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

Introduction

This document has been produced for the teachers and candidates of SSC Part II (Class X) Chemistry. It contains comments on candidates' responses to the 2014 Secondary School Certificate (SSC-II) 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.

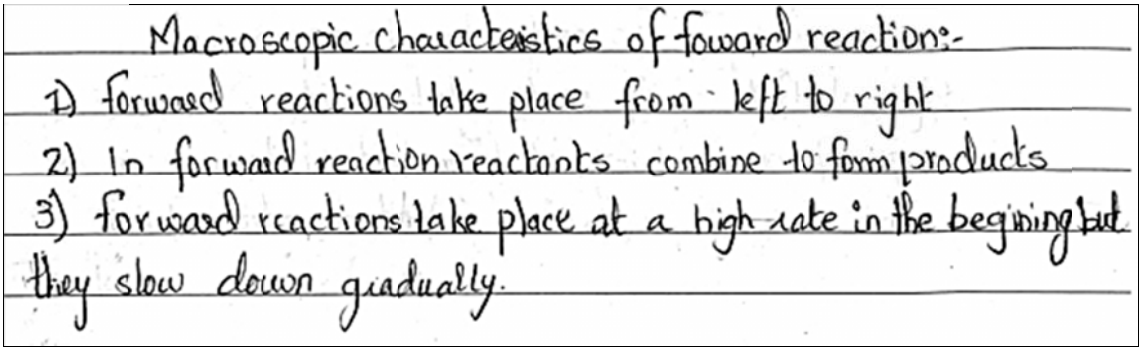
Teachers and candidates should be aware that examiners may ask questions that address the Student Learning Outcomes (SLOs) in a manner that require candidates to respond by integrating knowledge, understanding and application skills they have developed during the course of study. Candidates are advised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

Question 1

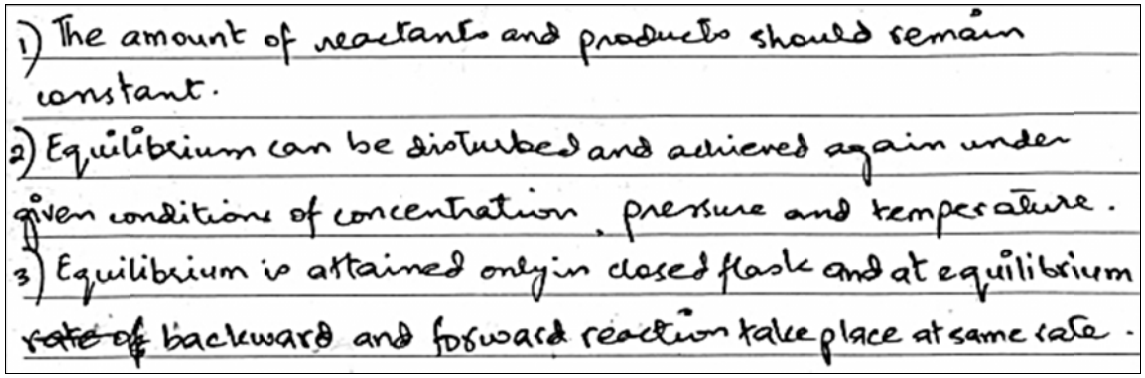
Better responses gave characteristics of a forward reaction highlighting direction, representation and rate of the reaction.

Example


Macroscopic characteristics of foward reaction:-
1) forward reactions take place from left to right
2) In forward reaction reactants combine to form products
3) forward reactions take place at a high rate in the beginning but they slow down gradually.

Weaker responses were unable to identify forward reaction as irreversible reaction. These responses focused on the characteristics of a reversible reaction or dynamic equilibrium.

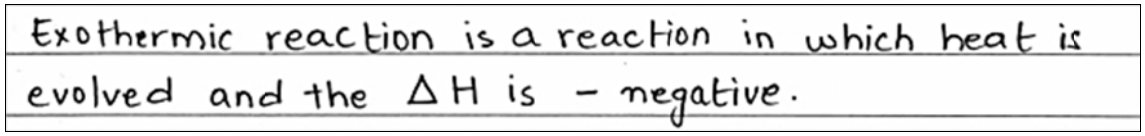
Example



Question 2a

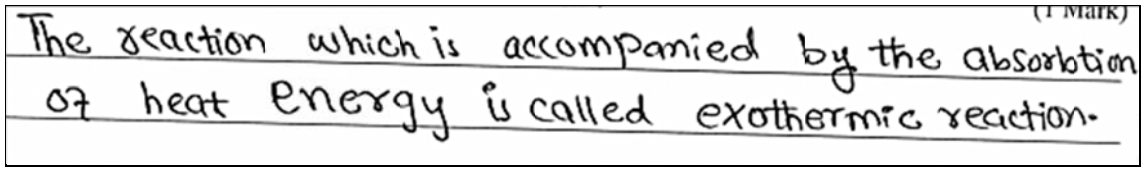
Better responses gave the correct definition of exothermic reaction which included understanding with reference to release of heat energy and negative value of ΔH.

Example



Weaker responses showed confusion between exothermic and endothermic reactions. Mostly the definition included absorption of heat energy with the positive sign of ΔH.

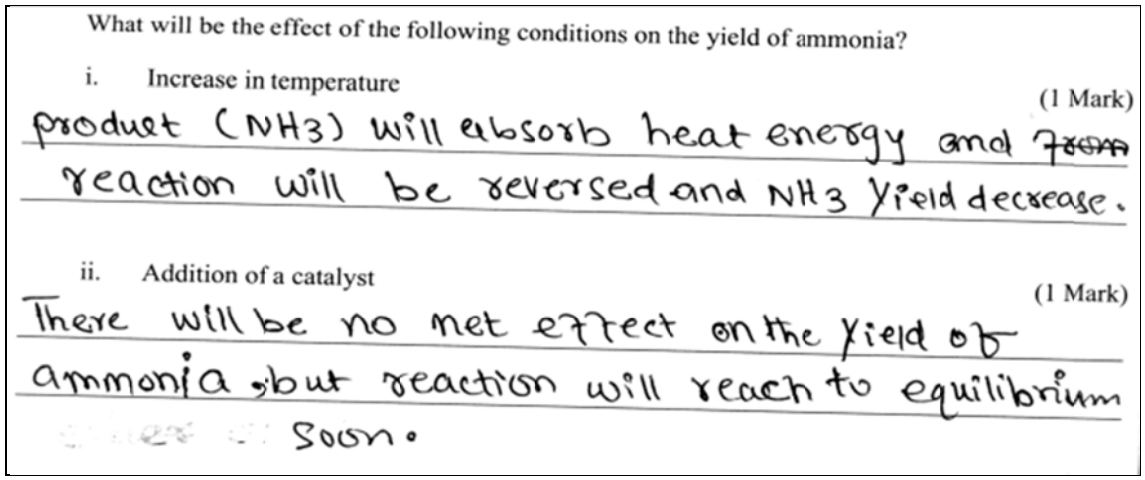
Example



Question 2b

Better responses clearly stated that the yield of ammonia will decrease with the rise in temperature as it is an exothermic reaction. However, the addition of a catalyst will only increase the rate of both reactions but would have no effect on the yield of ammonia which will neither increase nor decrease.

