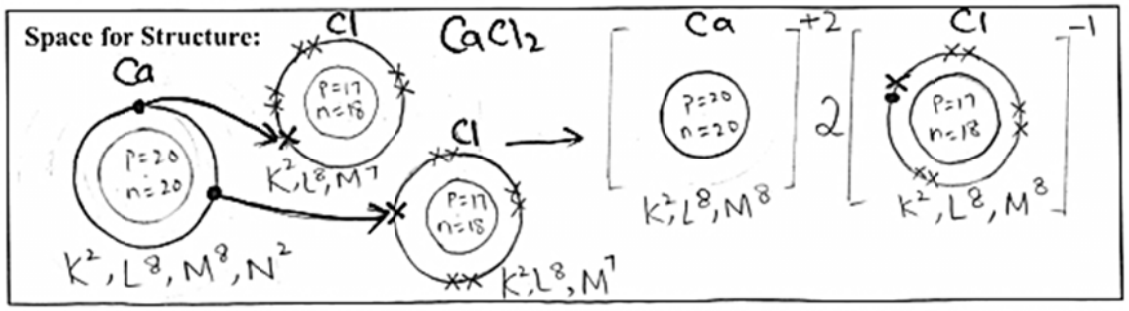
Example



Question 2b

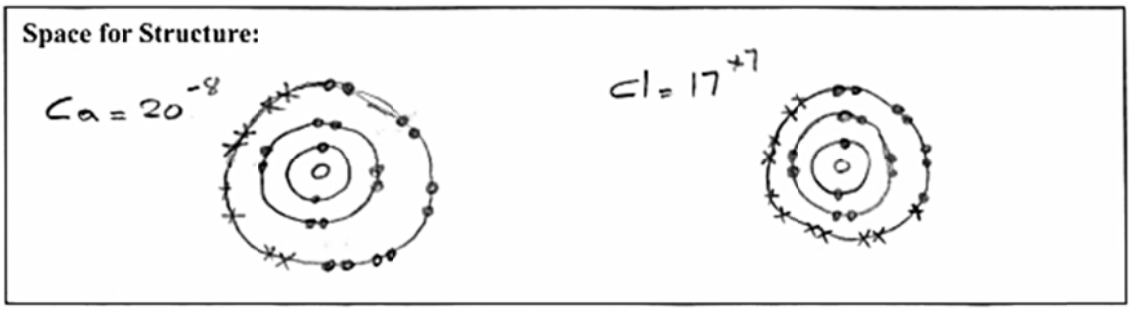
Better responses indicated accurate dot and cross structure of calcium chloride molecule with correct valence electrons and charges on ions. Even in some responses transfer of electrons from calcium to chlorine atoms was also shown.

Example



Weaker responses demonstrated poor understanding of the atomic structure. Candidates did not have the idea of valence electrons. Some responses drew total number of electrons of an atom in the valence shell and failed to show the correct charges on ions.

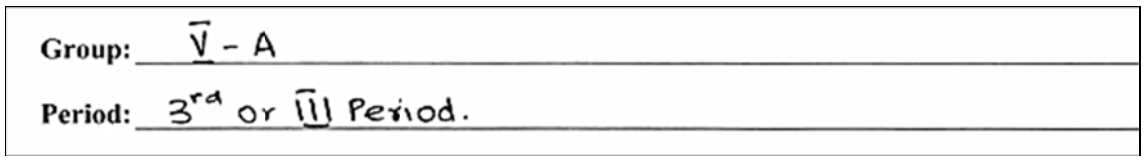
Example



Question 3a

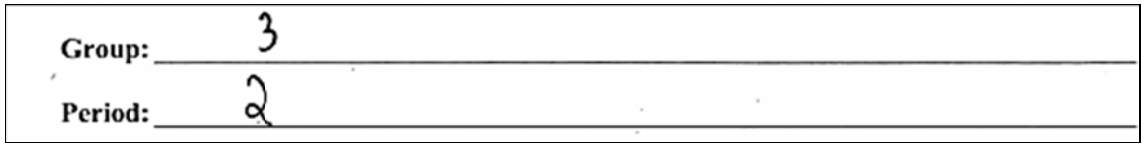
Better responses identified group and period from the given electronic configuration. Even in some cases nitrogen family was also mentioned with 5A group which showed in-depth understanding of the periodic table.

Example



Weaker responses depicted poor concept about electronic configuration. Candidates failed to figure out the exact group and period number based on the electronic configuration given. A few defined group and period which was not asked in the question.

