Aga Khan University Examination Board

Notes from E-Marking Centre on HSSC-I Biology Examination May 2017

Introduction

This document has been produced for the teachers and candidates of Higher Secondary School Certificate (HSSC-I) Biology. It contains comments on candidates' responses to the 2017 HSSC-I Examination indicating the quality of the responses and highlighting their relative strengths and weaknesses.

E-Marking Notes

This includes overall comments on candidates' performance on every question and some specific examples of candidates' 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. However, 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 requires 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.

General Observations

Candidates who did not score well were mostly not able to understand the demand of the question, often missing out important information like ‘common characteristics’, ‘common action’ and ‘body form’. Furthermore, understanding of use of scientific terminology and interpretation of unseen diagrams and graphs was also weak. Nevertheless, candidates outdid in questions without stimulus. However, there is still room for improvement. Mentioned below are few concepts that teachers need to focus and give candidates more drill and practice to have a strong grip.

a. Concept of competitive inhibition by using different examples
b. Diagrams of representatives of different phyla of kingdom animalia
c. Concepts of the light independent reactions
d. Concept of countercurrent exchange in fish
e. Concept of humoral immunity
f. Illustration of DNA strands

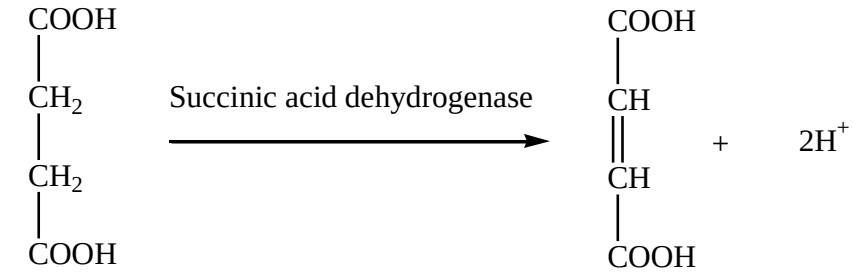
Detailed Comments:

Constructed Response Questions (CRQs)

Question 1a:

Consider the given reactions **I** and **II**

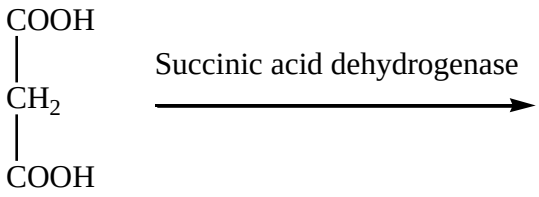
Reaction I



Succinic acid

Fumaric acid

Reaction II



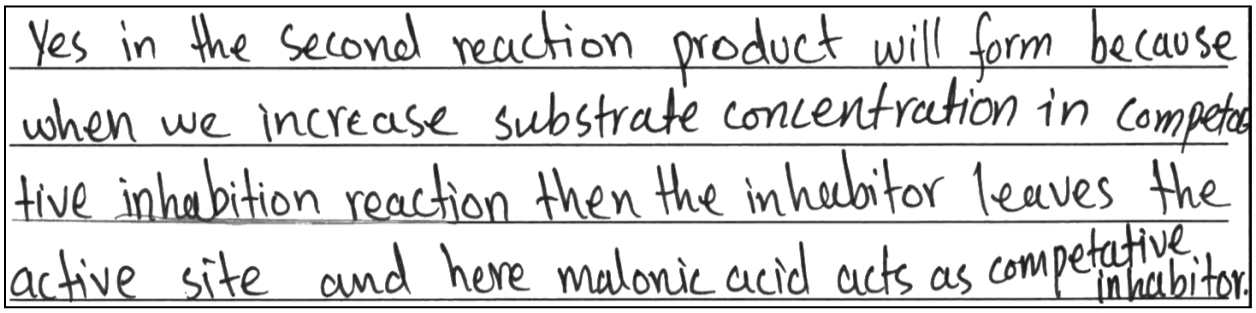
Malonic acid

No product formed

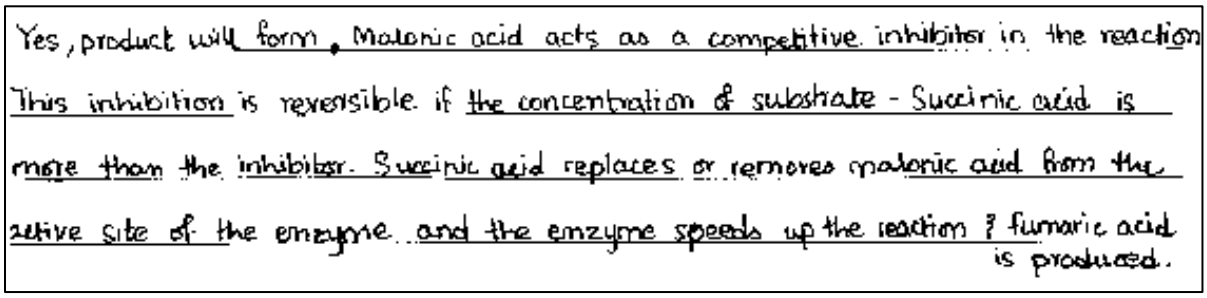
If succinic acid is added with malonic acid in reaction **II** and its quantity is 10 times that of malon malonic acid, will a product be formed? Justify your answer.

Better responses reflected clear understanding of the concept of competitive inhibition (reversible inhibition) by stating the formation of product in reaction II and writing the correct justification, i.e. increased concentration of succinic acid (the actual substrate) replaces malonic acid (inhibitor) or lowers the rate of inhibition.

Example 1:


Yes in the second reaction product will form because when we increase substrate concentration in competa tive inhabition reaction then the inhabitor leaves the active site and here malonic acid acts as competative inhabitor.

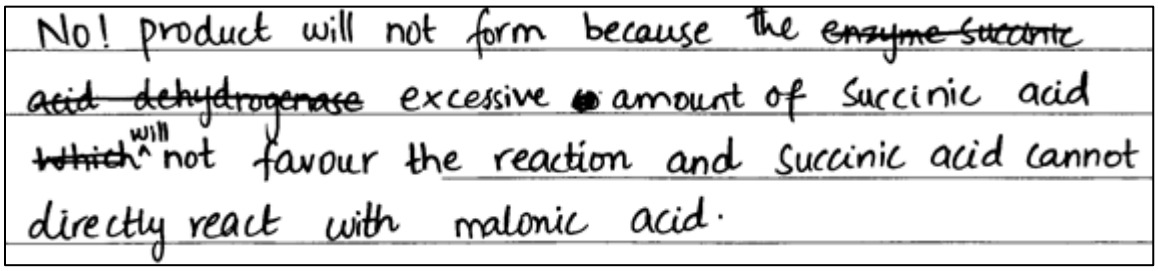
Example 2:



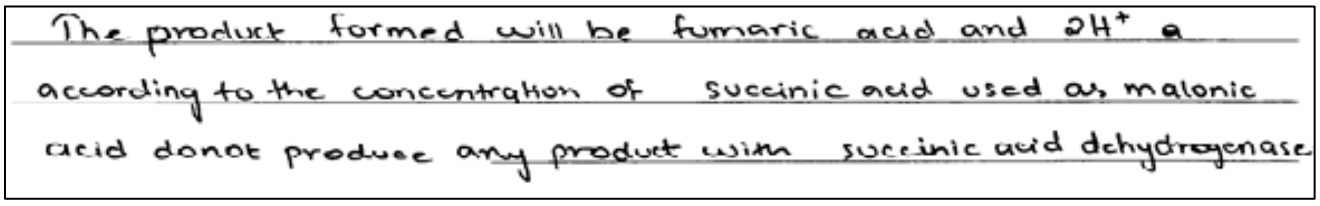
Weaker responses exhibited misunderstanding regarding the reactions given in the stimulus. Such responses were not able to extract the concept of competitive (reversible) inhibition from the given stimulus and they were not able to identify malonic acid as competitive inhibitor and succinic acid as actual substrate. 'Succinic acid dehydrogenase is not specific for the malonic acid' was the most frequently provided ambiguous justification for no product formation in the reaction II. Some of the other weaker responses provided irrelevant justifications for their answer, for example, both are acids therefore, they cannot react.

Structural similarity between succinic acid and molanic acid is evident in the given stimulus which navigates candidates to the correct answer. Candidates are advised to focus on the information provided in the stimulus before drafting their responses.

Example 1:

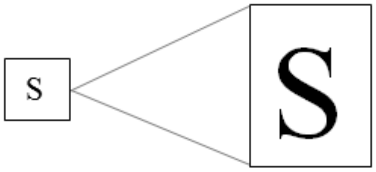


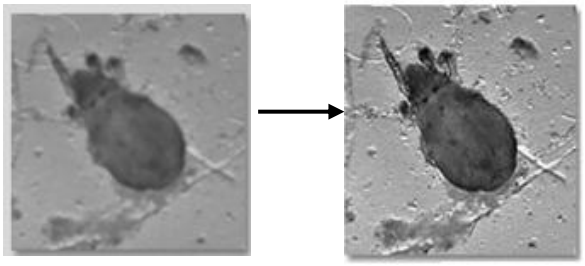
Example 2:



Question 1b:

The given diagrams show two features of the microscope. Identify these features.





DiagramI: _____ **Diagram II: _____**

Better responses identified correct features of microscope, i.e. magnification and resolution depicted by diagram I and II respectively.

Example:

Diagram I: Magnification **Diagram II:** Resolution

Weaker responses either identified incorrect features or used inappropriate scientific vocabulary for each feature. For example, 'enlargement' was used for magnification and 'focusing'/ 'clarity' was used for resolution.

Example 1:

Diagram I: Magnification **Diagram II:** Focus / focusing

Example 2:

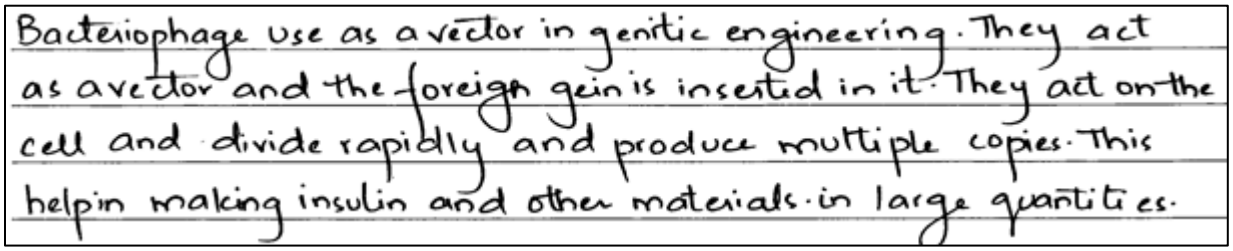
Diagram I: Showing larger image **Diagram II:** Showing clear image.