Example



What will be the effect of the following conditions on the yield of ammonia?

i. Increase in temperature (1 Mark)

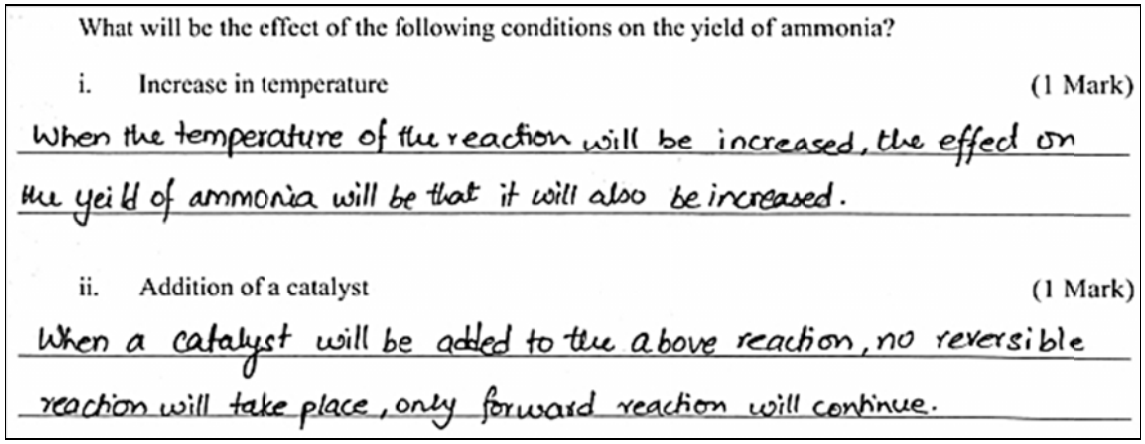
product (NH_3) will absorb heat energy and ~~from~~ reaction will be reversed and NH_3 yield decrease.

ii. Addition of a catalyst (1 Mark)

There will be no net effect on the yield of ammonia ,but reaction will reach to equilibrium soon.

Weaker responses showed the increase in yield of ammonia in both cases which revealed their lack of understanding of the concept of chemical equilibrium (Le-Chatelier's principle).

Example



What will be the effect of the following conditions on the yield of ammonia?

i. Increase in temperature (1 Mark)

When the temperature of the reaction will be increased, the effect on the yeild of ammonia will be that it will also be increased.

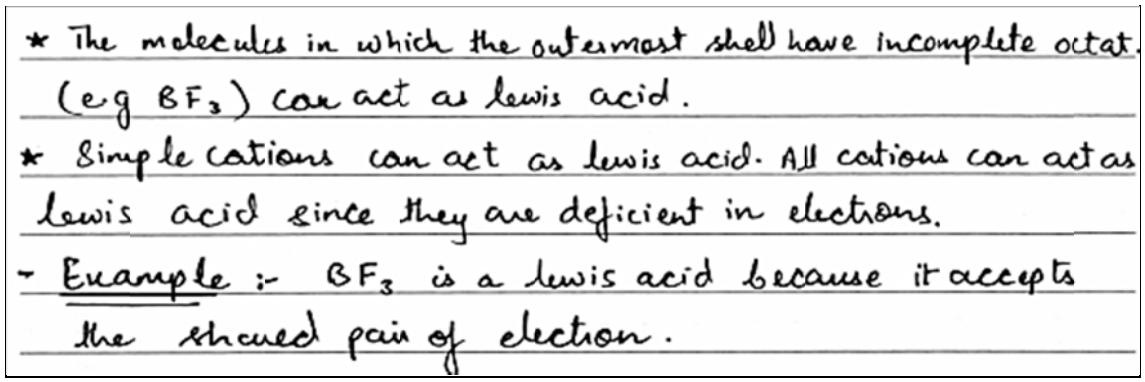
ii. Addition of a catalyst (1 Mark)

When a catalyst will be added to the above reaction, no reversible reaction will take place, only forward reaction will continue.

Question 3

Better responses were able to identify both species; the electron deficient cations and those molecules in which the central atom has incomplete octet as Lewis acids. Furthermore, they gave correct example of a Lewis acid.

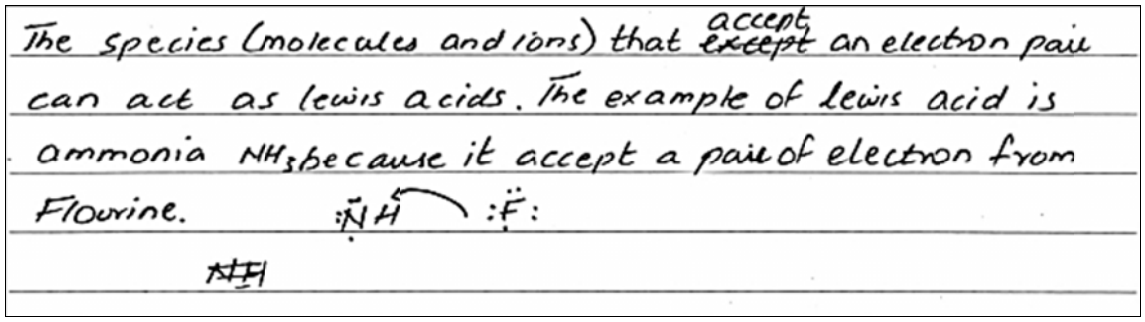
Example



* The molecules in which the outermost shell have incomplete octat. (e.g BF_3) can act as lewis acid.
* Simple cations can act as lewis acid. All cations can act as lewis acid since they are deficient in electrons.
- Example :- BF_3 is a lewis acid because it accepts the shared pair of election.

Weaker responses gave only the definition of Lewis acid without in-depth explanation of the two different species. They even failed to give relevant examples.

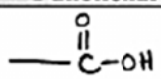
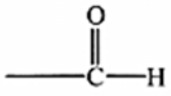
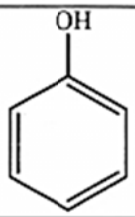
Example



Question 4

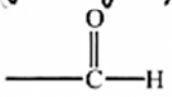
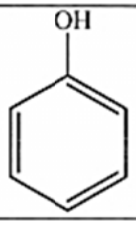
Better responses showed the completion of the given table with relevant information as per the clues given.

Example

Reaction in Test Tube	Result	Functional group
2.0 cm^3 of 5% $NaHCO_3$ + a pinch of organic compound	Carbon dioxide gas evolves with effervescence	
Equal volumes of Fehling's solution A and B + a pinch of organic compound + boil for five minutes	Brick red precipitates are formed	
Add phenol + ferric chloride solution & wait for few minutes.	Formation of voilet-purple solution	

Weaker responses were able to identify only one of the three given blanks. The lack of knowledge regarding the tests for functional groups was surprising as this concept is not only learnt in theory but also practiced in laboratory as part of the practical activity.

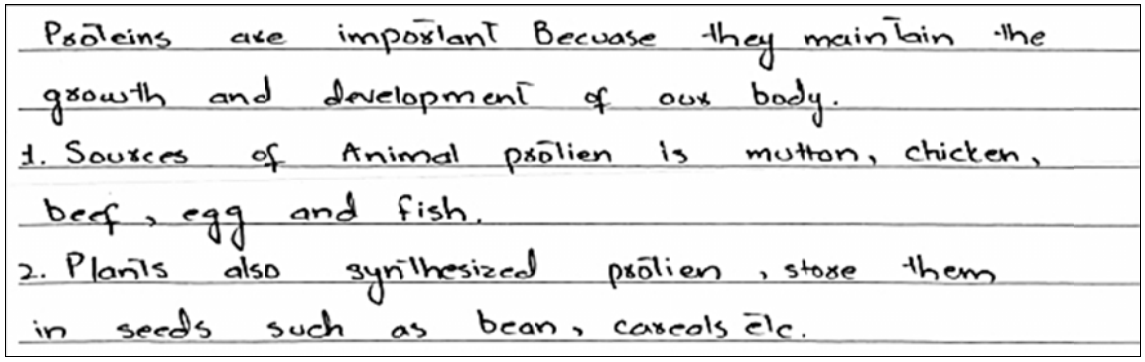
Example

Reaction in Test Tube	Result	Functional group
2.0 cm^3 of 5% $NaHCO_3$ + a pinch of organic compound	Carbon dioxide gas evolves with effervescence	R–C(=O)–H Aldehydic group.
Equal volumes of Fehling's solution A and B + a pinch of organic compound + boil for five minutes	Formation of red precipitates.	
Dissolve KMnO4 sol with water in test tube.	Formation of voilet-purple solution	