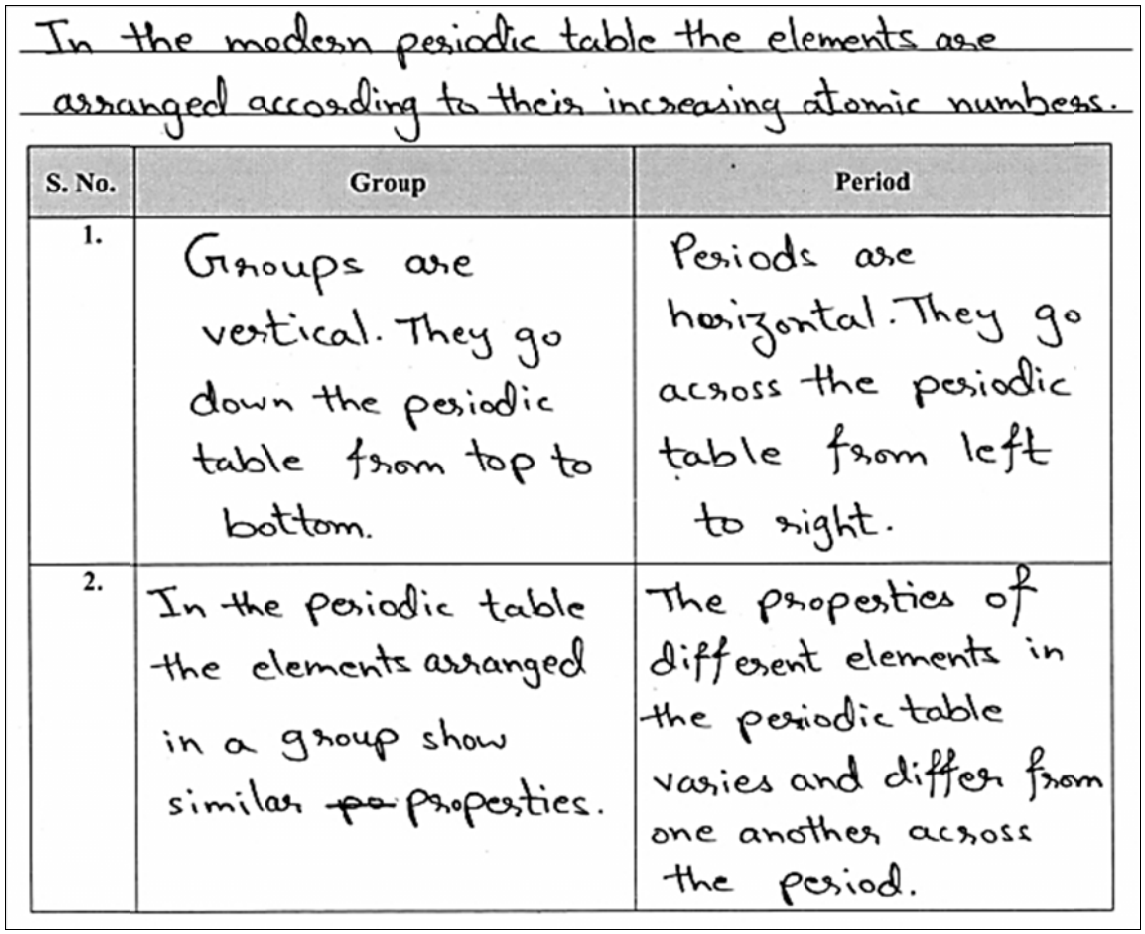
Example



Question 3b

Better responses mentioned atomic number / proton number as the basis for the arrangement of elements in the periodic table and gave clear points of differences between groups and periods of the periodic table.

Example


In the modern periodic table the elements are arranged according to their increasing atomic numbers.

S. No.	Group	Period
1.	Groups are vertical. They go down the periodic table from top to bottom.	Periods are horizontal. They go across the periodic table from left to right.
2.	In the periodic table the elements arranged in a group show similar ~~po~~ properties.	The properties of different elements in the periodic table varies and differ from one another across the period.

Weaker responses showed that candidates were not able to deliver their concepts accurately. They either swapped the differentiating points or gave completely irrelevant points. They also mentioned properties of elements and atomic masses as the basis for the arrangement of elements in the periodic table.

Example

Ans:- On there electronic configuration and there nature and there physical and chemical. paperties

S. No.	Group	Period
1.	Group is in Horizontaly line	period are verticaly line
2.	Group is made according to nature of element	

Question 4a

Better responses clearly identified the phenomenon of diffusion and described the mixing of particles. They mentioned diffusion as movement of particles from a region of higher concentration to that of lower concentration.

Example

i. Name the phenomenon that will occur after the lid is removed. (1 Mark)

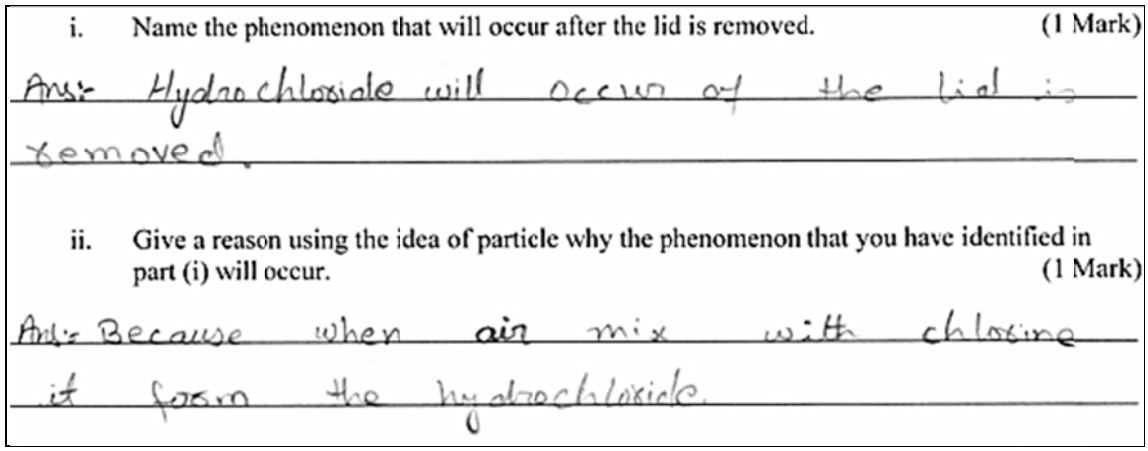
diffusion.

ii. Give a reason using the idea of particle why the phenomenon that you have identified in part (i) will occur. (1 Mark)

Diffusion will occur because as the lid is x removed the spontaneous mixing up of gas molecules by random motion and collision will take place to form a homogenous mixture.

Weaker responses tried to explain the release of gases from the jar but they were not able to relate their answer with the phenomenon of diffusion.

Example


i. Name the phenomenon that will occur after the lid is removed. (1 Mark)

Ans: Hydrochloride will occur of the lid is removed.

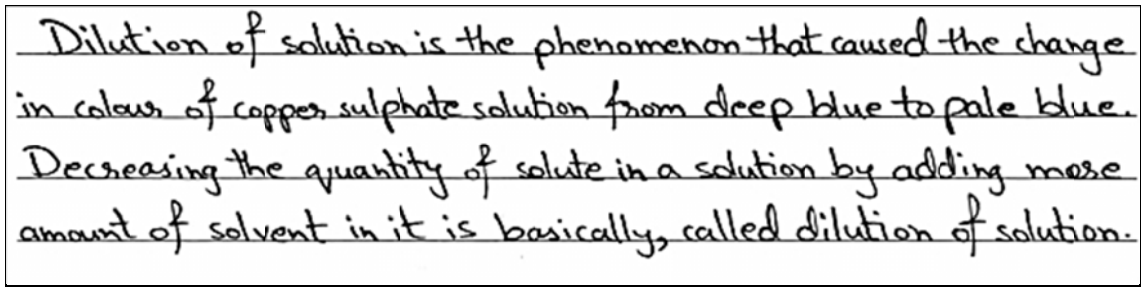
ii. Give a reason using the idea of particle why the phenomenon that you have identified in part (i) will occur. (1 Mark)

Ans: Because when air mix with chlorine it form the hydrochloride.

Question 4b

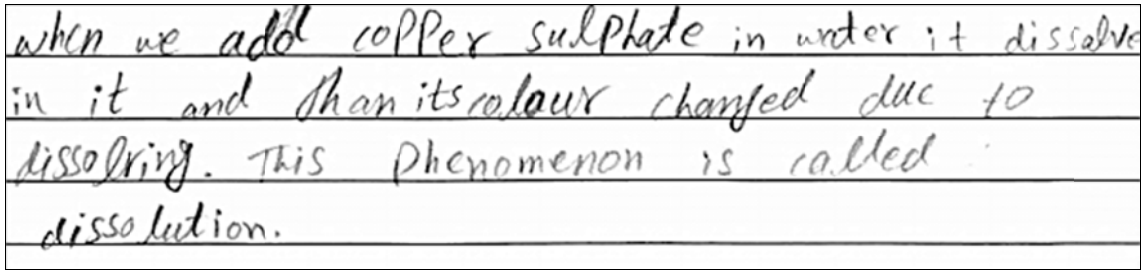
Better responses identified the phenomenon of dilution and described it with reference to the decrease in concentration of copper sulphate solution or the decrease in the amount of solute.