Question 2a:

Describe the use of bacteriophages in genetic engineering.

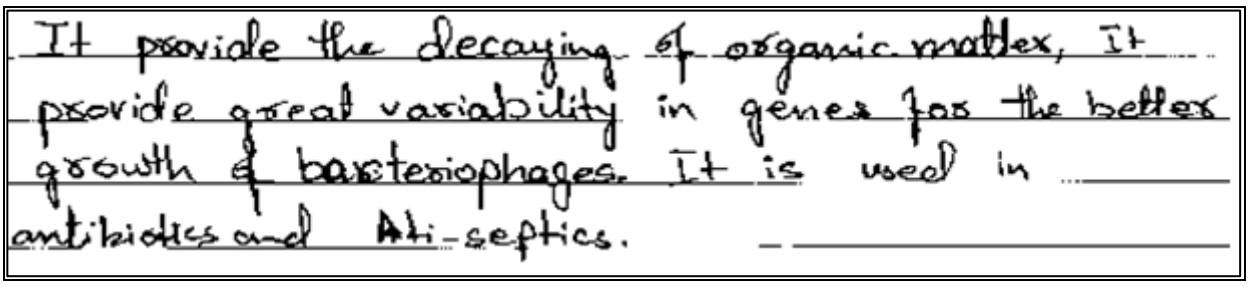
Better responses correctly described the use of bacteriophages in genetic engineering, i.e. bacteriophages are used as vectors. Moreover, such responses provided valid description of how and why they are used as vector, for example, use in recombinant DNA technology for cloning of the required genes/ for the production of insulin/ gene therapy/ production of transgenic organisms/ making multiple copies of DNA for genome library/ cloning or copies of genetically modified DNA fragments.

Example:


Bacteriophage use as a vector in genitic engineering. They act as a vector and the foreign gein is inseitid in it. They act on the cell and divide rapidly and produce multiple copies. This helpin making insulin and other materials in large quantities.

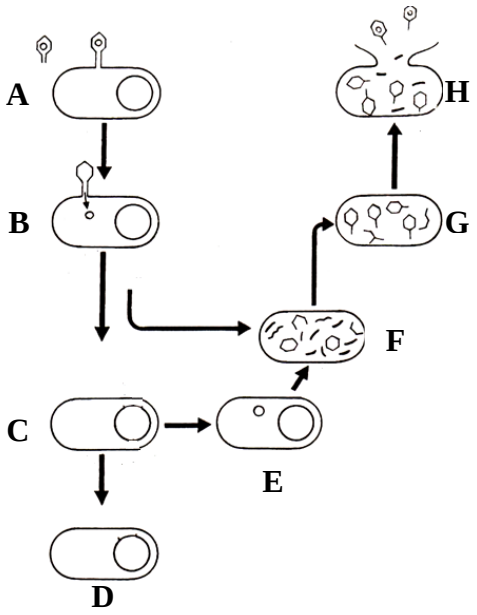
Weaker responses displayed lack of understanding of use of bacteriophage in genetic engineering. Such responses provided irrelevant use of bacteriophage, i.e. use to kill bacterial cell/ provide variety of gene/ provide medium for growth, etc. Some of the other responses described general properties of bacteriophages, for example, they kill/ infect bacteria/ replicate inside the host cell using host cell machinery etc.

Example:


It provide the decaying of organic matter, It provide great variability in genes for the better growth of bacteriophages. It is used in antibiotics and Ati-septics.

Question 2b:

The given diagram shows the life cycle of a bacteriophage.

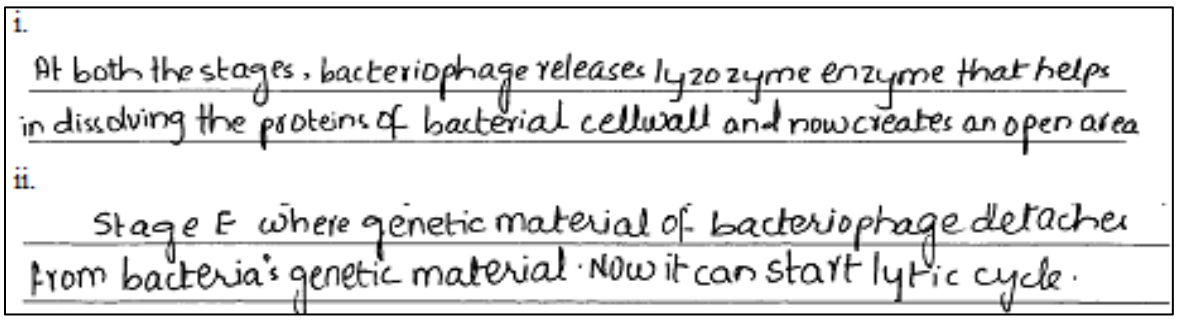


i. Which common action is taking place at stage **B** and stage **H**?

ii. At which stage does the process of induction take place?

Better responses correctly identified the common action taking place at stage B and H, i.e. release of lysozyme dissolve/ break the bacterial cell wall. Candidates also correctly identified the stage of induction, i.e. E. Responses which identified the process of induction occurring from C to E were also awarded marks.

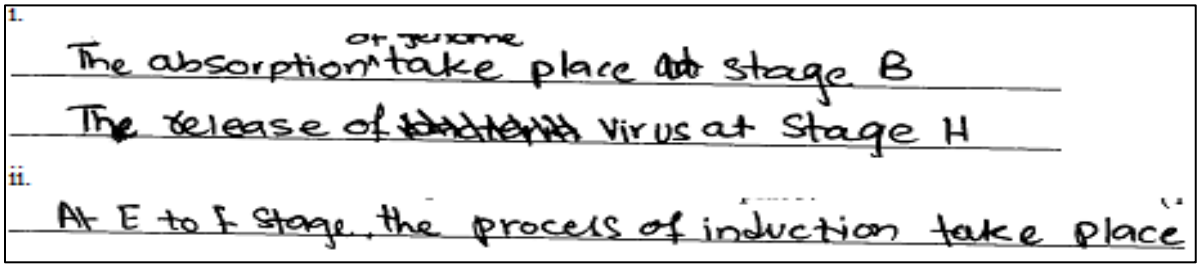
Example:


i.
At both the stages, bacteriophage releases lyzozyme enzyme that helps in dissolving the proteins of bacterial cellwall and now creates an open area

ii.
Stage E where genetic material of bacteriophage detaches from bacteria's genetic material. Now it can start lytic cycle.

Weaker responses were unable to identify and unpack the key term, 'common action' in the question, therefore, described the process at B and H separately and hence did not meet the demand of the question. This also manifests the lack of care in reading and understanding the question. These responses exhibited lack of understanding of the process of induction, therefore, tried to make random guesses, i.e. C, D and E to F etc.

Example:

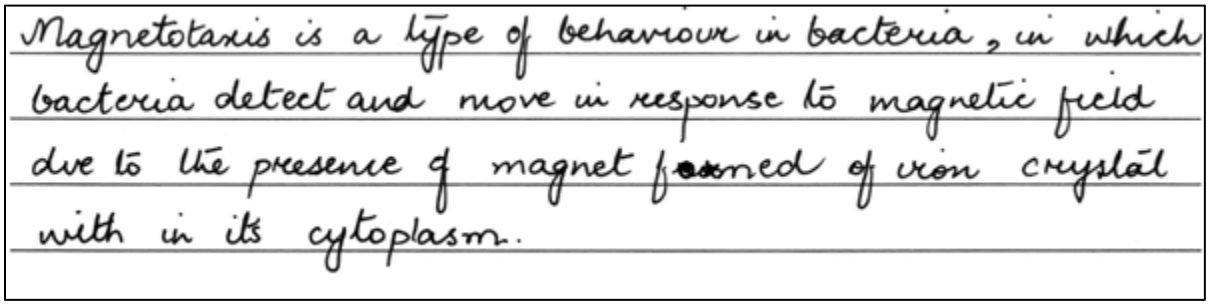


Question 3a:

Describe magnetotaxis in bacteria.

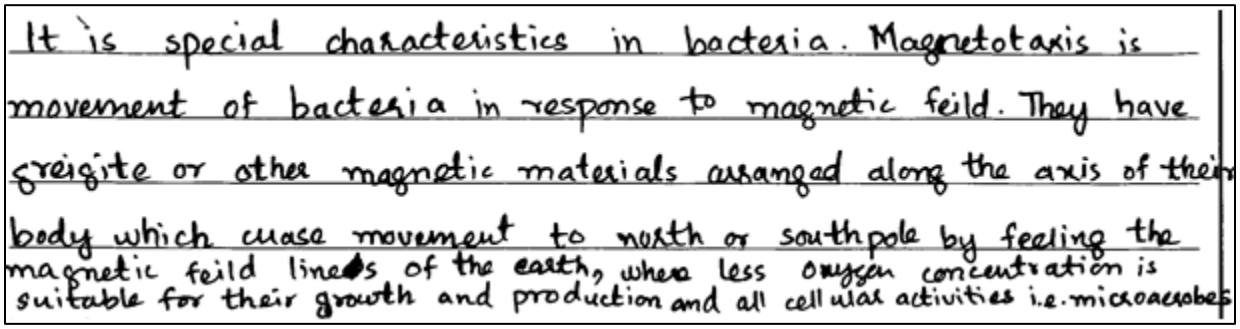
Better responses showed correct understanding of the term magnetotaxis and related the term with bacteria. Furthermore, such responses described magnetotaxis in bacteria due to presence of intracellular membrane enveloped magnetic iron mineral crystals magnetosomes.

Example:



Weaker responses defined the term magnetotaxis and did not relate it with bacteria. Such responses provided vague and irrelevant descriptions like bacteria obtain energy through magnetotaxis/ it helps to attach with several objects/ helps to capture food, etc.