Question 5

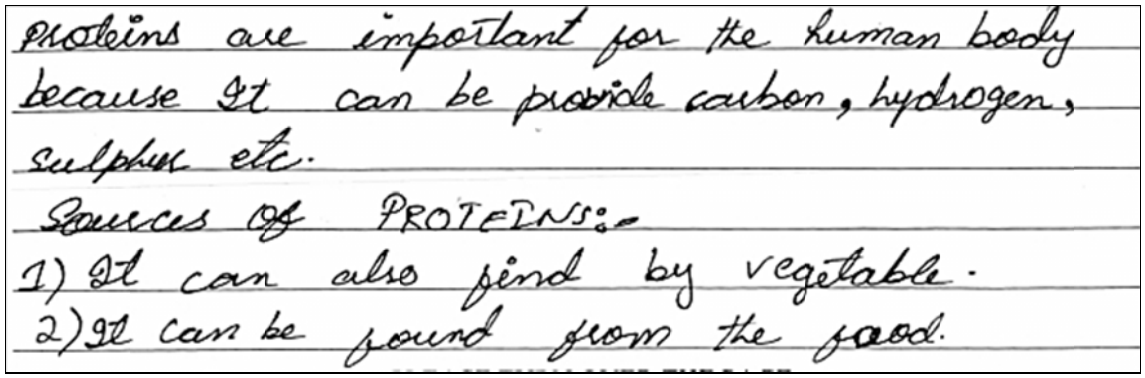
Better responses gave the correct importance of proteins for the human body with reference to growth and development of the body, formation of protoplasm and repair of damaged cells and tissues etc. Moreover, these responses depicted the correct sources of proteins.

Example


Proteins are important Because they maintain the growth and development of our body.
1. Sources of Animal protien is mutton, chicken, beef, egg and fish.
2. Plants also synthesized protien, store them in seeds such as bean, cereals etc.

Weaker responses gave the composition of proteins with a general statement that these are beneficial for the body but specifically couldn't give the exact significance as for what purpose are they required in the body. Furthermore, only one source of protein was mentioned in such responses.

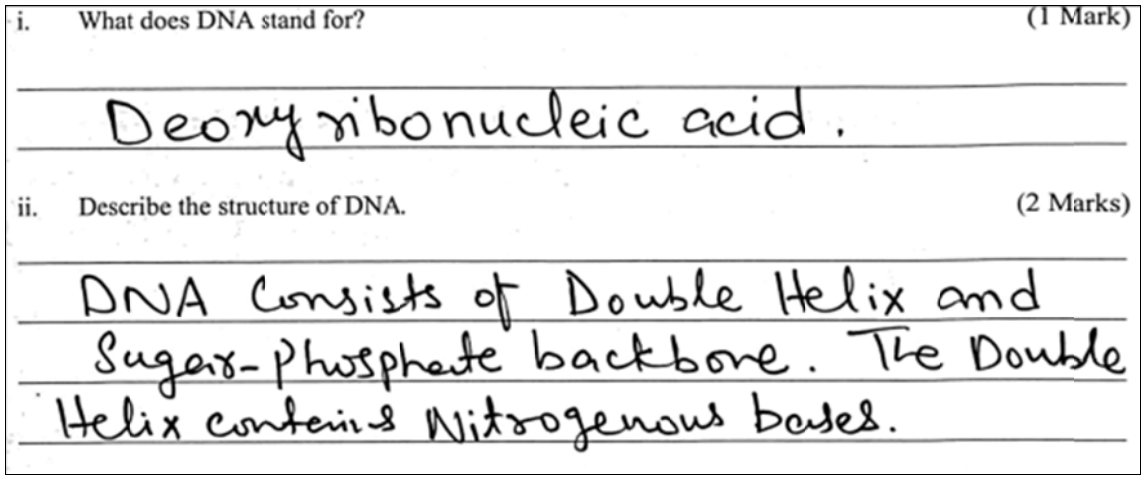
Example


Proteins are important for the human body because It can be provide carbon, hydrogen, sulphur etc.
Sources of PROTEINS:-
1) It can also find by vegetable.
2) It can be found from the food.

Question 6

Better responses identified the full form of DNA and described its structure by giving points like DNA consists of deoxyribose sugar, it is long double stranded molecule consisting of two chains, the chains are wrapped around each other in a double helix form and each chain is made up of sugar, phosphate and a base etc.

Example


i. What does DNA stand for? (1 Mark)

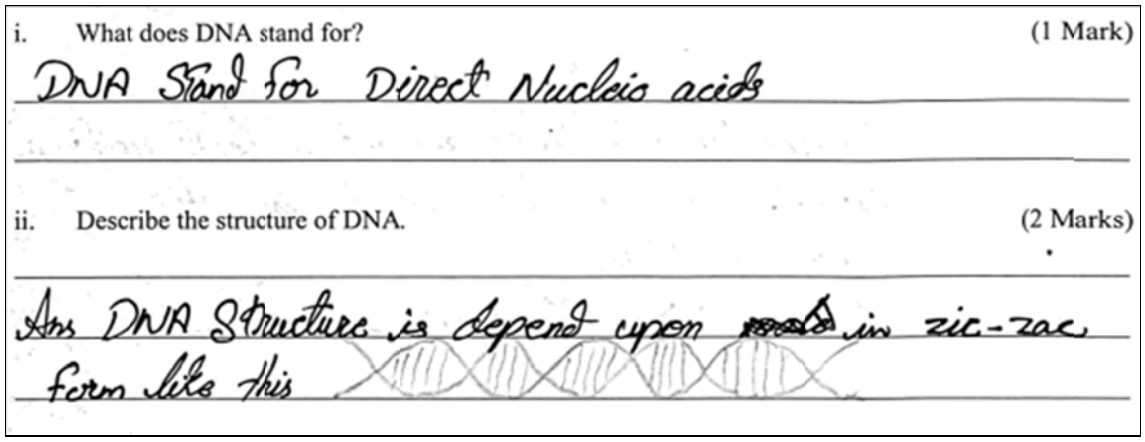
Deoxyribonucleic acid.

ii. Describe the structure of DNA. (2 Marks)

DNA Consists of Double Helix and Sugar-Phosphate backbone. The Double Helix contains Nitrogenous bases.

Weaker responses gave incorrect full form of DNA such as dinuclide acid. Their description about the structure of DNA also showed lack of clarity of concept for example DNA is a double helix structure which are made up of pair of chromosomes.

Example


i. What does DNA stand for? (1 Mark)

DNA Stand for Direct Nucleic acids

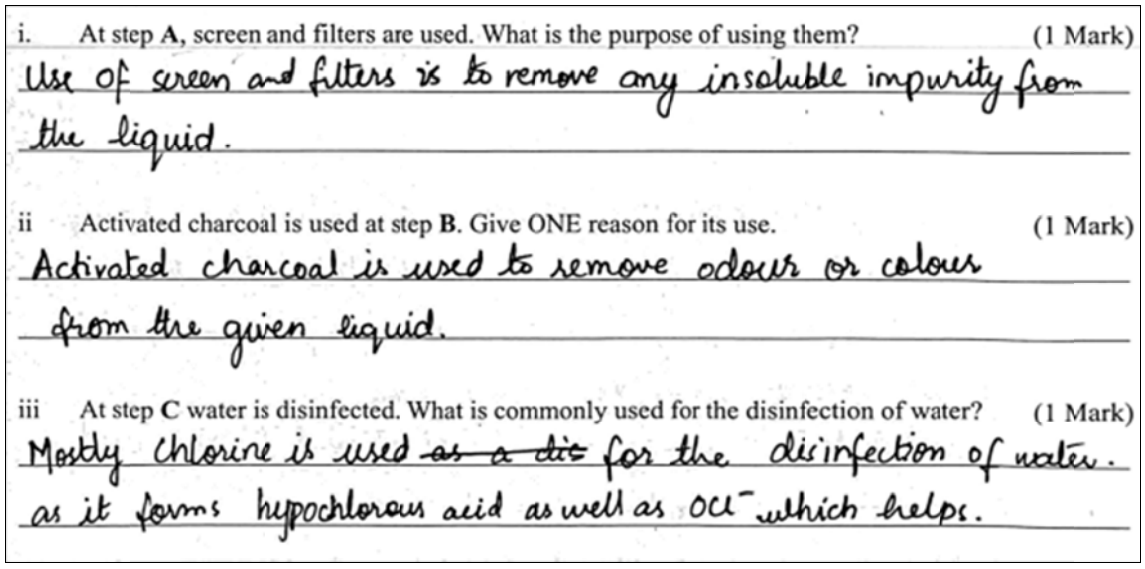
ii. Describe the structure of DNA. (2 Marks)

Ans DNA Structure is depend upon [redacted] in zic-zac form like this

Question 7

Better responses mentioned the correct use of screen, filters and activated charcoal in the treatment of water at water works as shown in the figure. They also identified chlorine, ultraviolet radiations and ozone as disinfectants used for the disinfection of water.