Example


Dilution of solution is the phenomenon that caused the change in colour of copper sulphate solution from deep blue to pale blue. Decreasing the quantity of solute in a solution by adding more amount of solvent in it is basically, called dilution of solution.

Weaker responses could not figure out the phenomenon of dilution. Either they left the space for answer blank or defined concepts of solubility / dissolution of copper sulphate in water.

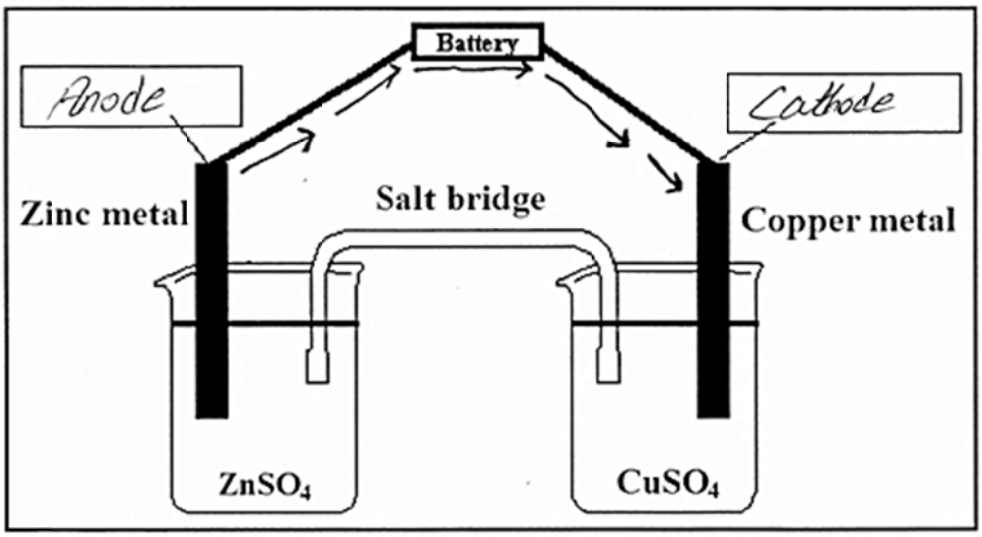
Example


when we add copper sulphate in water it dissolve in it and than its colour changed due to dissolving. This phenomenon is called dissolution.

Question 5a

Better responses were able to label cathode and anode and presented the correct flow of current with the help of arrows. They also identified anode / Zinc electrode as the site where the process of oxidation occurs.

Example



i. Label the cathode and anode in the given diagram. (1 Mark)

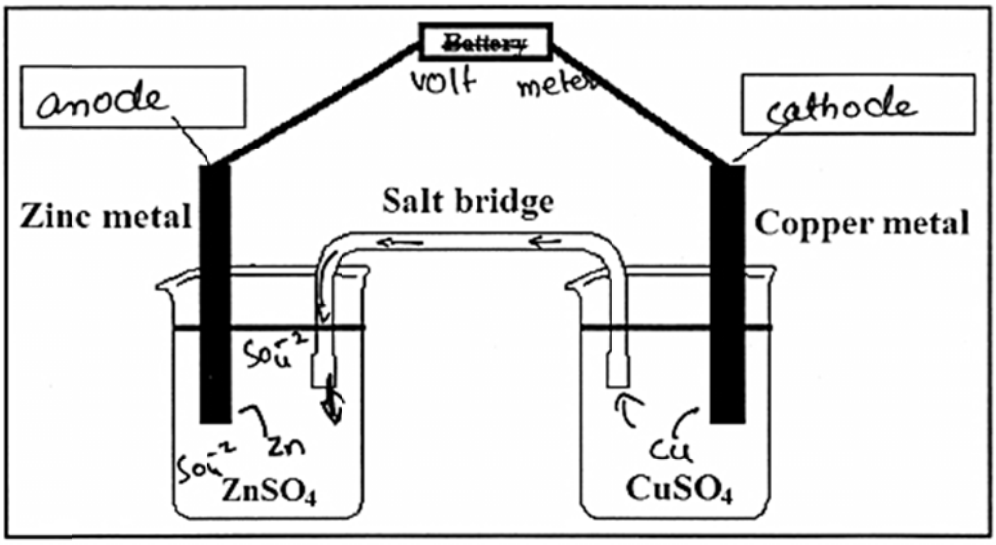
ii. Show the flow of current with the help of arrows in the given diagram. (1 Mark)

iii. Identify at which electrode the process of oxidation occurs. (1 Mark)

The process of oxidation will occur on the Zn electrode as it is the Anode.

Weaker responses tried to label the electrodes correctly. However, majority of these responses gave wrong answers to the remaining two parts. The error observed was that they showed the flow of current through the salt bridge and identified zinc sulphate / copper sulphate solutions as the site for the process of oxidation.

Example



i. Label the cathode and anode in the given diagram. (1 Mark)

ii. Show the flow of current with the help of arrows in the given diagram. (1 Mark)

iii. Identify at which electrode the process of oxidation occurs. (1 Mark)

$CuSO_4$

Question 5b

Better responses precisely described the complete ionization of sodium hydroxide with the help of a balanced chemical equation.

Example

i. What makes sodium hydroxide conduct electricity in aqueous solutions? (1 Mark)

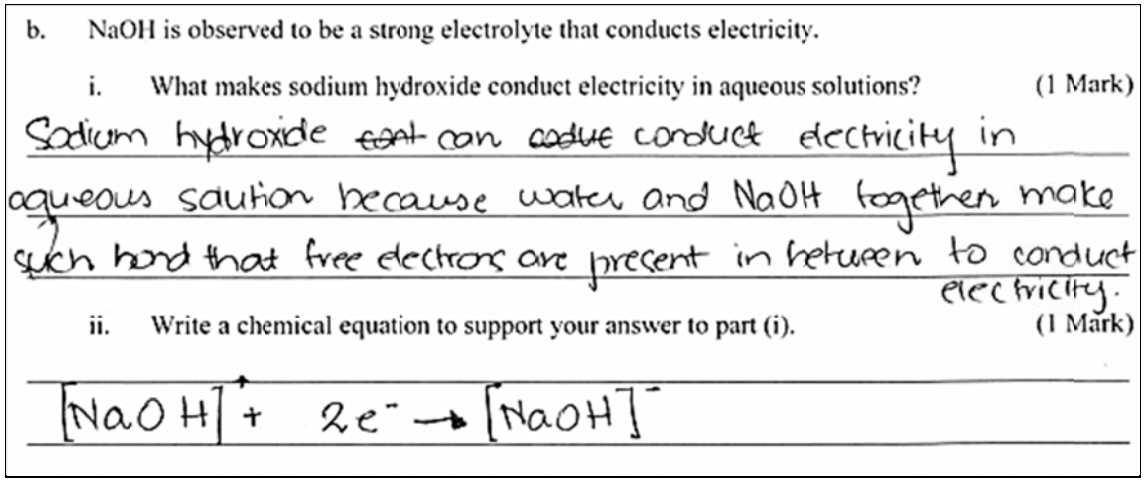
NaOH ionizes in aqueous solution. As we know that ions can conduct electricity as they ~~have~~ are ~~ca~~ charged particals, so NaOH will conduct electricity because of ionization. It will ionize completely and produce many ions.