Example:

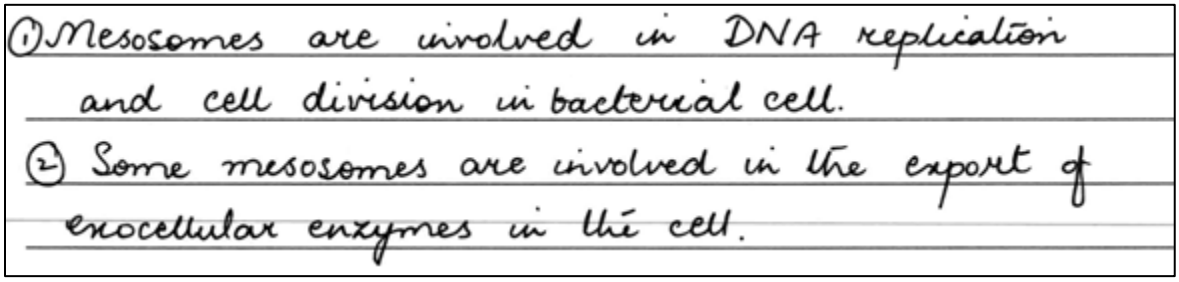

It is special characteristics in bacteria. Magnetotaxis is movement of bacteria in response to magnetic feild. They have greigite or other magnetic materials arranged along the axis of their body which cuase movement to north or southpole by feeling the magnetic feild lines of the earth, where less oxygen concentration is suitable for their growth and production and all cellular activities i.e. microaerobes

Question 3b:

State any TWO roles of mesosomes in a bacterial cell.

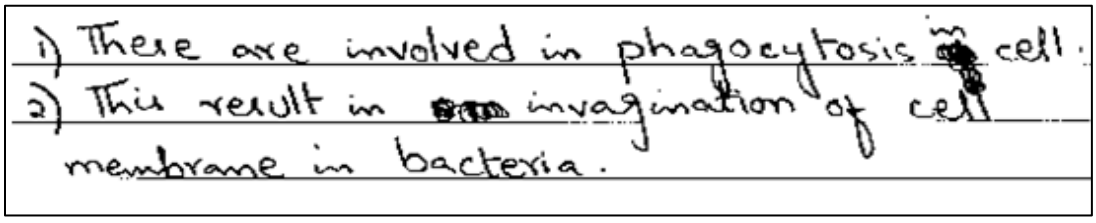
Better responses stated correct roles of mesosomes in bacteria, i.e. mesosomes are responsible for DNA replication/ cell division/ involved in export of exocellular enzymes/ transport of proteins/ contain enzymes for detoxification.

Example:


(1) Mesosomes are involved in DNA replication and cell division in bacterial cell.
(2) Some mesosomes are involved in the export of exocellular enzymes in the cell.

Weaker responses stated irrelevant roles of mesosomes such as mesosomes are involve in phagocytosis/ result in invagination of cell membrane/ responsible for exchange of materilas/ help in the formation of food vacuoles/ in reproduction/ cytoplasmic streaming/ provide energy to the cells etc.

Example:

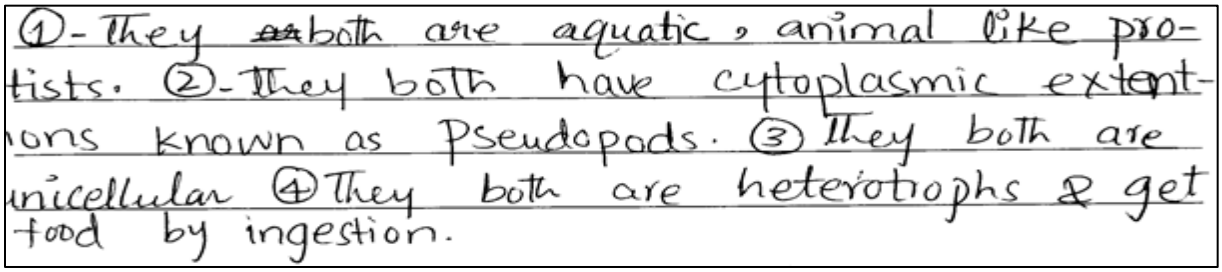

1) These are involved in phagocytosis in cell.
2) This result in invagination of cell membrane in bacteria.

Question 4a:

List any TWO common characteristics of actinopods and amoebae.

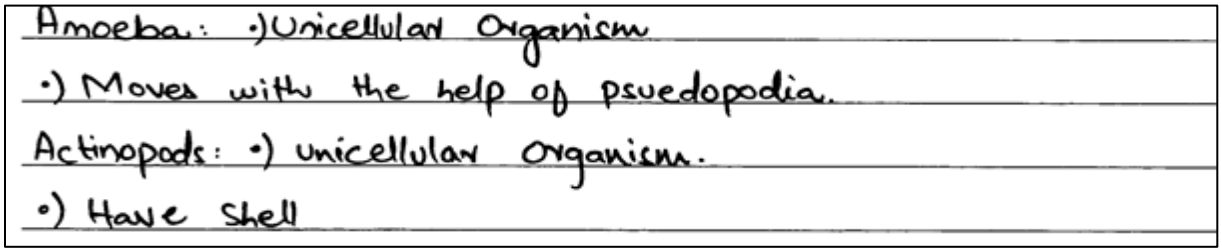
Better responses were able to list the common characteristics of actinopodes and amoeba, i.e. both are animal like protists, protozoans, aquatic organisms, eukaryotes unicellular, motile, heterotrophs and form pseudopodia.

Example:



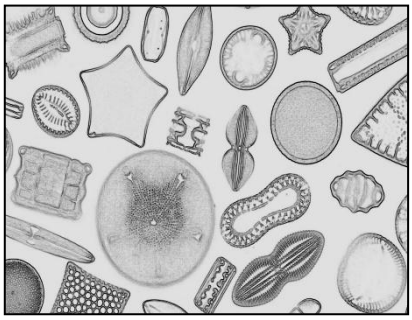
Weaker responses were unable to extract the 'common' characteristics of actinopodes and amoebae; therefore, separately listed down the characteristics of each. Candidates are advised to read the question very carefully in order to meet the demand of the question.

Example:



Question 4b:

The given diagram shows some organisms of kingdom Protista.

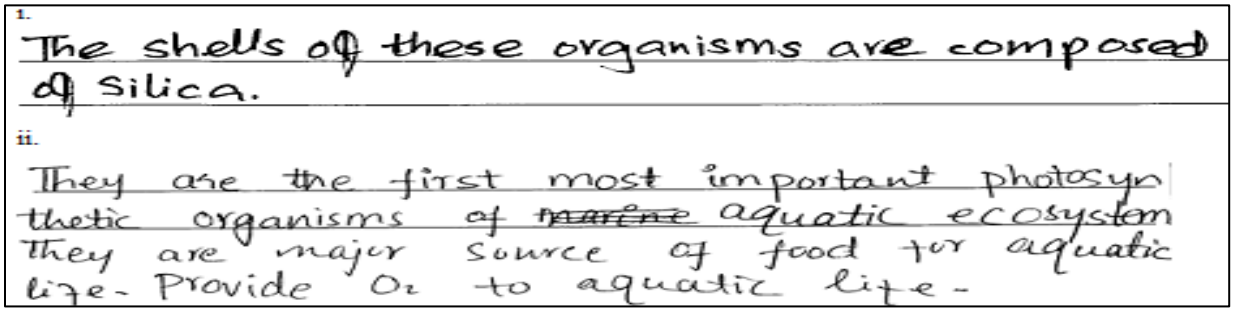


i. What is the composition of shells of the organisms shown in the diagram?

ii. Mention the importance of these organisms to the ecosystem.

Better responses were able to identify the organisms in the given stimulus, therefore, were able to name the composition of shells, i.e. silica. These responses mentioned the correct role of the given organisms in the ecosystem, such as producers/ provide food.

Example:


i.
The shells of these organisms are composed of silica.

ii.
They are the first most important photosynthetic organisms of ~~marine~~ aquatic ecosystem they are major source of food for aquatic life- Provide O_2 to aquatic life-

Weaker responses wrongly named the composition of shells. Most of the weaker responses named the composition of mollusc's shell, i.e. calcium carbonate or bicarbonate/ chitin/ legnin. In this question, candidates were unable to identify the organisms, therefore, could not reached to the correct answer.

Example:

i.

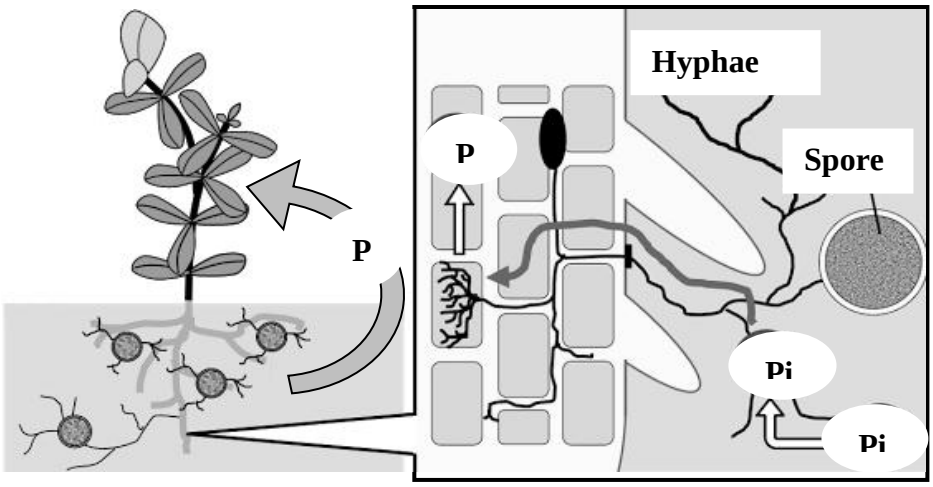
Their shells are composed of chitin.

ii.

- Amoeba cause dysentry in human.
- apicomplexan cause Malaria in human.

Question 5:

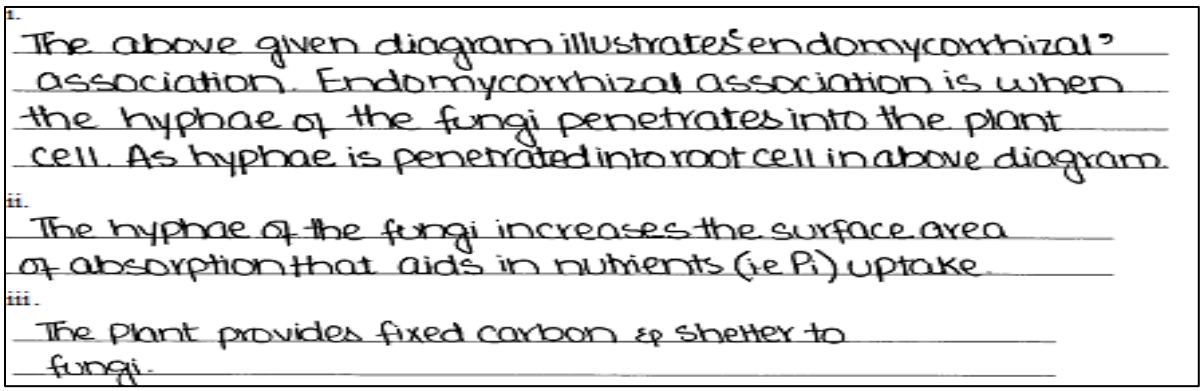
The given diagram shows a mycorrhizal association.



i. Identify the type of mycorrhizal association. Give a reason to support your answer.
ii. How do the fungal hyphae increase the absorption of inorganic phosphate (Pi) in plants?
iii. What is the benefit of mycorrhizal association to fungi?