Example


i. At step **A**, screen and filters are used. What is the purpose of using them? (1 Mark)

Use of screen and filters is to remove any insoluble impurity from the liquid.

ii Activated charcoal is used at step **B**. Give ONE reason for its use. (1 Mark)

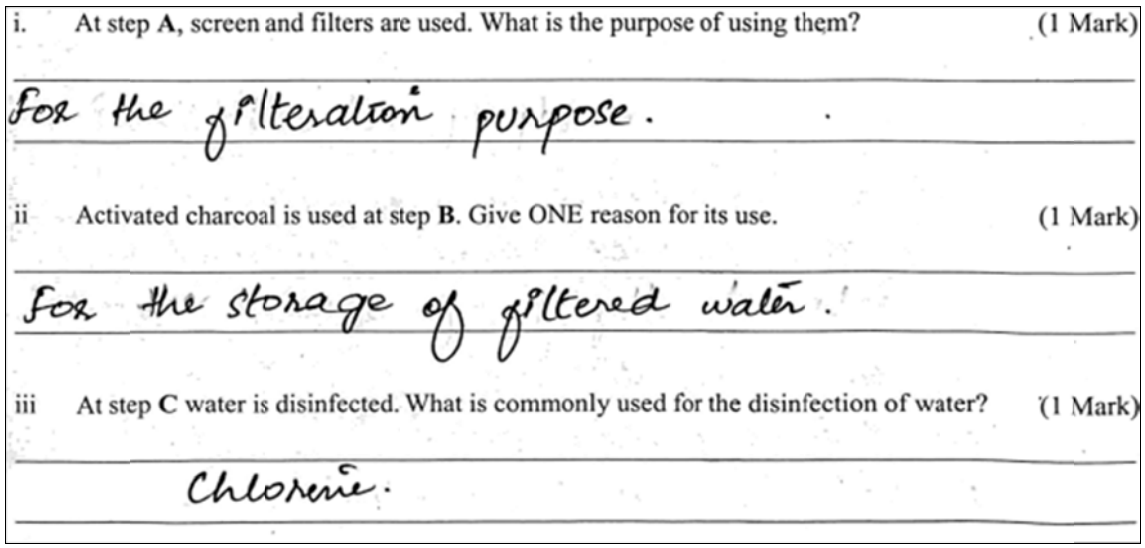
Activated charcoal is used to remove odour or colour from the given liquid.

iii At step **C** water is disinfected. What is commonly used for the disinfection of water? (1 Mark)

Mostly Chlorine is used ~~as a dis~~ for the disinfection of water. as it forms hypochlorous acid as well as OCl^- which helps.

Weaker responses couldn't reveal the use of screen, filters and activated charcoals. However, they identified the correct disinfectant.

Example


i. At step **A**, screen and filters are used. What is the purpose of using them? (1 Mark)

For the filteration purpose.

ii Activated charcoal is used at step **B**. Give ONE reason for its use. (1 Mark)

For the storage of filtered water.

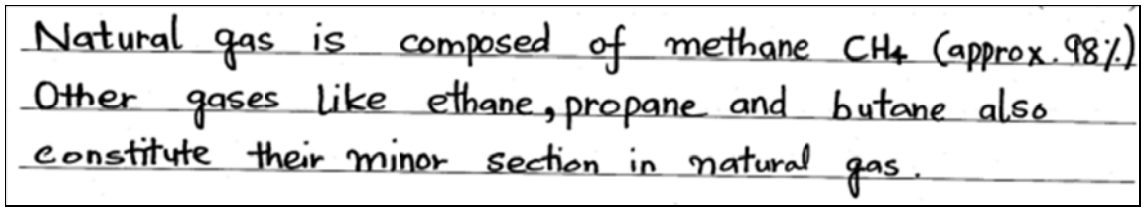
iii At step **C** water is disinfected. What is commonly used for the disinfection of water? (1 Mark)

Chlorine.

Question 8a

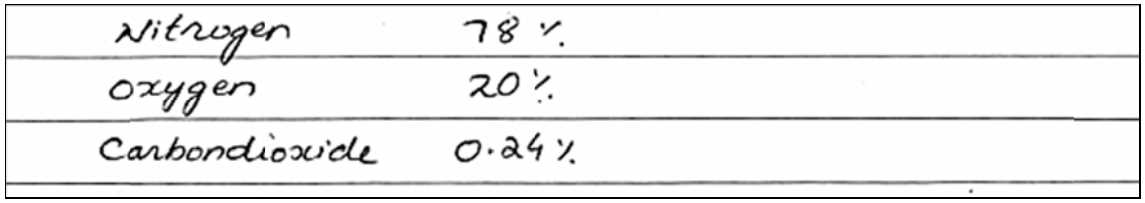
Better responses gave the complete composition of natural gas. These responses highlighted methane as the major constituent with ethane, propane, butane and sulphur compounds as the minor constituents forming natural gas.

Example


Natural gas is composed of methane CH_4 (approx. 98%) Other gases like ethane, propane and butane also constitute their minor section in natural gas.

Weaker responses mentioned the composition of air and formation of natural gas against the question asked. This showed that candidates could not make a difference between the terms natural gas and air as well as formation and composition of natural gas.

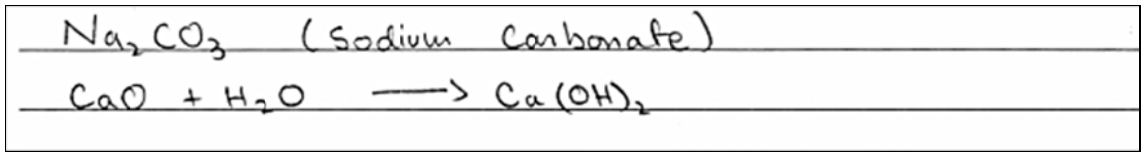
Example



Question 8b

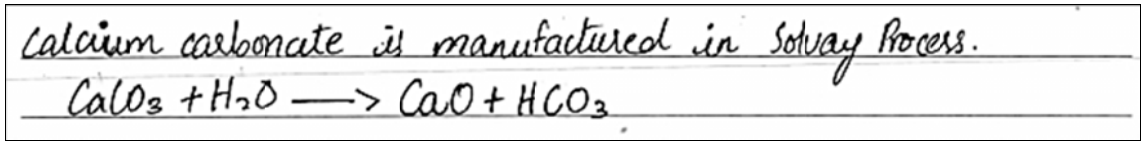
Better responses identified sodium carbonate or sodium bicarbonate as the product of Solvay process and were able to show the reaction of calcium oxide and water with the formation of calcium hydroxide.

Example



Weaker responses mentioned incorrect product and chemical equation which showed that candidates haven't studied the concept of Ammonia Solvay process in detail.