ii. Write a chemical equation to support your answer to part (i). (1 Mark)

$NaOH \xrightarrow{\text{ionizes}} Na^+ + (OH)^-$

Weaker responses were not able to give the correct reason. Candidates seemed to think that conduction of electricity in sodium chloride was due to the presence of free electrons. The responses also produced wrong equations showing lack of concept of ionization and formation of chemical equations.

Example


b. NaOH is observed to be a strong electrolyte that conducts electricity.

i. What makes sodium hydroxide conduct electricity in aqueous solutions? (1 Mark)

Sodium hydroxide ~~can~~ can ~~could~~ conduct electricity in aqueous solution because water and NaOH together make such bond that free electrons are present in between to conduct electricity.

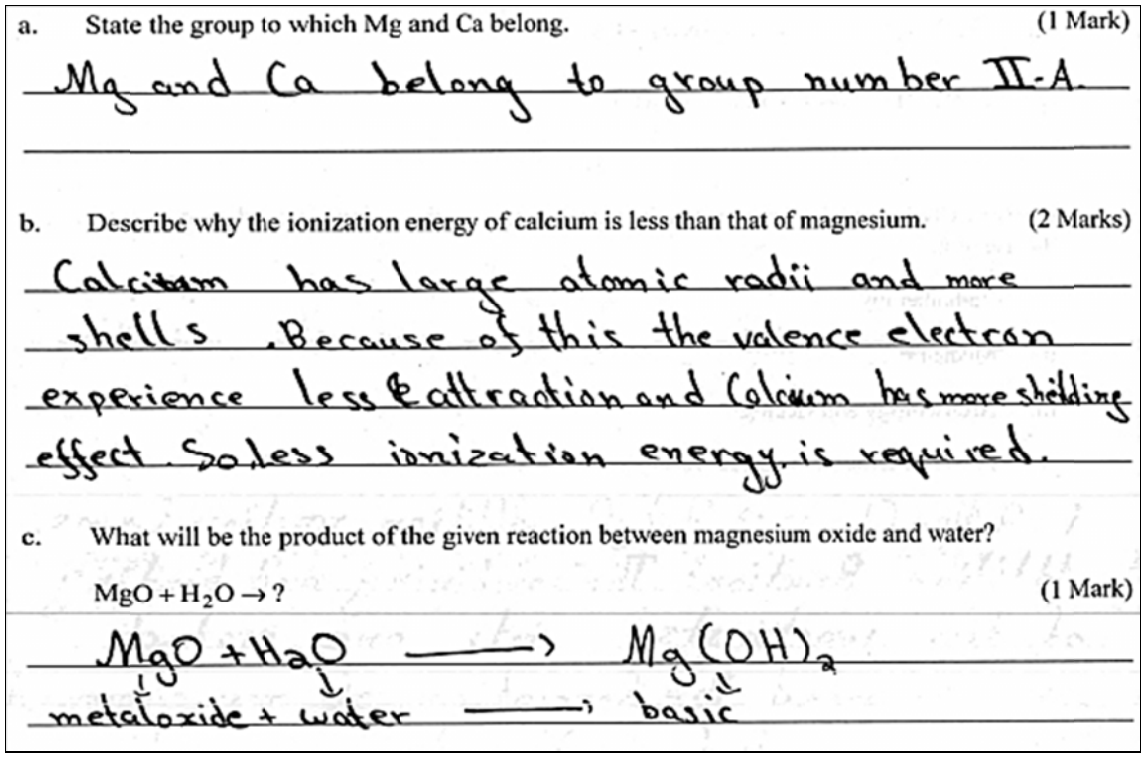
ii. Write a chemical equation to support your answer to part (i). (1 Mark)

$[NaOH]^{+} + 2e^{-} \rightarrow [NaOH]^{-}$

Question 6

Better responses correctly identified group IIA for magnesium and calcium. Candidates were able to express clear understanding of the concept of ionization energy which decreases down the group with the increase in the number of shells and as the atomic size increases effective nuclear charge or the hold of nucleus on the valence shell electrons reduces. Furthermore, they worked out the correct product of the reaction between magnesium oxide and water.

Example


a. State the group to which Mg and Ca belong. (1 Mark)

Mg and Ca belong to group number II-A.

b. Describe why the ionization energy of calcium is less than that of magnesium. (2 Marks)

Calcium has large atomic radii and more shells. Because of this the valence electron experience less attraction and Calcium has more shielding effect. So less ionization energy is required.

c. What will be the product of the given reaction between magnesium oxide and water?