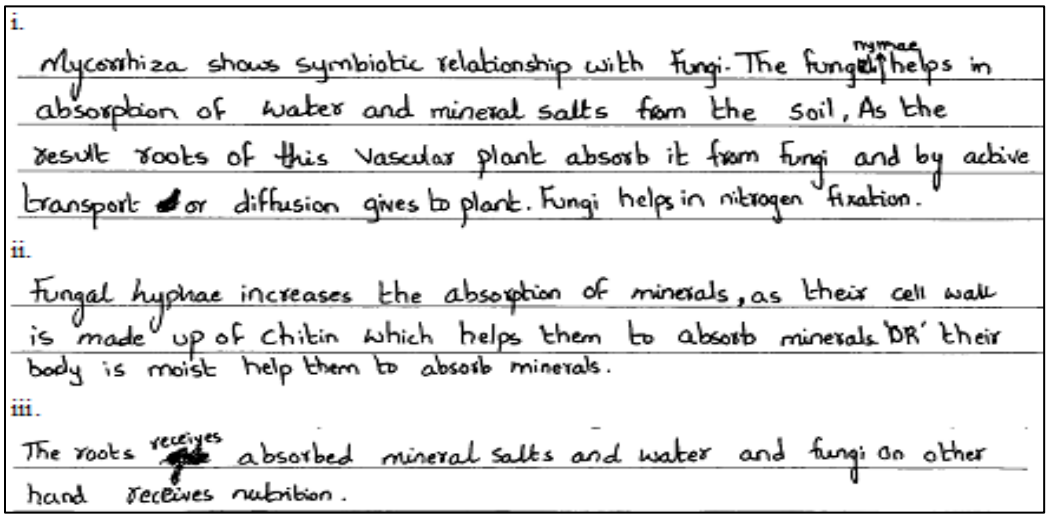
Better responses exhibited clear understanding of the type of mycorrhizal association as depicted in the diagram. Such responses smartly traced the presence of hyphae to get to the correct answer. These responses also correctly mentioned the way fungal hyphae increase absorption is by increasing surface area/ contact with the soil. Such responses correctly mentioned the benefit of mycorrhizal association to fungi that is providing carbon/ photosynthetic products.

Example:


i.
The above given diagram illustrates endomycorrhizal association. Endomycorrhizal association is when the hyphae of the fungi penetrates into the plant cell. As hyphae is penetrated into root cell in above diagram.
ii.
The hyphae of the fungi increases the surface area of absorption that aids in nutrients (i.e Pi) uptake.
iii.
The plant provides fixed carbon & shelter to fungi.

Weaker responses failed to identify the type of mycorrihizal association because they were unable to understand the diagram, therefore, provided ambiguous answers such as symbiotic association. The way to increase absorption was incorrectly mentioned and they gave irrelevant answers such as diffusion/ transportation, etc. Such responses showed apparent lack of care in reading the question that led to misinterpretation because most of the weaker responses mentioned the benefit of fungi to the plants which is not the demand of the question.

Example:


i.
Mycorrhiza shows symbiotic relationship with fungi. The fungi(hyphae) helps in absorption of water and mineral salts from the soil, As the result roots of this vascular plant absorb it from fungi and by active transport or diffusion gives to plant. Fungi helps in nitrogen fixation.
ii.
Fungal hyphae increases the absorption of minerals, as their cell wall is made up of chitin which helps them to absorb minerals 'OR' their body is moist help them to absorb minerals.
iii.
The roots receives absorbed mineral salts and water and fungi on other hand receives nutrition.

Question 6a:

Fill in the given table by stating the names of part of gastrointestinal tract which match each mentioned pH level and also state the role of pH on enzymatic digestion.

pH	Name of the Part of Gastrointestinal Tract	Role of pH in Enzymatic Digestion
High (around 8)		
Low (around 2)		

Better responses correctly named the part of gastrointestinal tract mentioning the role of given pH in enzymatic digestion, such as, small intestine has high (around 8) pH in order to activate trypsinogen into trypsin which converts proteins into peptones and polypeptides and stomach has low pH (around 2) for the activation of pepsinogen into pepsin in order to digest proteins in the stomach. However, marks have also been awarded to responses for mentioning duodenum, jejunum and ileum instead of small intestine.

Example:

pH	Name of the Part of Gastrointestinal Tract	Role of pH in Enzymatic Digestion
High (around 8)	Dudenum of Small intestine	Trypsin works in the basic medium. It will denature in the acidic medium. It converts Dipeptide and polypeptide chains into simple amino acid.
Low (around 2)	Stomach	Enzymes are pH specific - The pepsinogen is converted into pepsin by the help of HCl. This Pepsin ~~digest~~ converts the protein molecules into Dipeptide and polypeptide. In this pH enzyme can perform its function effectively

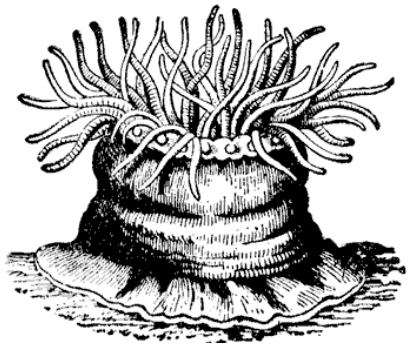
Weaker responses wrongly identified the part of gastrointestinal tract against each given pH and mentioned irrelevant role of pH in enzymatic digestion. These responses mentioned generalised role of given pH such as enzymes work at specific pH, enzymes require optimum pH to work and acidic environment is require to kill the microorganisms in the stomach. One common trend observed in the majority of responses which has caused loss of marks was that candidates mentioned ambiguous role of pH, i.e. proteins present in stomach and small intestine digest proteins in alkaline and acidic medium respectively.

Example:

pH	Name of the Part of Gastrointestinal Tract	Role of Pepsin in Enzymatic Digestion
High (around 8)	Stomach	In this the food becomes acidic and backeria's are killed and then food is broke down into simple It is because of having high pH around 8.
Low (around 2)	Pancrease	It provides fluid to when the food is passing to small intestine

Question 6b:

The given diagram shows the radial symmetry of an invertebrate.



In which body form does the given invertebrate exist?

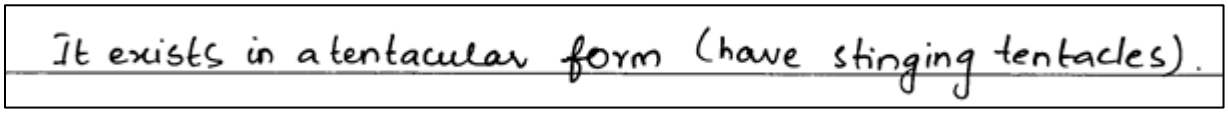
Better responses correctly identified the body form of given invertebrate, i.e. poly form.

Example:

This invertibrate exist in the form of medusa. polyp.

Weaker responses failed to understand the key term 'body form' in the question. Therefore, very vague responses were given like diploblastic, bilateral symmetrical, upwards mouth, sessile body and etc. This question highlighted the failure of many candidates to use the correct scientific terminology. For better understanding and learning of these topics, it is important to be familiar with the diagrams, key terms and scientific vocabulary.

Example:

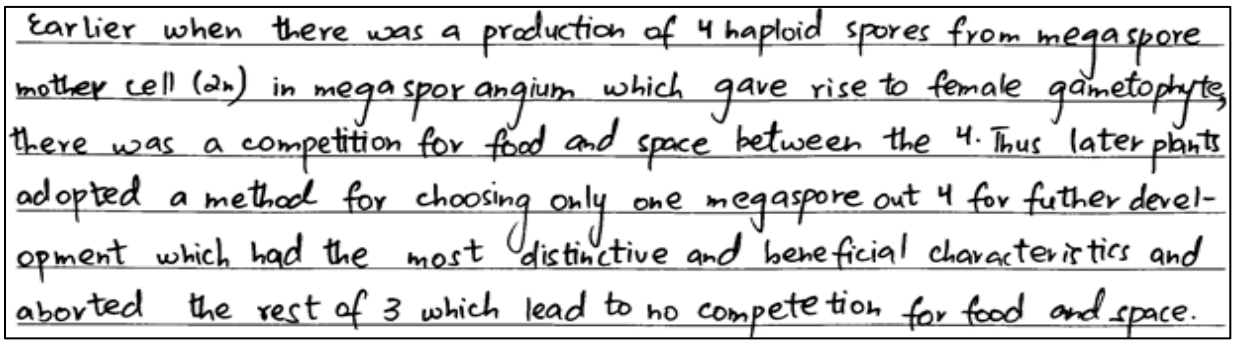


Question 7a:

There are various steps that took place in the evolution of seed habit, out of which, one is 'reduction to a single functional megaspore per sporangium'. Describe the need and outcome of this step.

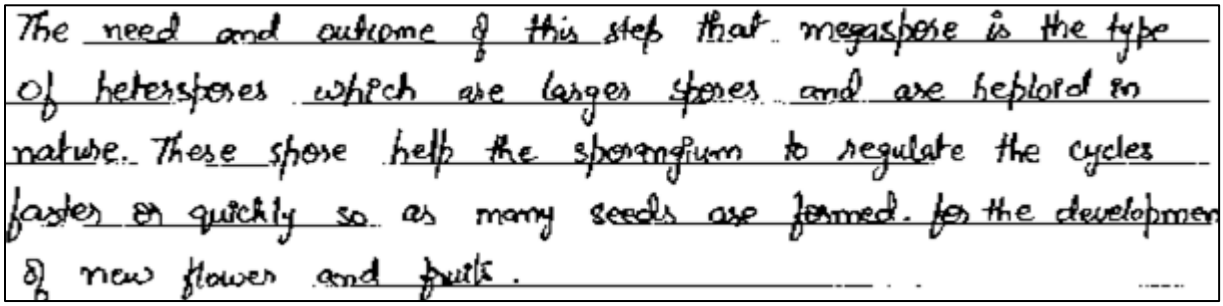
Better responses were credited full marks because they were able to understand the demand of the question, i.e. need and outcome. Such responses correctly described the need and outcome, i.e. the production of four gametophytes by each megaspore mother cell which caused a competition for space and food among the four gametophytes therefore, only one megaspore is selected to further develop into a healthy female gametophyte while the remaining three are aborted. Ultimately, one megaspore will germinate so that all needs can be fulfilled.