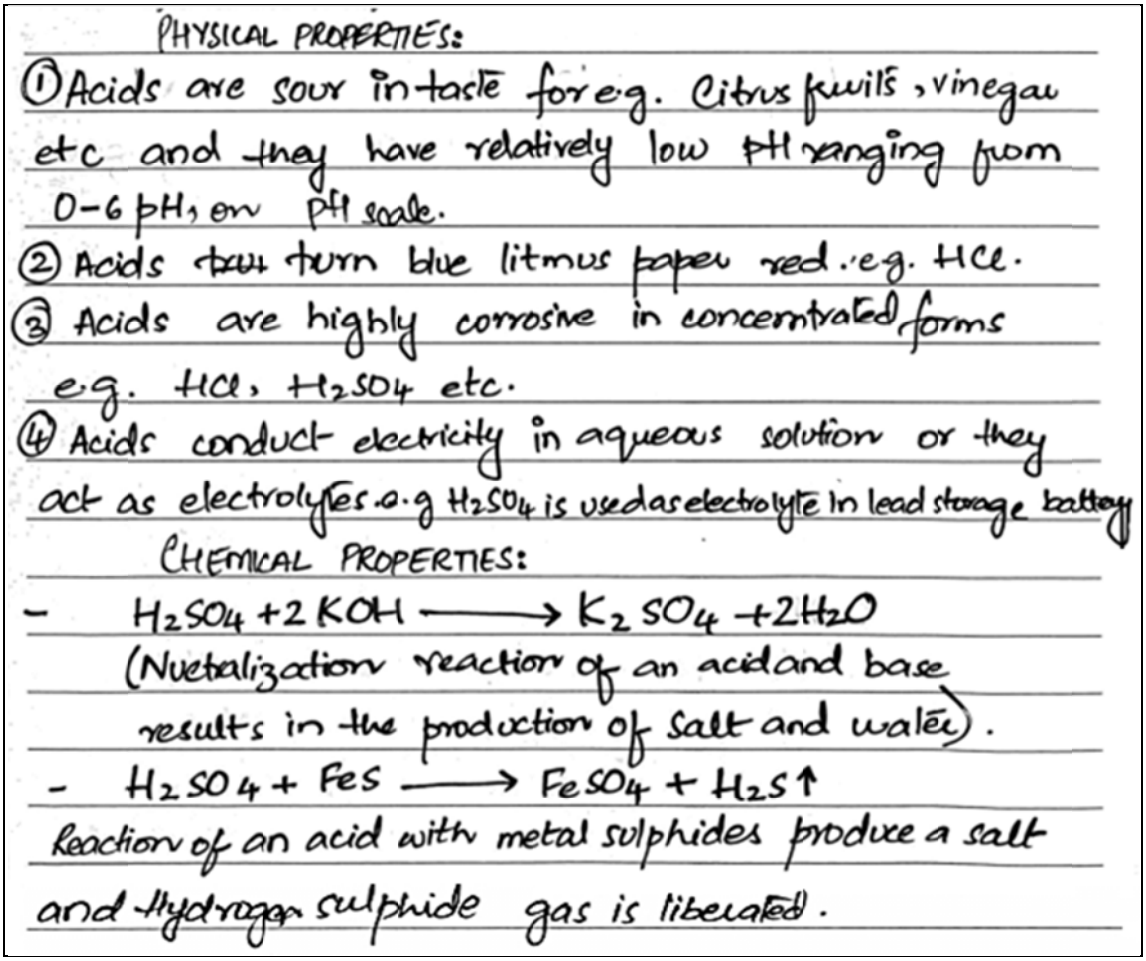
Example



Question 9a

Better responses wrote the correct physical properties of acids including taste, pH, solubility, conduction of electricity, corrosive nature etc. These responses also showed complete well balanced equations for both the given reactions.

Example



PHYSICAL PROPERTIES:

① Acids are sour in taste for e.g. Citrus fruits, vinegar etc and they have relatively low pH ranging from 0-6 pH, on pH scale.

② Acids turn blue litmus paper red. e.g. HCl.

③ Acids are highly corrosive in concentrated forms e.g. HCl, H_2SO_4 etc.

④ Acids conduct electricity in aqueous solution or they act as electrolytes. e.g H_2SO_4 is used as electrolyte in lead storage battery

CHEMICAL PROPERTIES:

- $H_2SO_4 + 2KOH \longrightarrow K_2SO_4 + 2H_2O$

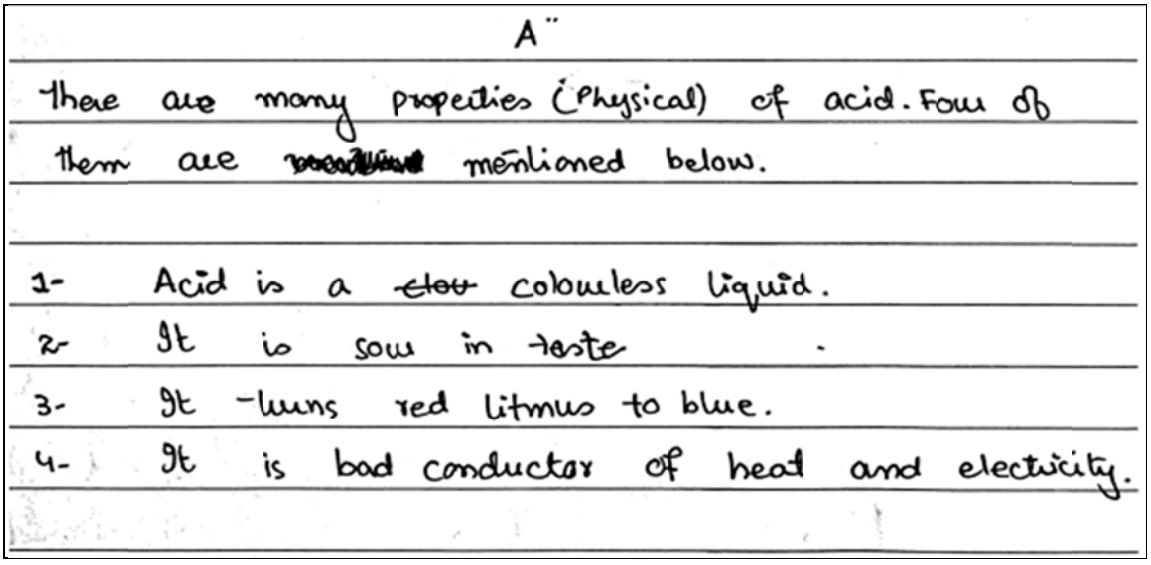
(Nuetalization reaction of an acid and base results in the production of salt and water).

- $H_2SO_4 + FeS \longrightarrow FeSO_4 + H_2S\uparrow$

Reaction of an acid with metal sulphides produce a salt and hydrogen sulphide gas is liberated.

Weaker responses either wrote uses of acids or showed confusion by jumbling the physical properties of acids and bases. They tried to write chemical equations for the given reactions but out of four products (two for each equation) only one, water was mostly correct.

Example



A"

There are many properties (Physical) of acid. Four of them are mentioned below.

1- Acid is a colourless liquid.

2- It is sour in taste.

3- It turns red litmus to blue.

4- It is bad conductor of heat and electricity.

: CHEMICAL EQUATIONS:

1- H_2SO_4 with Pottasium hydroxide:-

- $H_2SO_4 + KOH \longrightarrow KHSO_4 + H_2O$

2- H_2SO_4 with Ferous sulphide :-

- $H_2SO_4 + 2FeS \longrightarrow 2FeSO + (OH)_2$

Question 9b

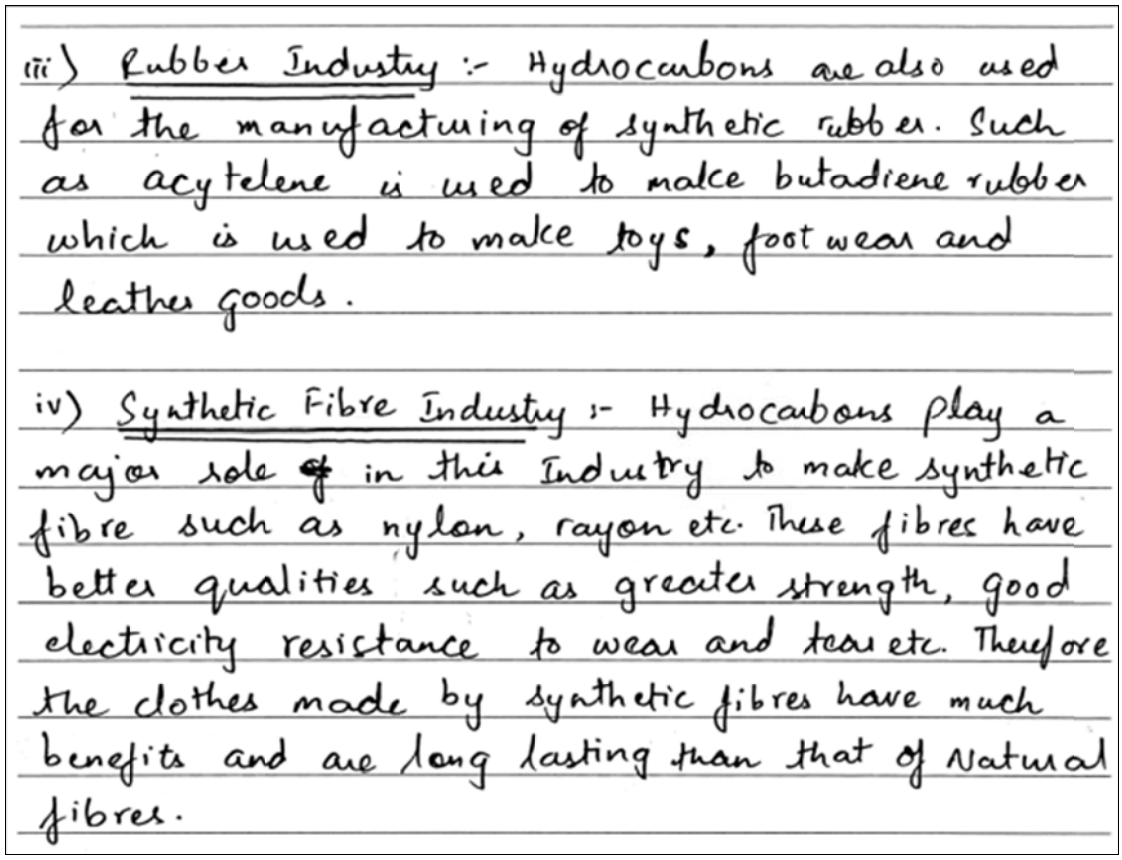
Better responses mentioned the names of products formed from hydrocarbons in each of the given industries with the common items manufactured from these products.

Example

(b)

i) Petrochemical industry :- The Major use of Hydro carbon is in this industry. The organic compounds obtained from the Hydrocarbons are the petrochemicals. such as (petroleum, natural gas). some of the important petrochemicals are methyl alcohol, ethyl alcohol, toluene etc. The products are mainly used as fuel.

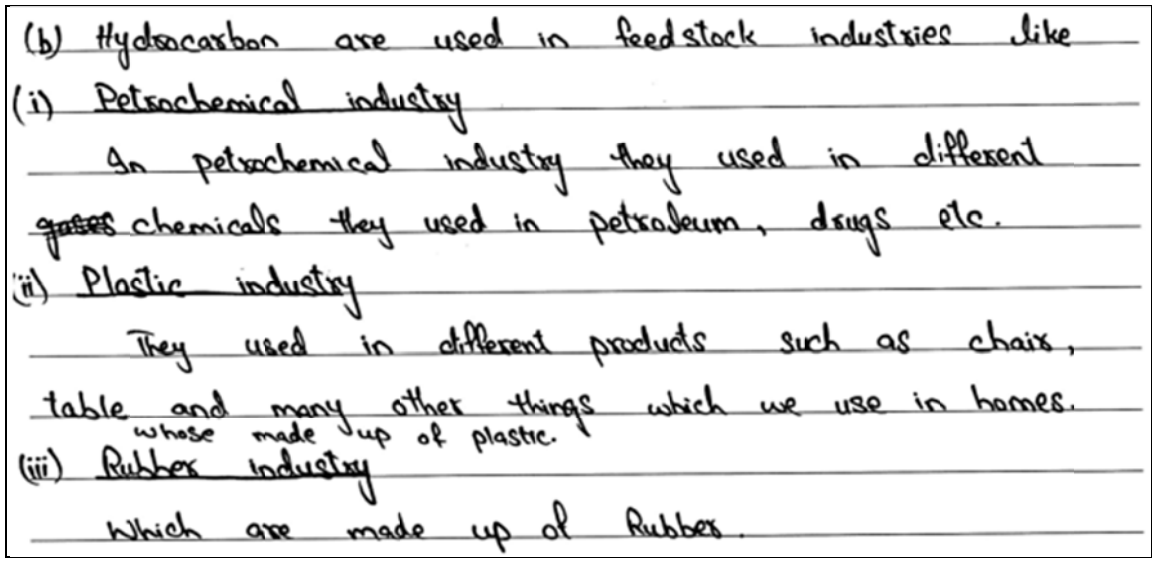
ii) Plastic industry :- Hydrocarbons are used as a raw material for the manufacturing of synthetic polymers known as plastic such as pla- polyesters. These can be given any shape when they are soft and on hardening make a durable article to be used in our daily lives. An example is of plastic chair which is given its shape in plastic industry.


(iii) Rubber Industry :- Hydrocarbons are also used for the manufacturing of synthetic rubber. Such as acytelene is used to make butadiene rubber which is used to make toys, foot wear and leather goods.

iv) Synthetic Fibre Industry :- Hydrocarbons play a major role ~~of~~ in this Industry to make synthetic fibre such as nylon, rayon etc. These fibres have better qualities such as greater strength, good electricity resistance to wear and tear etc. Therefore the clothes made by synthetic fibres have much benefits and are long lasting than that of Natural fibres.

Weaker responses wrote a general description of the utilization of hydrocarbons in each of these industries. These responses got common items correct and that too mostly in case of plastic and rubber industries.

Example


(b) Hydrocarbon are used in feedstock industries like

(i) Petrochemical industry

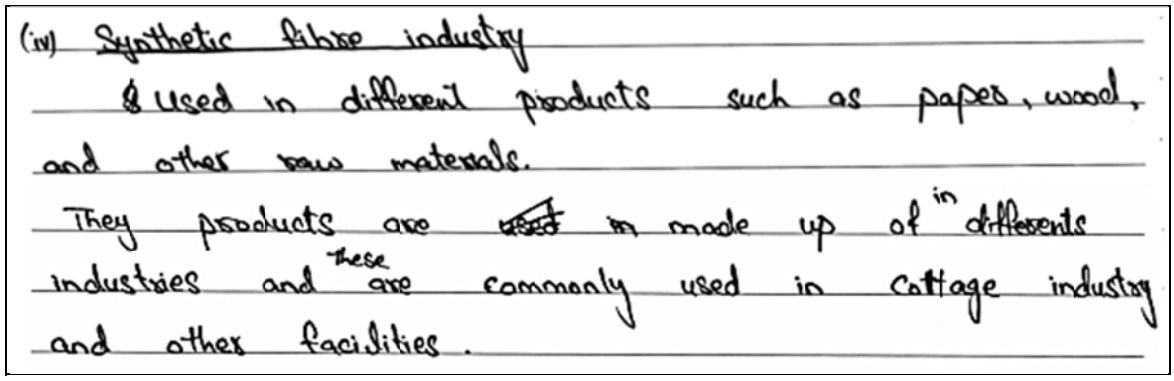
In petrochemical industry they used in different ~~gases~~ chemicals they used in petroleum, drugs etc.

(ii) Plastic industry

They used in different products such as chairs, table and many other things which we use in homes. whose made up of plastic.