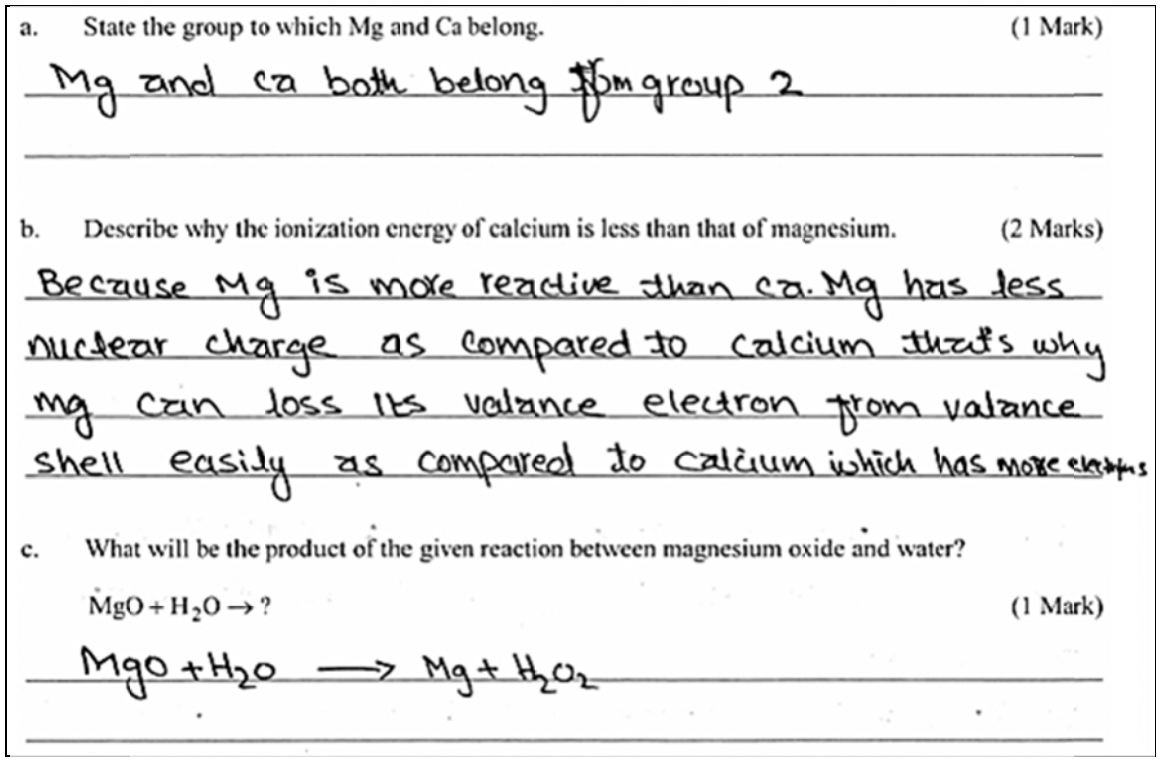
$MgO + H_2O \rightarrow ?$ (1 Mark)

$MgO + H_2O \longrightarrow Mg(OH)_2$

metaloxide + water ⟶ basic

Weaker responses identified the group number of magnesium and calcium but showed misconception regarding ionization energy. Few had identified the group as ‘s’. These responses also showed wrong product of the given reaction.

Example



a. State the group to which Mg and Ca belong. (1 Mark)

Mg and ca both belong from group 2

b. Describe why the ionization energy of calcium is less than that of magnesium. (2 Marks)

Because Mg is more reactive than ca. Mg has less nuclear charge as compared to calcium that's why mg can loss its valance electron from valance shell easily as compared to calcium which has more electrons

c. What will be the product of the given reaction between magnesium oxide and water?

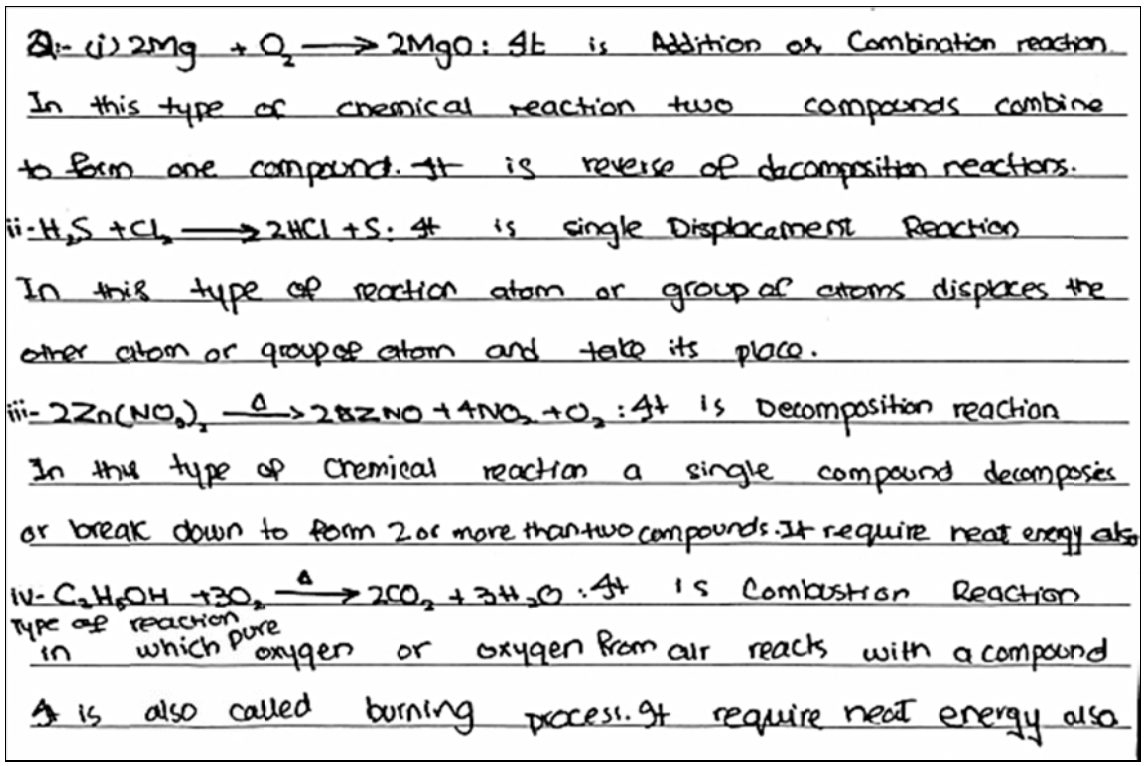
$MgO + H_2O \rightarrow ?$ (1 Mark)