Example1:


Earlier when there was a production of 4 haploid spores from megaspore mother cell (2n) in megasporangium which gave rise to female gametophyte, there was a competition for food and space between the 4. Thus later plants adopted a method for choosing only one megaspore out 4 for futher development which had the most distinctive and beneficial characteristics and aborted the rest of 3 which lead to no competetion for food and space.

Weaker responses exhibited inability to use the stem correctly and reproduced the stem. Most of the other weaker responses described irreverent need and outcome of reduction to single megaspore, i.e. this allows the male gametes in pollen tube to enter into sporangium/ single megaspore allows the male gametophyte to fuse with it/ better formation of fruits/ results in better nourishment of seeds and reduction to one megaspore to germinate a healthy plant.

Example:

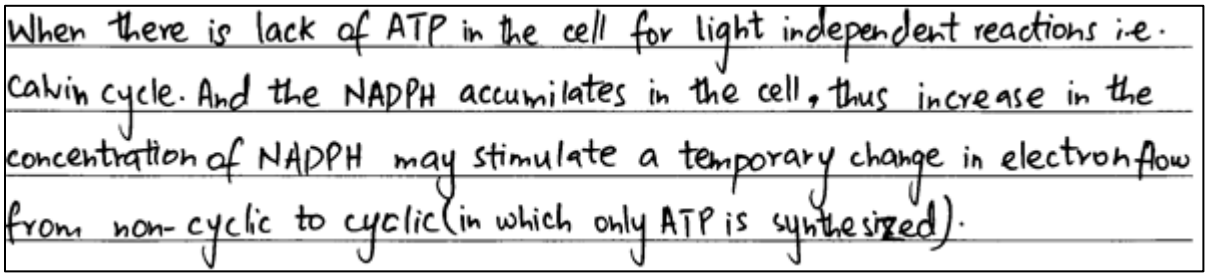

The need and outcome of this step that megaspore is the type of heterospores which are larger spores and are heploid in nature. These spore help the sporangium to regulate the cycles faster or quickly so as many seeds are formed. for the development of new flower and fruits.

Question 7b:

Describe the condition that leads to the shift in the flow of electrons from non-cyclic to cyclic phosphorylation during the light dependent reactions of photosynthesis.

Most of the *better responses* correctly described the condition, i.e. chloroplast runs low of ATP for the Calvin cycle. The Calvin cycle slows down and NADPH accumulates in chloroplast. This rise in NADPH may stimulate a temporary shift from non-cyclic to cyclic electron flow until ATP supply meets the demand.

Example:


When there is lack of ATP in the cell for light independent reactions i.e. Calvin cycle. And the NADPH accumilates in the cell, thus increase in the concentration of NADPH may stimulate a temporary change in electron flow from non-cyclic to cyclic (in which only ATP is synthesized).

Weaker responses were unable to describe the "condition" that causes the shift in flow of electrons from non-cyclic to cyclic phosphorylation during the light dependent reactions of photosynthesis. Such responses described the cyclic electron flow without describing the condition. Most of the vague responses included low concentration of CO_2, conversion of ATP into ADP and NADP to NADPH, etc.

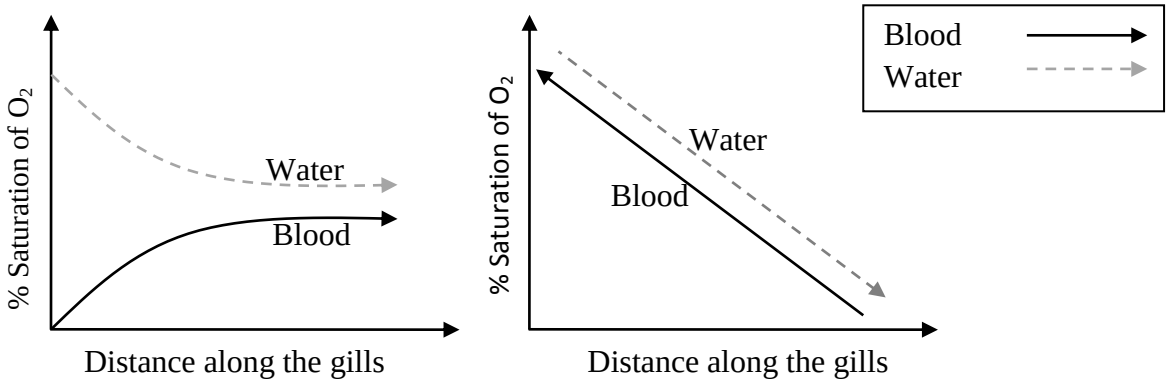
It is highly recommended to carefully read the question in order to meet the demand of the question.

Example 1:

The flow of electron from non-cyclic to cyclic phosphorylation is shifted due to the conversion of ATP to ADP and NADPH to NADP* because these energy supply molecules give electrons to these cycle.

Question 8a:

The given graphs show two mechanisms exchange of gases.



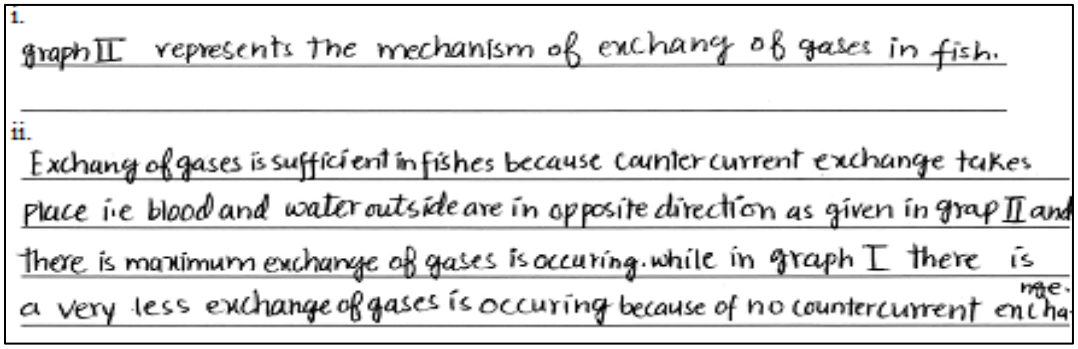
i. Which graph represents the mechanism of exchange of gases in fish?

ii. 'The exchange of gases is efficient in fish.' Compare both the graphs to explain this statement.

Better responses correctly identified graph II which shows mechanism of exchange of gases in fish. The key point which can lead candidates towards the correct identification is the opposite direction of flow of blood and water shown in the graph II. In order to understand the graph, it is important to have better understanding of mechanism of gaseous exchange in fish, i.e. counter-current mechanism. Such responses correctly compared graph I and II, i.e. graph I exhibits the countercurrent exchange whereas graph II manifests co-current exchange. In fish efficiency of gas exchange is maximised by countercurrent exchange that keep concentration gradient in blood and water. Some other responses described both graph separately, such as in graph II the flow of blood is in the opposite direction to the flow of water across the gills. Furthermore, this is explained that blood is continually meeting fresh water with a higher percentage saturation of oxygen. In this way, the concentration gradient is maintained across the gill lamella and oxygen continues to diffuse into the blood.

As shown in graph I, blood and water flow in the same direction (co-current mechanism), diffusion would only occur until equilibrium is achieved. Therefore, this is less efficient as the blood would only be able to reach a maximum of 50% O_2 saturation.

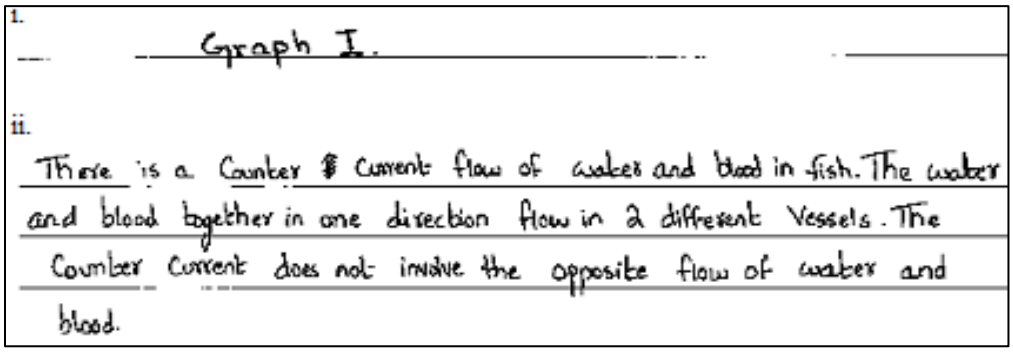
Example:


i. graph II represents the mechanism of exchang of gases in fish.

ii. Exchang of gases is sufficient in fishes because counter current exchange takes place i.e blood and water outside are in opposite direction as given in grap II and there is maximum exchange of gases is occuring. while in graph I there is a very less exchange of gases is occuring because of no countercurrent exchange.

Weaker responses failed to identify the correct graph to show mechanism of gaseous exchange in fish because of the inability to relate the graph to the concept of countercurrent and concurrent exchange. Such responses took distance along the gills into account without referring to the flow of blood and water. Such responses compared the distance along the gills in graph I and II. Most of the weaker responses described the pathway of blood circulation in fish. Teachers can take help of graphical representation to inculcate the concept of exchange of gases in fish.

Example:


i. Graph I.

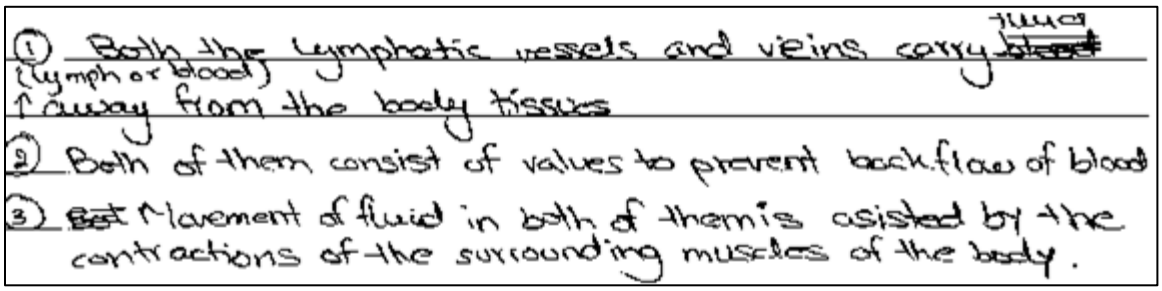
ii. There is a Counter Current flow of water and blood in fish. The water and blood together in one direction flow in 2 different Vessels. The Counter Current does not involve the opposite flow of water and blood.