(iii) Rubber industry

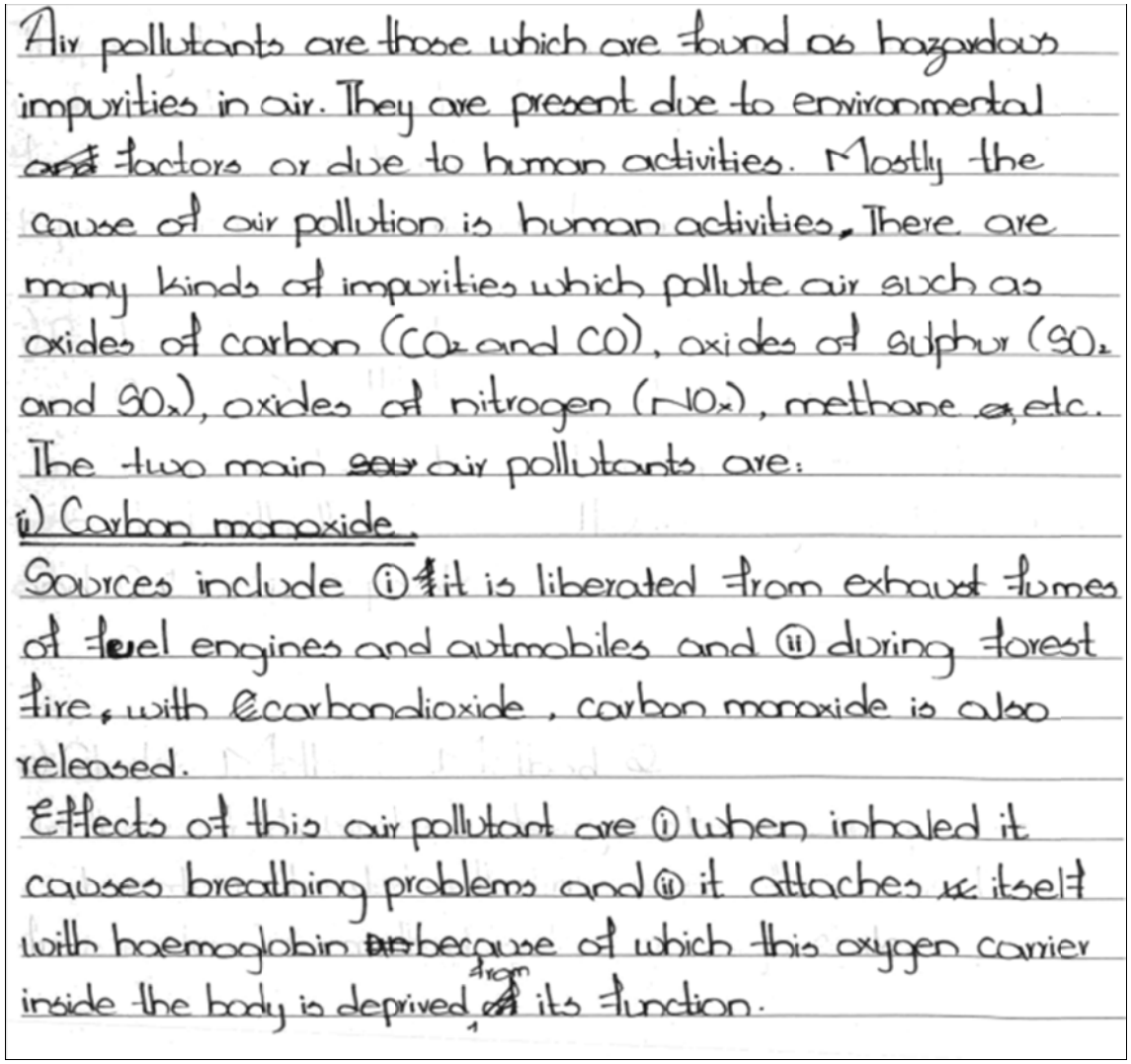
which are made up of Rubber.


(iv) Synthetic fibre industry
& used in different products such as papers, wood, and other raw materials.
They products are ~~used~~ made up of in different industries and these are commonly used in cottage industry and other facilities.

Question 10a

Better responses gave sources of sulphur dioxide and carbon monoxide with their correct effects. The sources mentioned in these responses were volcanic eruptions, combustion of fossil fuels and forest fires. Effects chalked out for sulphur dioxide were suffocation, severe respiratory problems and acid rain whereas those for carbon monoxide were headache, fatigue, nausea and breathing difficulties etc.

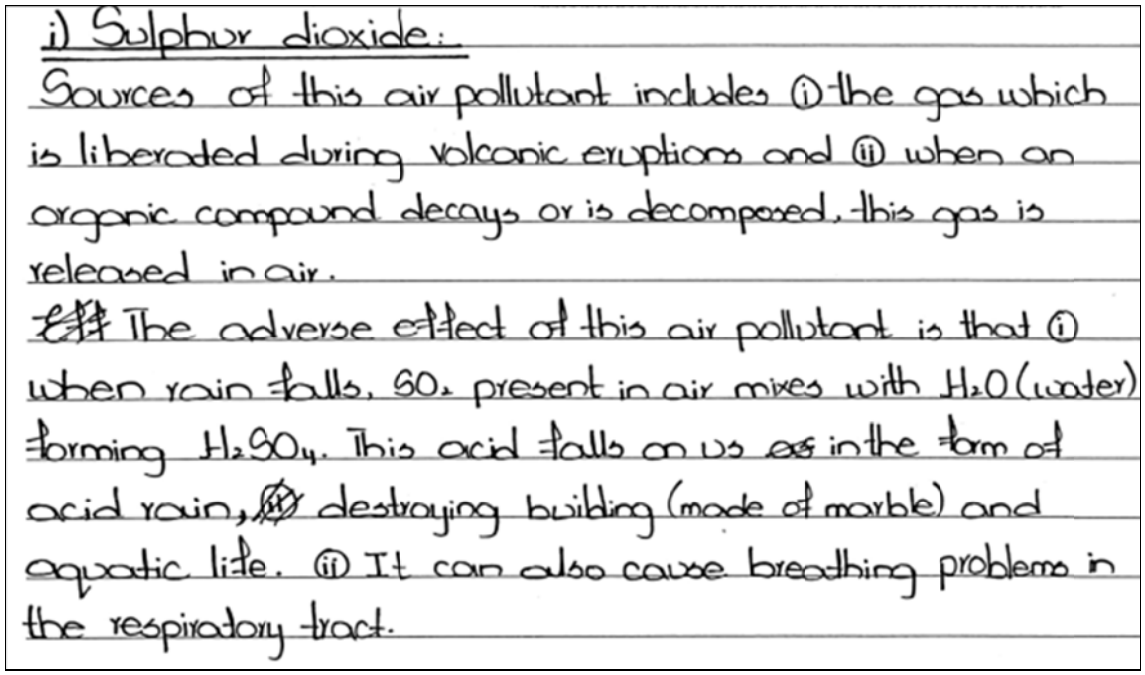
Example


Air pollutants are those which are found as hazardous impurities in air. They are present due to environmental ~~and~~ factors or due to human activities. Mostly the cause of air pollution is human activities. There are many kinds of impurities which pollute air such as oxides of carbon (CO_2 and CO), oxides of sulphur (SO_2 and SO_3), oxides of nitrogen (NO_x), methane ~~e~~, etc. The two main ~~sour~~ air pollutants are:

i) Carbon monoxide.