$MgO + H_2O \longrightarrow Mg + H_2O_2$

Question 7a

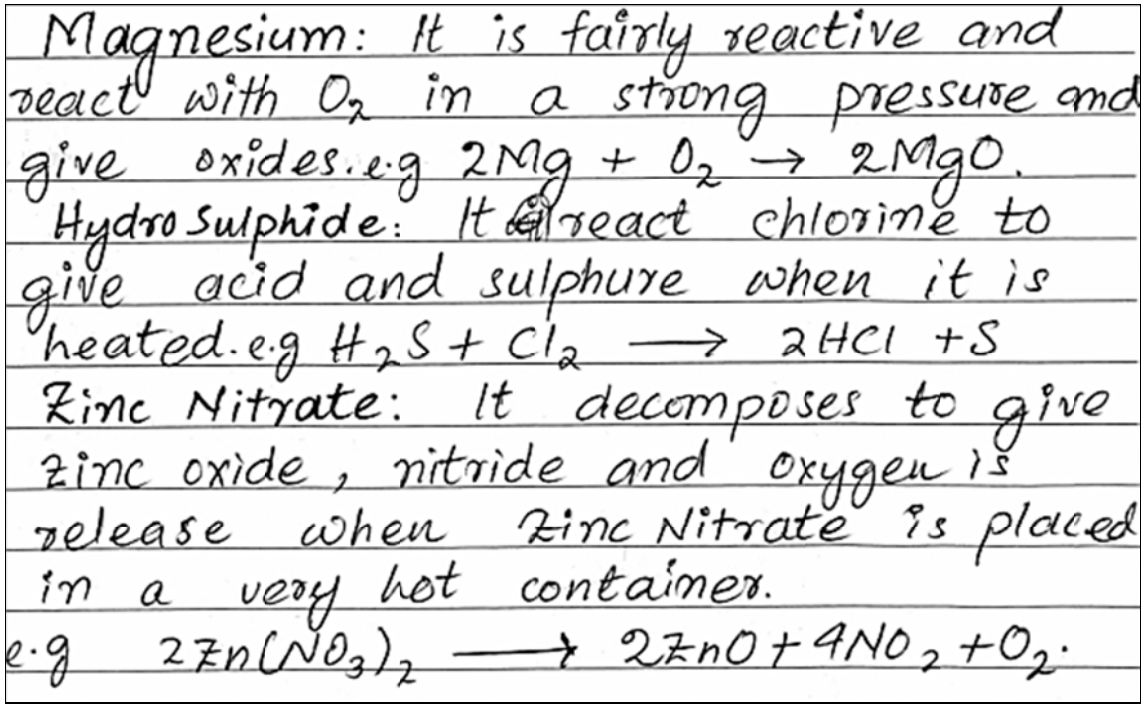
Better responses identified and described the type of each chemical reaction correctly. In some cases, even the general equations were given to explain the chemical reaction.

Example



Weaker responses were not able to identify and describe the type of reaction. They only described their general observations of the given equations as hydrogen combines with chlorine and zinc joins with oxygen. Some even described the types of chemical bonding which was not asked.

Example



Alcohol (C_2H_5OH):

It react with oxygen in the presence of oxygen to gives us carbon dioxide and water.

e.g $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$.

Question 7b

Better responses gave correct examples of isotopes with the description of the use of each of the isotopes in the given fields.

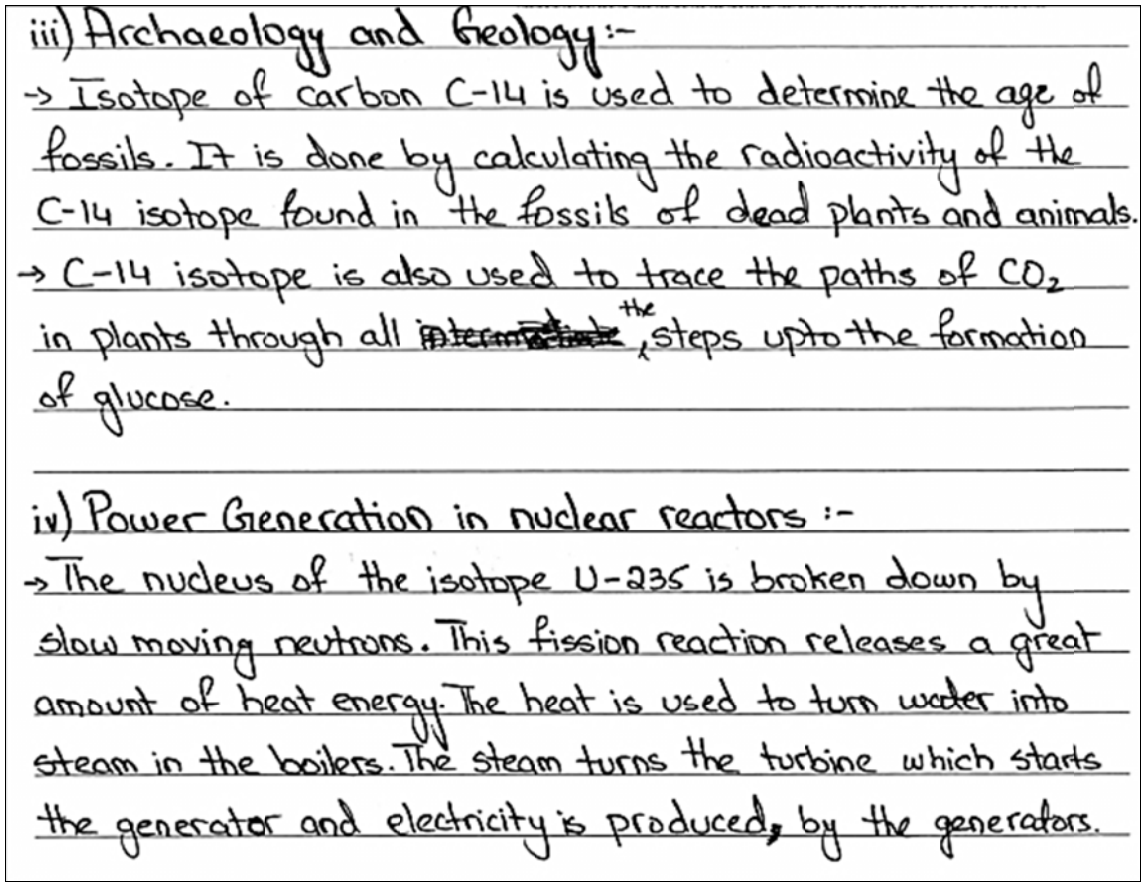
Example

i) Radiotherapy :-

→ Isotopes are used in the treatment of cancer. The isotopes used are radioactive. P-32 and Sr-90 are used in the treatment of skin cancer because they emit less penetrating beta radiations. Co-60 is used in the treatment of cancer within the body because it emits more penetrating gamma radiations.

ii) Medicine :-

→ The isotope iodine-131 is used in the diagnosis of goitre in the thyroid gland and the isotope technitium is used to moniter bone growth.


iii) Archaeology and Geology :-

→ Isotope of carbon C-14 is used to determine the age of fossils. It is done by calculating the radioactivity of the C-14 isotope found in the fossils of dead plants and animals.