Question 8b:

Mention any TWO similarities between lymphatic vessels and veins?

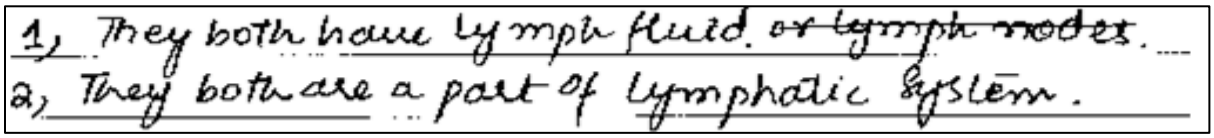
Better responses correctly mentioned similarities between lymphatic vessels and veins, i.e. the flow of blood in the vein and lymphatic vessels is maintained by contraction of skeletal muscles/ in both vessels valves are present to prevent backflow of fluid/ both bring circulatory fluid back to the heart/ carry fluid away from the body tissues.

Example:



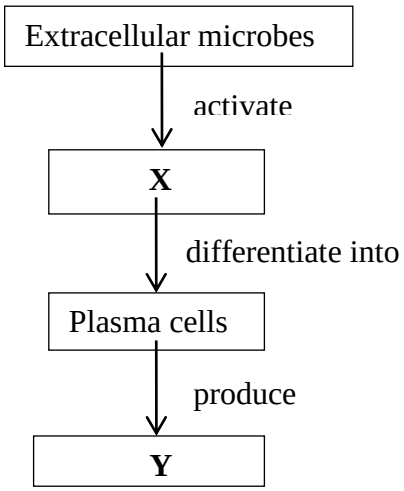
Weaker responses did not focus on the similarities; rather they mentioned the differences between lymphatic vessels and veins. Most of the weaker responses mentioned flow of blood in lymphatic vessels and veins. It is highly recommended to inculcate the development of conceptual linkage among different student learning outcomes for better understanding.

Example:



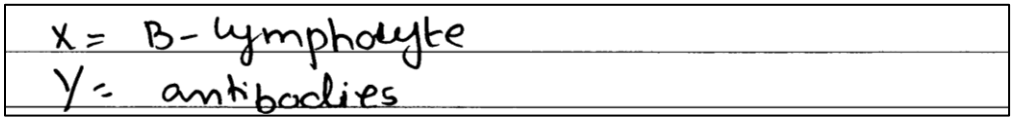
Question 9a:

The given flowchart represents the immune response produced upon the invasion of extracellular microbes in the human body.



Better responses correctly identified X as B-cells/ B lymphocytes and Y as antibodies. Candidates smartly used the key terms ‘extracellular microbes’ and ‘plasma cells’ to get the correct answer.

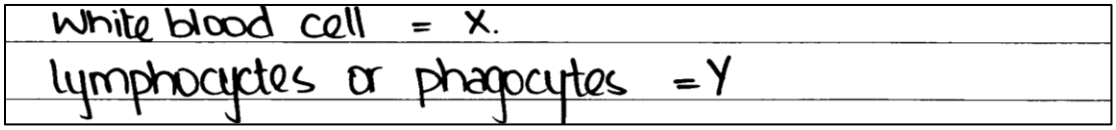
Example:



Weaker responses incorrectly identified X and Y and gave vague answers like X as immune system/ defence mechanism/ innate immunity/ adaptive immunity/ WBCs and Y as antigen/ blood cells.

It is important to be familiar with scientific vocabulary in order to understand the demand of the question. Better understanding of scientific terms leads students to the correct answer. In this question, 'extracellular microbes' and 'plasma cells' are important scientific key terms which navigate students to the correct answer. In this case it is obvious that for the defence against extracellular microbes in the body, humoral immune response is responsible which involves activation of B-cells and production of antibodies.

Example:



Question 9b:

Identify the phenomena that are described in the given table with reference to ascent of sap in plants.

Description of Phenomenon	**Name of Phenomenon**
Water molecules stick to the walls of xylem so that column of water in xylem tissue does not break.	
It is the uptake of water by seeds during germination.	
It is provided when the water chain is pulled up in the xylem. It is between the molecules of water by hydrogen bonding.	

Better responses showed clear understanding of meaning of the terms adhesion, imbibition, and tension. Moreover, endosmosis was also awarded for the imbibition and osmosis; cohesion and transpiration pull were accepted for the movement of water in xylem.

Example:

Description of Phenomenon	Name of Phenomenon
Water molecules stick to the walls of xylem so that the column of water in xylem tissue does not break.	Adhesion.
It is the uptake of water by seeds during germination.	Imbibition.
It is provided when the water chain is pulled up in the xylem. It is formed between the molecules of water by hydrogen bonding.	Cohesion-tension.

Weaker responses showed lack of understanding of the terms, i.e. adhesion, imbibition, and tension and were unable to relate the terms with the phenomena.

Example:

Water molecules stick to the walls of xylem so that the column of water in xylem tissue does not break.	Cohesion
It is the uptake of water by seeds during germination.	tension
It is provided when the water chain is pulled up in the xylem. It is formed between the molecules of water by hydrogen bonding.	Inhibition

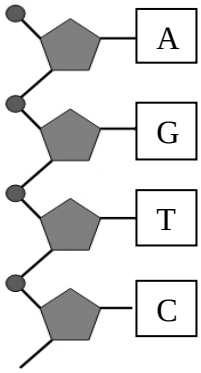
Extended Response Questions (ERQs)

The following questions (10 and 11) offered a choice between part **a** and **b**.

Approximately, larger number of candidates attempted part 'b' of question 10. This shows their interest and strong understanding of 'role of cell organelles in the protein formation and secretion' than part 'b', i.e. 'structure and properties of DNA'. Similarly, in question 11, more preference of candidates was observed in part 'b' than part 'a'. This indicates that candidates are more confident in human physiology than entomology.

Question 10a:

The given diagram depicts a strand of DNA.

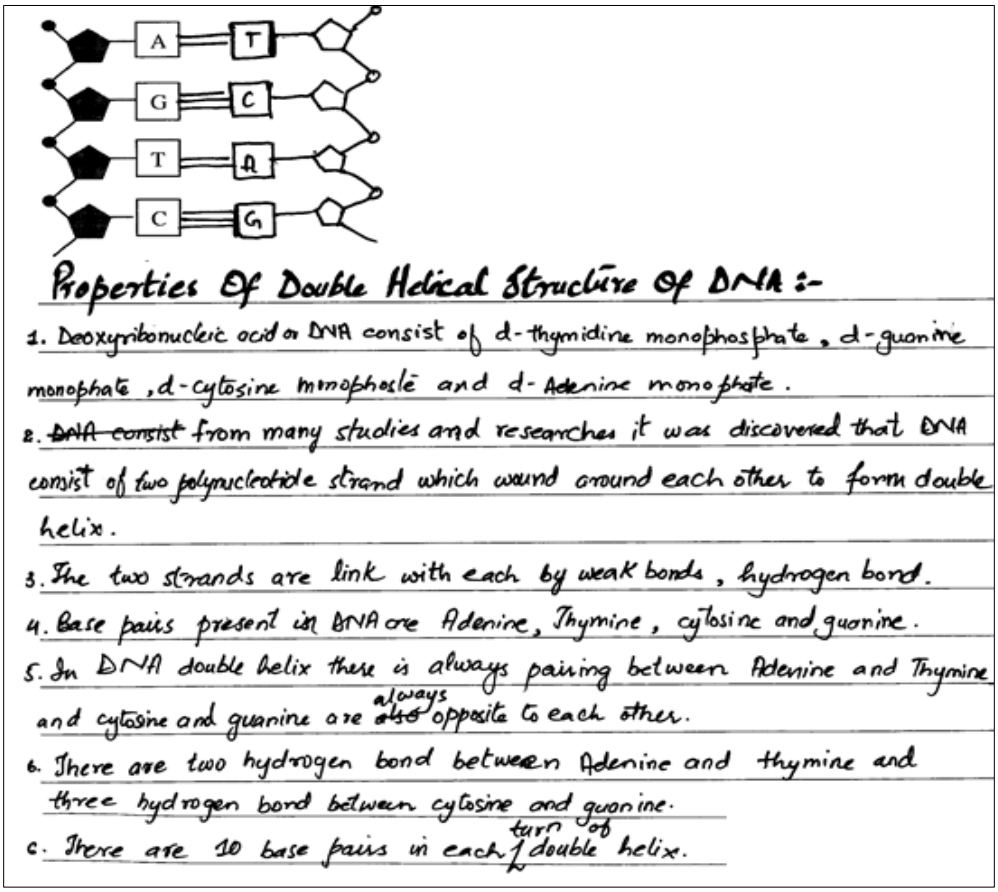


i. Using the given strand as template, illustrate the complementary strand to complete the double helical structure of DNA.

ii. Describe any FIVE properties of double helical structure of DNA.

Better responses were able to illustrate the double helical structure of DNA by using the given template and showed correct pairing of nitrogenous bases and hydrogen bonds (A═T, G≡C) present between them. This manifests clear understanding of term, i.e. template. Such responses gave good description of properties of DNA and presented it in a series of bullet points describing each property followed by additional details.