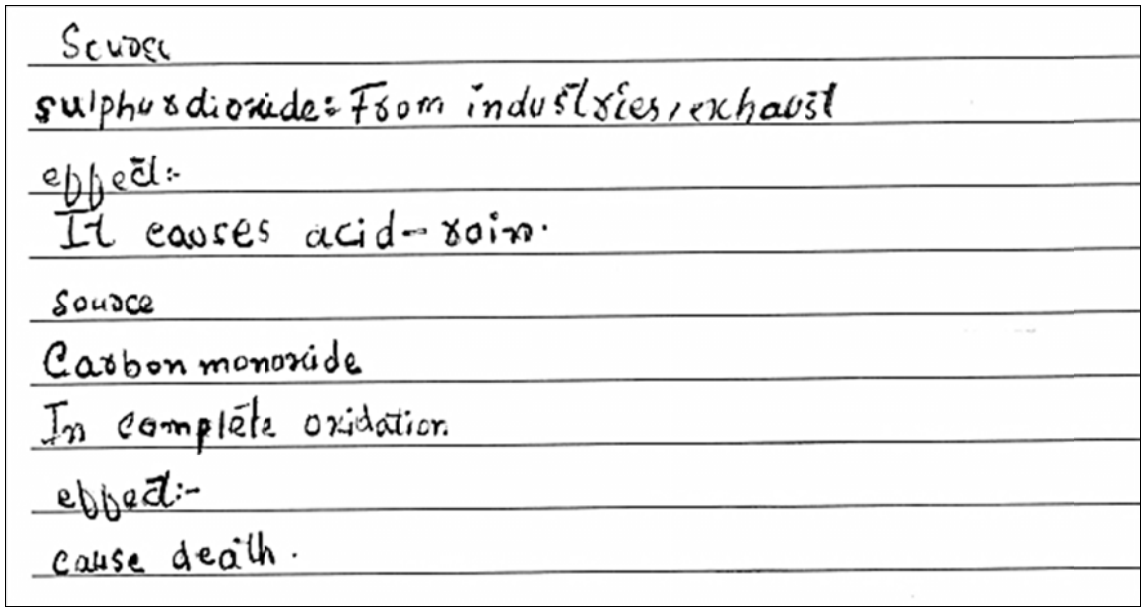
Sources include (i) it is liberated from exhaust fumes of fuel engines and automobiles and (ii) during forest fire, with carbondioxide, carbon monoxide is also released.

Effects of this air pollutant are (i) when inhaled it causes breathing problems and (ii) it attaches itself with haemoglobin ~~in~~ because of which this oxygen carrier inside the body is deprived from its function.



Weaker responses mostly mentioned one source and effect of sulphur dioxide. Moreover, these responses focused on the sources and effects of carbon dioxide rather than carbon monoxide which showed students haste in writing a response without properly reading what is actually asked in the question.

Example



Question 10b

Better responses showed detail understanding of the concept by highlighting the presence of bicarbonates of calcium and magnesium in temporary hard water. Furthermore, these responses clearly described with the help of chemical equations the process of boiling and Clark's method for the removal of temporary hardness from water.

Example

The water that does not produce lather with soap is called "Hard Water". There are two types of hardness Temporary hardness and Permanent hardness in water.

* The water that contains bicarbonates of calcium and magnesium, this is called "temporary hardness in water".

This hardness in water can be removed by following two methods:

1. Boiling: During boiling of water, the bicarbonates of calcium and magnesium breaks down into insoluble calcium and magnesium carbonate that precipitates out and the water become soft.

$$\Rightarrow Ca(HCO_3)_{2(aq)} \xrightarrow{heat} CaCO_{3(s)} + CO_{2(g)} + H_2O_{(l)}$$

$$\Rightarrow Mg(HCO_3)_{2(aq)} \xrightarrow{heat} MgCO_{3(s)} + CO_{2(g)} + H_2O_{(l)}$$

Carbondioxide escapes out of the water as it is a gas.

2. Clark's method: It is a chemical method in which slaked lime ($Ca(OH)_2$) is used to remove the temporary hardness in water. It is added in a calculated amount.

$$\Rightarrow Ca(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow 2CaCO_{3(s)} + 2H_2O_{(l)}$$

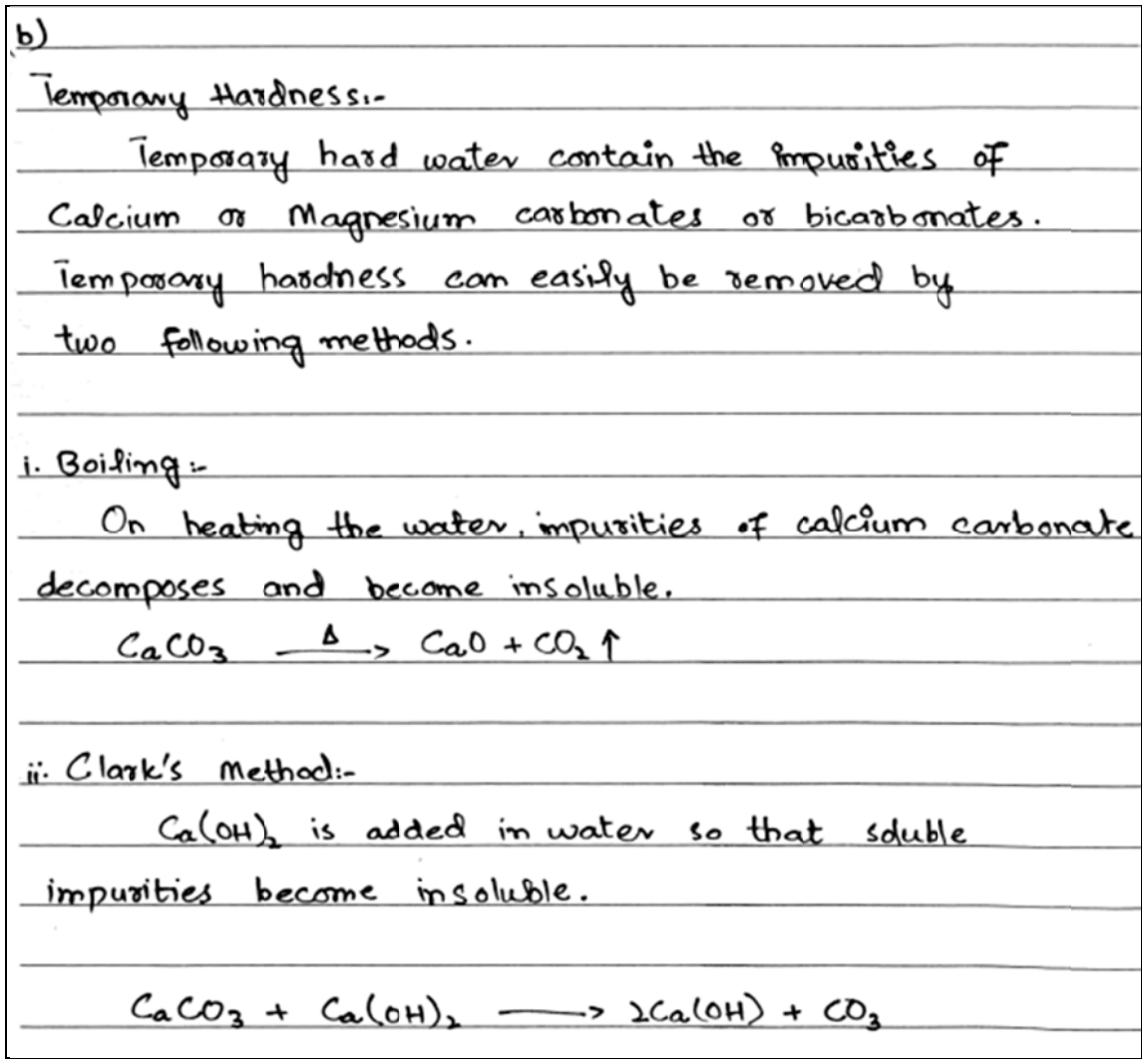
$$\Rightarrow Mg(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow MgCO_{3(s)} + CaCO_{3(s)} + 2H_2O_{(l)}$$

Once these carbonates ~~protip~~ precipitates out of the water the water become soft.

By these ~~two~~ two ways we can easily removed the temporary hardness in water.

Weaker responses mentioned presence of carbonates and bicarbonates of calcium and magnesium in temporary hard water. Most of the relevant information such as decomposition of calcium bicarbonate, formation of calcium carbonate with complete equations was missing. Rarely a few highlighted the addition of slaked lime in words or through incomplete equations with incorrect reactants.

Example



b)

Temporary Hardness:-

Temporary hard water contain the impurities of Calcium or Magnesium carbonates or bicarbonates. Temporary hardness can easily be removed by two following methods.

i. Boiling:-

On heating the water, impurities of calcium carbonate decomposes and become insoluble.

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2 \uparrow$

ii. Clark's Method:-

$Ca(OH)_2$ is added in water so that soluble impurities become insoluble.

$CaCO_3 + Ca(OH)_2 \longrightarrow 2Ca(OH) + CO_3$