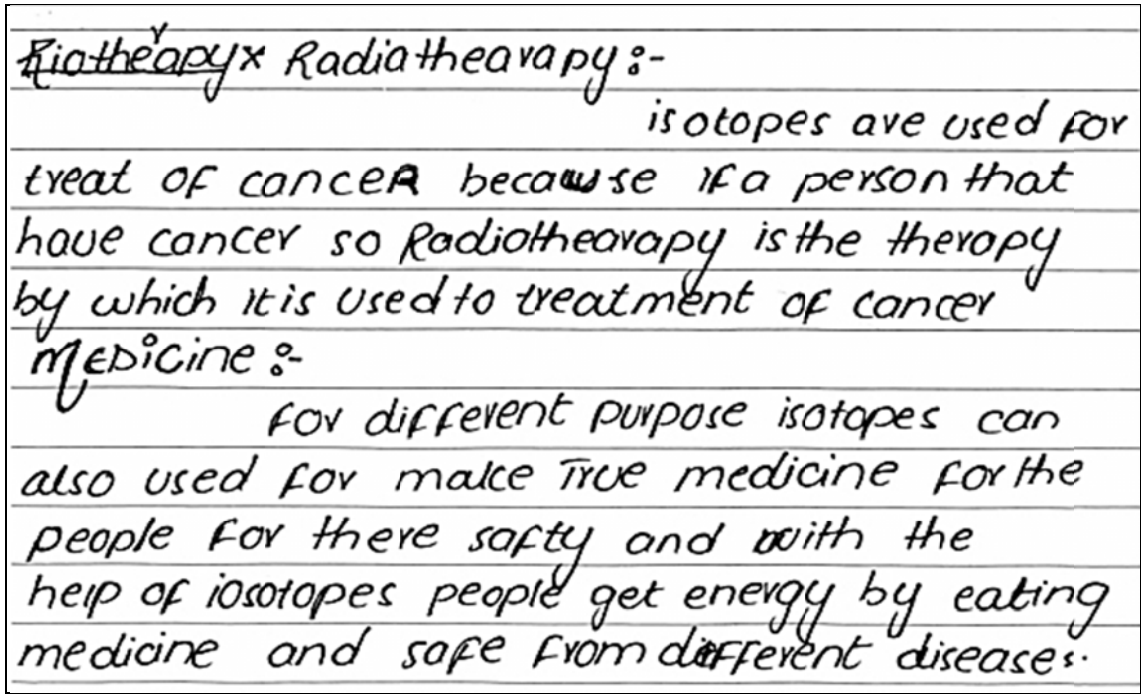
→ C-14 isotope is also used to trace the paths of CO_2 in plants through all the steps upto the formation of glucose.

iv) Power Generation in nuclear reactors :-

→ The nucleus of the isotope U-235 is broken down by slow moving neutrons. This fission reaction releases a great amount of heat energy. The heat is used to turn water into steam in the boilers. The steam turns the turbine which starts the generator and electricity is produced, by the generators.

Weaker responses gave the general use of isotopes in the field of medicine and nuclear reactors but were not able to identify examples of isotopes with their proper use for all the given fields. Even in some cases explanation pertaining to the isotopes of hydrogen was observed.

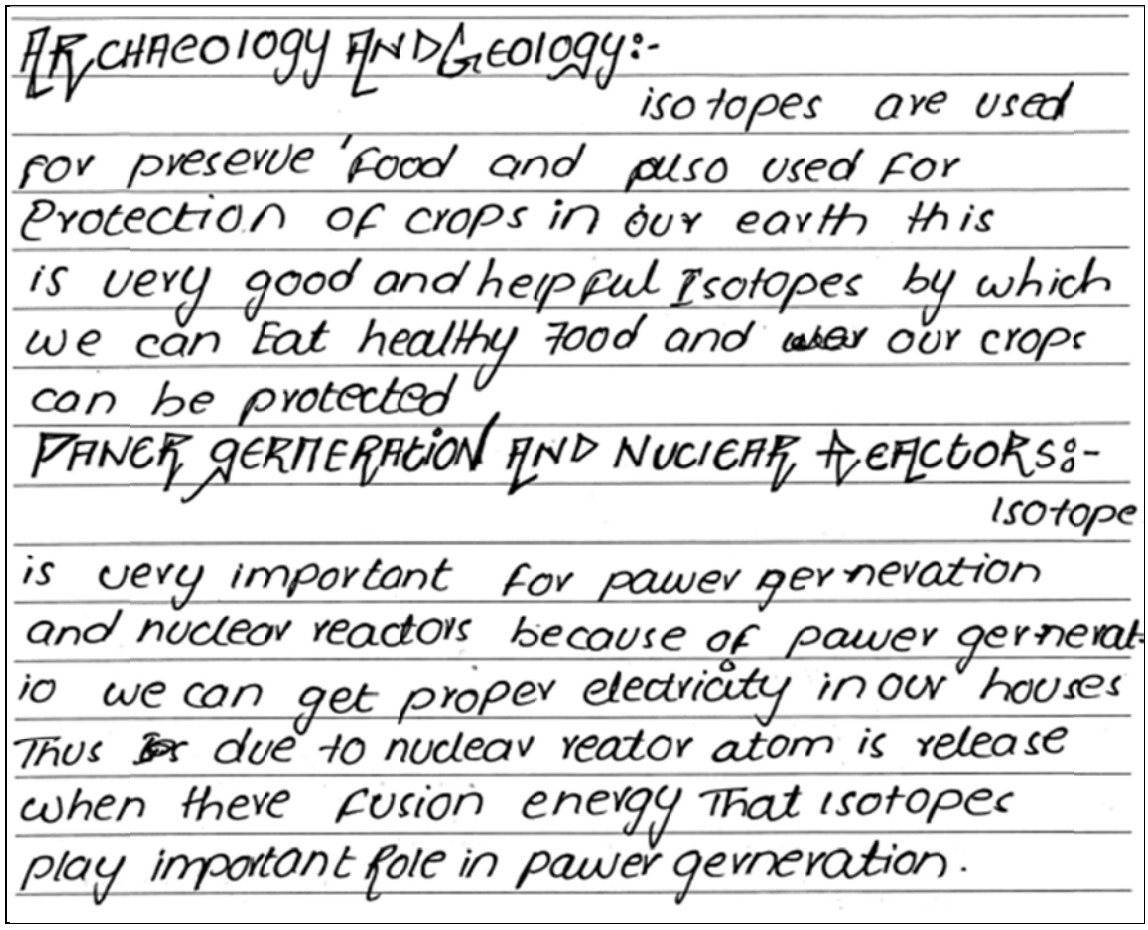
Example


Radiotheavapy :-

isotopes ave used for treat of cancer because if a person that have cancer so Radiotheavapy is the theropy by which it is used to treatment of cancer

MEDICINE :-

for different purpose isotopes can also used for make true medicine for the people for there safty and with the help of isotopes people get energy by eating medicine and safe from different diseases.


ARCHAEOLOGY AND GEOLOGY:-
isotopes are used for preserve food and also used for protection of crops in our earth this is very good and helpful Isotopes by which we can Eat healthy food and ~~wher~~ our crops can be protected
POWER GERNERATION AND NUCIEAR REACTORS:-
Isotope is very important for pawer gernevation and nucleav reactors because of pawer gernerat-io we can get propev electricity in ouv houses Thus ~~for~~ due to nucleav veator atom is release when theve fusion energy That isotopes play important role in pawer gernevation.

Question 8a

Better responses gave valid differentiating points between amorphous and crystalline solids with correct examples of each. The differences were based on shape, arrangement of particles, cleavage planes, symmetry, melting points etc.