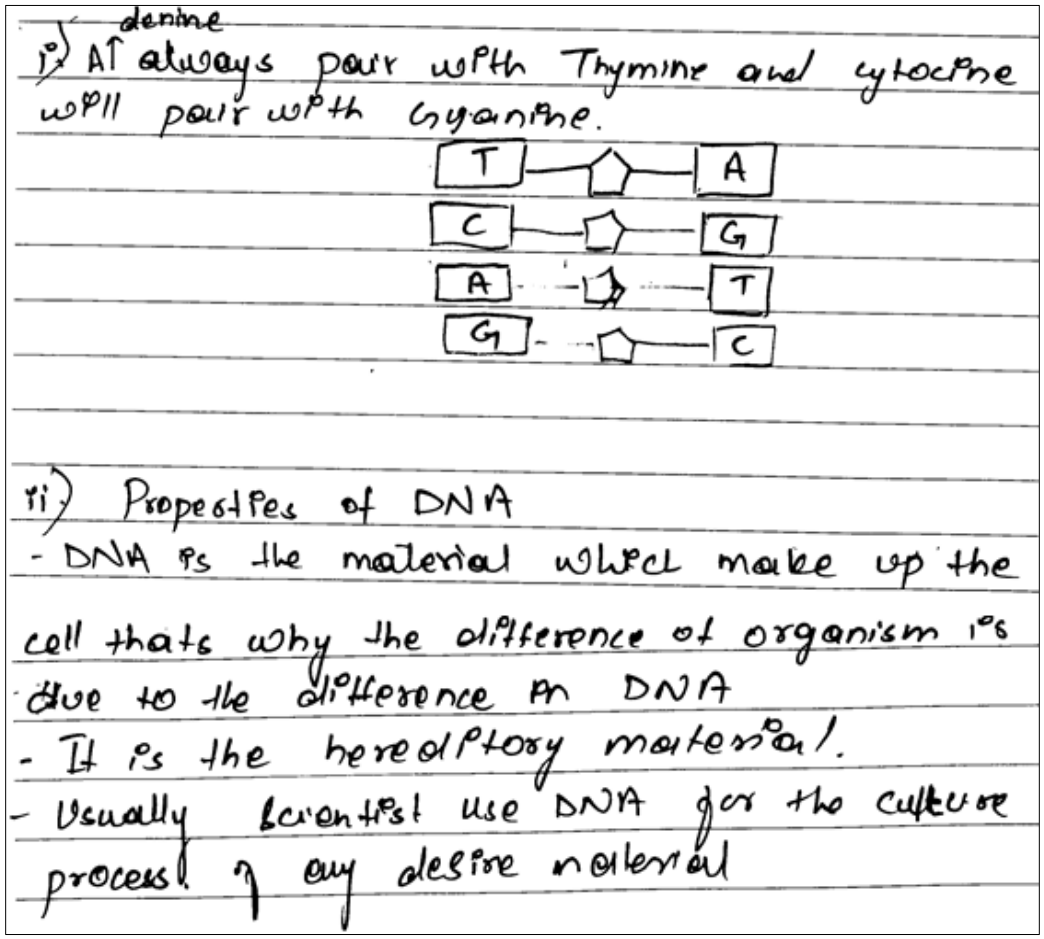
Example:



Weaker responses were unable to unpack the command word, i.e. illustrate. They could not differentiate between description and illustration. Hence, they gave correct description of complementary strand of given DNA template but failed to illustrate the complementary structure, therefore, marks were not awarded. Some responses tried to illustrate the complimentary strand with incorrect arrangement of DNA components, i.e. position of pentose sugar, nitrogenous base pairs and hydrogen bonds present between them. The concept of structure of DNA is very elementary in biology; thus, illustrations must be taken as mandatory part of teaching and learning. These responses provided properties of DNA ambiguously such as hereditary material. Furthermore, they mentioned that DNA helps to trace ancestors of any organisms/ store genetic information/ manipulate to form variety of organisms/ use in genetic engineering/ helps in protein synthesis etc.

Due to the unfamiliarity with the structure of DNA, candidates struggled to get marks in the second part of the question. Therefore, it is advised to use illustrations in teaching and learning that will enable students to grasp better understanding of concept.

Example:



Question 10b:

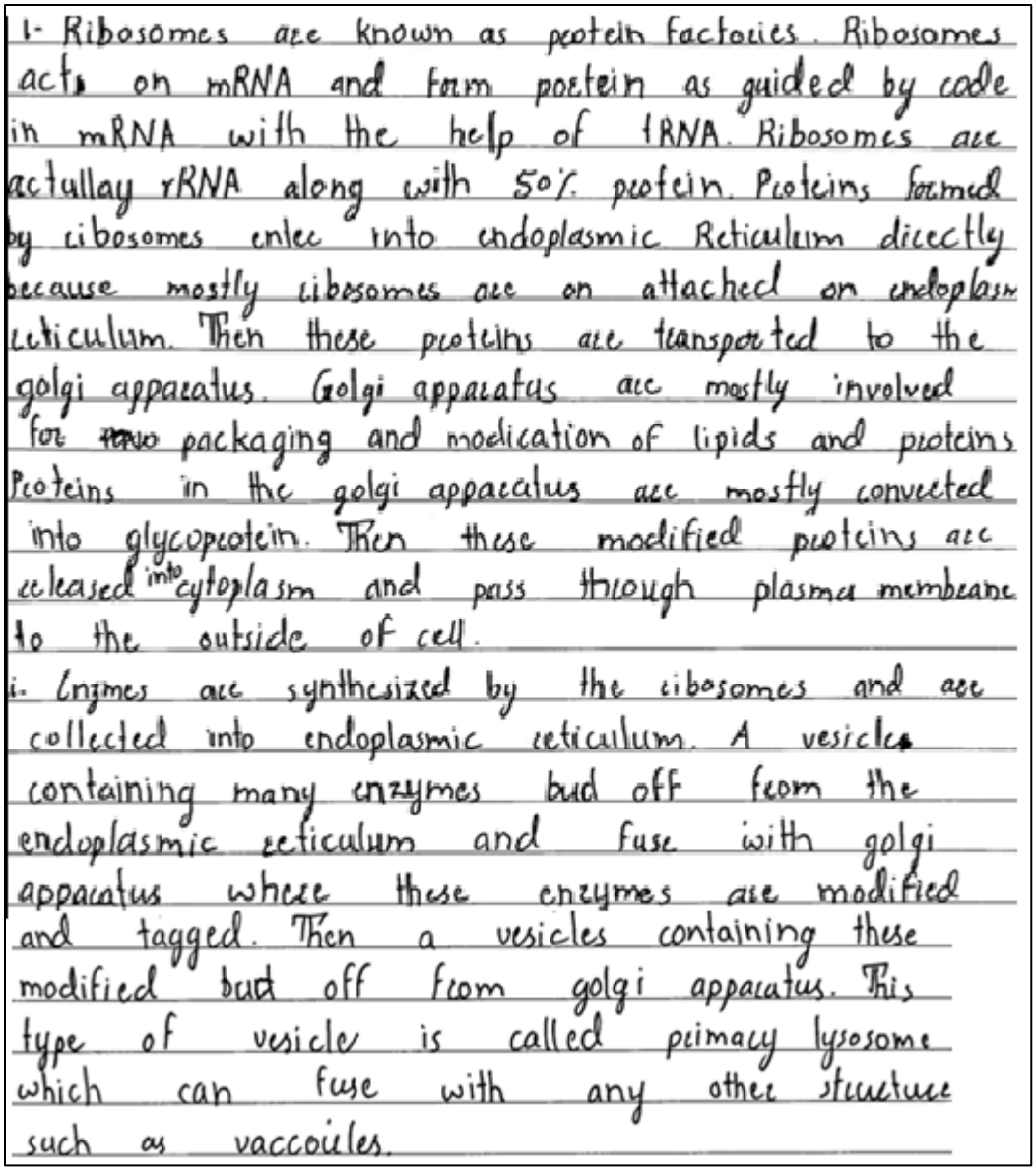
(i) Describe the function of ribosomes, endoplasmic reticulum, Golgi apparatus and plasma membrane in the formation and secretion of proteins.

(ii) Describe the role of endoplasmic reticulum and Golgi apparatus in the formation of lysosomes.

Better responses correctly described the functions of different organelles involved in the *formation* and secretion of proteins. Many candidates displayed ability to organise their answers in a coherent way and gave a well-structured account of the key functions of each asked organelle in a sequence such as ribosomes assemble proteins from their polypeptides entering rough endoplasmic reticulum; proteins move through the endoplasmic reticulum where they are further modified; transport vesicles containing proteins pinched off from the endoplasmic reticulum; transport vesicles fuse with the membrane of Golgi apparatus and proteins are released inside; within Golgi apparatus proteins are further processed and final product is formed; Vesicles from Golgi apparatus travel to the plasma membrane; fuse with the plasma

membrane and release to outside/ through exocytosis. This shows candidates had gone beyond *the* basic requirements and had good knowledge of the details. In the second part of the question better responses developed a sound understanding of functional linkage between endoplasmic reticulum and Golgi apparatus in the formation of lysosomes like enzymes of lysosomes are synthesised on rough endoplasmic reticulum and are further processed in Golgi apparatus. The processed enzymes are budded off/ produced as Golgi vesicles/ primary lysosomes from the Golgi apparatus.

Example:



1- Ribosomes are known as protein factories. Ribosomes acts on mRNA and form poetein as guided by code in mRNA with the help of tRNA. Ribosomes are actullay rRNA along with 50% protein. Proteins formed by ribosomes enter into endoplasmic Reticulum directly because mostly ribosomes are on attached on endoplasm reticulum. Then these proteins are transported to the golgi apparatus. Golgi apparatus are mostly involved for ~~two~~ packaging and modication of lipids and proteins Proteins in the golgi apparatus are mostly converted into glycoprotein. Then these modified proteins are released into cytoplasm and pass through plasma membrane to the outside of cell.

i. Enzmes are synthesized by the ribosomes and are collected into endoplasmic reticulum. A vesicle containing many enzymes bud off from the endoplasmic reticulum and fuse with golgi apparatus where these enzymes are modified and tagged. Then a vesicles containing these modified bud off from golgi apparatus. This type of vesicle is called primary lysosome which can fuse with any other structure such as vaccoules.