Example

S. No.	Amorphous Solid	Crystalline Solid
1.	They have irregular shape.	They have geometrical or 3 Dimensional shape.
2.	They are unsymmetric.	They are symmetric.
3.	They donot have high & fixed heat of fusion. OR They have low heat of fusion.	They have high & fixed heat of fusion
4.	They donot breakout at a cleavage planes.	They break out at a cleavage planes.
5.	They donot have fixed boiling and melting Point. They melt and boil at very wide range.	They have fixed boiling and melting point
Example:	Rubber, Plastic, glass	Diamond, NaCl

Weaker responses showed lack of understanding of amorphous and crystalline solids. Candidates were not able to differentiate between the two and put forth points with reference to metals and non-metals with their respective examples. Hardly 1 or 2 basic characteristics such as of shape and melting point were observed in few cases with the common example of diamond in case of crystalline solids.

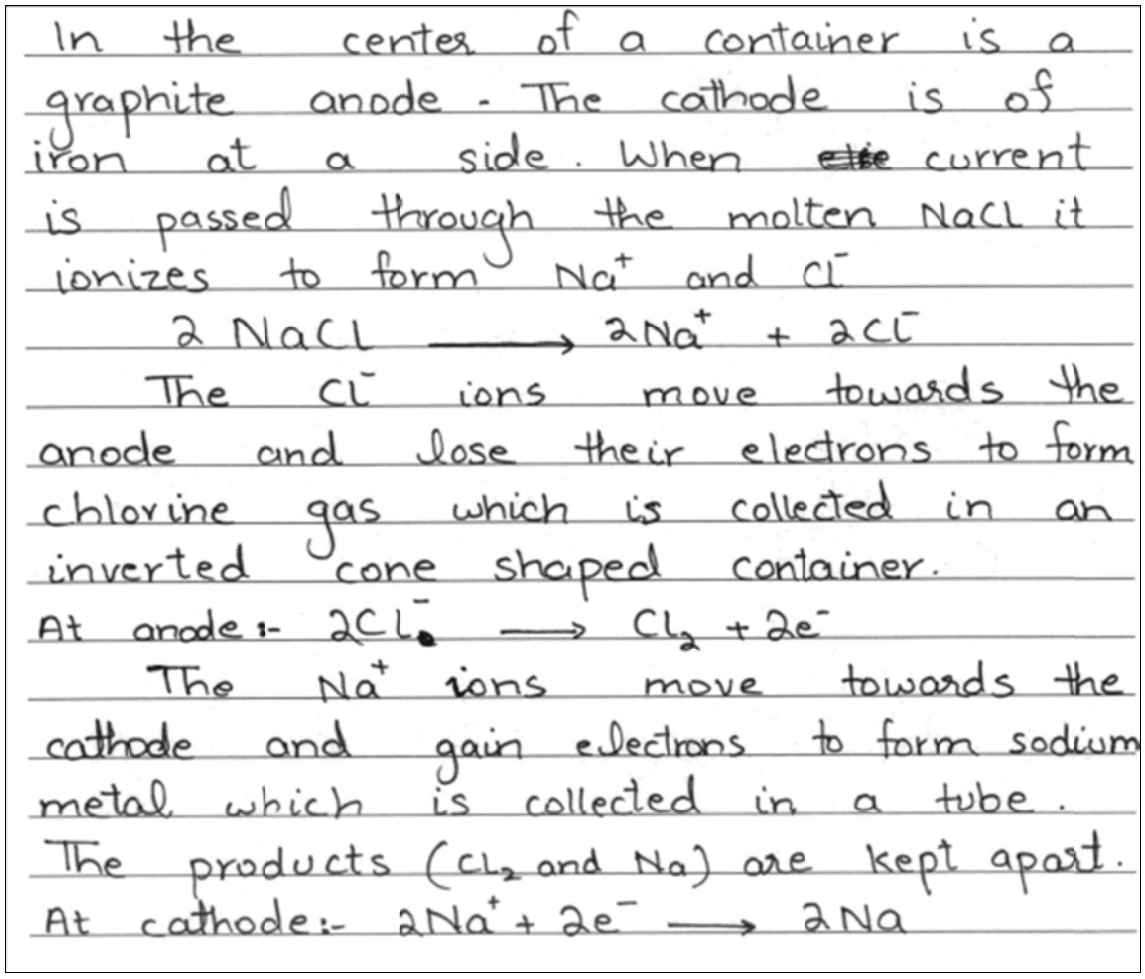
Example

S. No.	Amorphous Solid	Crystalline Solid
1.	It donot form three dimensional shape.	It form three dimensional shape.
2.	Amorphous solids are used in some works.	crystaline solids are used in many works.
3.	Amorphous solids are Not much Expensive.	crystalline solids are very much Expensive.
4.	Amorphous solids are found easily	crystaline solids are found diffi-cultly.
5.	It have low melting and Boiling point	It have high melting and Boiling Point.
Example:	lime stone.	Diamond

Question 8b

Better responses gave detailed construction of down's cell mentioning anode and cathode. They described the redox reactions occurring at both electrodes and were able to produce correct chemical equations showing the formation of sodium metal as product and chlorine gas as by-product.

Example


In the center of a container is a graphite anode - The cathode is of iron at a side. When ~~the~~ current is passed through the molten NaCl it ionizes to form Na^+ and Cl^-

$2NaCl \longrightarrow 2Na^+ + 2Cl^-$

The Cl^- ions move towards the anode and lose their electrons to form chlorine gas which is collected in an inverted cone shaped container.

At anode :- $2Cl^- \longrightarrow Cl_2 + 2e^-$

The Na^+ ions move towards the cathode and gain electrons to form sodium metal which is collected in a tube.

The products (Cl_2 and Na) are kept apart.

At cathode :- $2Na^+ + 2e^- \longrightarrow 2Na$

Weaker responses were not able to give complete description regarding the construction of Down's cell. They only identified anode as positive and cathode as negative electrodes. They showed ionization of sodium chloride but couldn't proceed further revealing some confusion in concepts of oxidation-reduction. In few cases along with sodium metal liberation of hydrogen gas was mentioned.

Example

The Sodium chloride is separated by the Down cell

construction of Down cell:-

The Down cell consist of Furnace with a stell gauze that separated the anode and cathode and inside the Furnace is cathode and outside the Furnace is the anode.

Working of Down cell:-

First NaCl is outside the Furnace and by the chemical reaction "Na" and "Cl" separated "Na" go to anode and the "Cl" go to the cathode

So by this process ~~the~~ Na is separated to the "Cl" and Cl is change into "Cl_2" inthe bubble Form.

The equation of this chemical is →

$$NaCl \longrightarrow Na^{+} + Cl^{-}$$