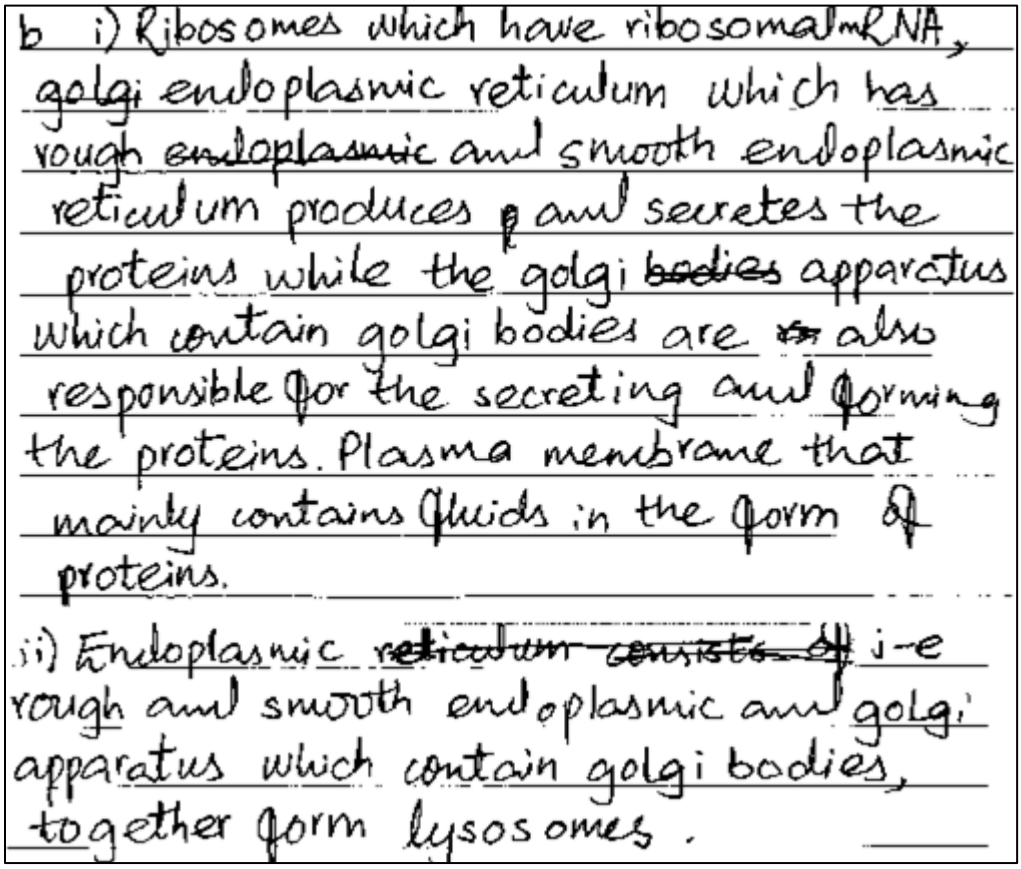
Weaker responses were not able to meet the requirement of the question. Such responses gave unnecessary information, for example, a detailed account on structure endoplasmic reticulum and Golgi apparatus was given as extended network of channels/ tube like system, etc.

Some other weaker responses mentioned irrelevant functions of endoplasmic reticulum like storage of calcium ions/ detoxification of chemical/ manufacturing of lipids etc. Similarly they mentioned unrelated functions of ribosomes, Golgi apparatus and plasma membrane. In the second part of the question weaker responses could not develop the functional correlation between endoplasmic reticulum and Golgi apparatus in the formation of lysosomes.

Elaboration of synthesis, processing/ modification, packaging and transportation of any protein or lysosomes would have been sufficient to get good marks in this question.

Many biological concepts are interlinked, therefore, it is advised to correlate the concepts during teaching and learning and the best way is to take help of flowcharts.

Example:


b i) Ribosomes which have ribosomal mRNA, golgi endoplasmic reticulum which has rough endoplasmic and smooth endoplasmic reticulum produces & and secretes the proteins while the golgi ~~bodies~~ apparatus which contain golgi bodies are ~~is~~ also responsible for the secreting and forming the proteins. Plasma membrane that mainly contains fluids in the form of proteins.

ii) Endoplasmic ~~reticulum consists of~~ i-e rough and smooth endoplasmic and golgi apparatus which contain golgi bodies, together form lysosomes.

Question 11a:

According to an article published by Nic Fleming on February 10, 2015, "The most dominating form of life, in terms of number on the Earth, is six-legged, shrimp-like springtails … The 6,000 known species of these wingless arthropods can be found in all manner of habitats all over the world, from beaches and cliffs to the Antarctic and the highest mountain ranges on Earth."

(i) Explain any FOUR ways in which the organisms described in the given text have successfully adapted to diverse habitats.

(ii) Describe any FOUR ways in which these organisms impact our economy.

Better responses intelligently used the stimulus in drafting their answers. In the stimulus, information about the arthropods is given, i.e. six-legged organism and diverse habitat. This information was sufficient enough to explain the adaptations of arthropods, i.e. presence of appendages (six-legged/ mouth parts/ antennae/ jointed legs/ wings etc.), presence of cuticle (exoskeleton), small size, segmented body, high rate of reproduction and different developmental processes (metamorphosis) and each mentioned adaptation was explained thoroughly such as small size permits them to live in diverse type of localities from small microhabitat to macro habitats. In part ii, better responses exhibited good knowledge of positive and negative impact of insects on our economy. Some responses reflected only upon the positive impact, i.e. insects help to boost up the economy in textile industry through sericulture (breeding of silk worm)/ food industry through apiculture (breeding of honey bees for honey production)/ help in pollination as pollen grains are carried by insects' legs to other flowers helping in the dispersal of pollen grains/ help in dispersal of seeds as seeds become attached with the insects' appendages thus disseminating seeds, maintaining ecosystem as some of them are scavengers which feed on dead organisms thus maintaining food web.

Moreover, some other credit worthy responses gave description of negative impact of insects on our economy such as insects (pests) affect economy by heavy attack on cash crops such as cotton, rice and wheat/ many insects are vector of dangerous diseases like malaria, dengue virus, Zika virus and African sleeping sickness causing economic loss and human loss/ some insects cause annoyance/ nuisance in the environment etc.

Example:

2) They have jointed appendeges and wings which help them survive and make them aerial as well as terrestial hence, they are not restricted to any one habitat. They also have digestive enzymes for the digestion of food.

3) A hard protective exoskeleton which is made up of chitin. This character is the most important for it protects them from water loss, abrasive damage and makes them resistant.

4) High reproductive potential and metamorphosis. During metamorphosis the pupa and larvae are formed which are a land adaptation so the young can grow with sufficient amount of nutrients.

5) They also exhibit social behaviour which favours them in making colonies.

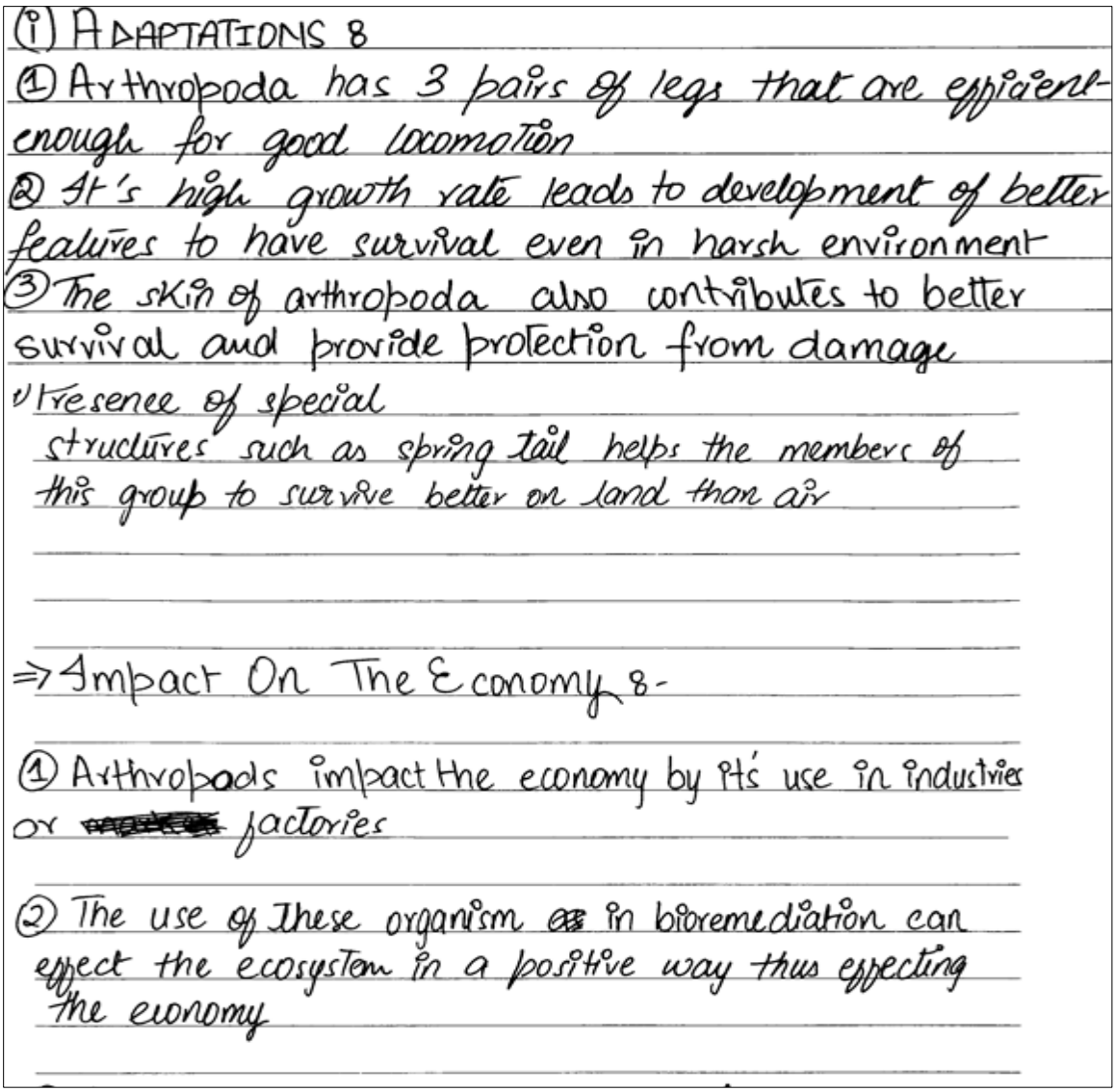
Economic impacts of arthropods:-

Beneficial	Disadvantageous
1) Honeybees are a source of honey and wax. Therefore, honeybee farming is done which is called apiculture.	1) Some arthropods like locusts act as plant pests and destroy crops.
2) Arthropods are the main source of pollination in insect-pollinated plants.	2) They are also responsible for the transfer of diseases such as Trypanosoma is carried by Tsetsy fly and plasmodium is carried by mosquito.
3) They are a valuable source of food in different parts of the world	

Weaker responses indicated lack of care in reading the stimulus which led to misinterpretation of the given stimulus thus writing ambiguous answers or incomplete answers. These responses mentioned the characteristics of insects and could not relate with the adaptation, i.e. different types of mouth parts/ appendages. Some other weaker responses mentioned irrelevant answers such as reduced coelom/ bilaterally symmetrical body plan etc.

Such kind of topics can be made more interesting for students by using preserved specimens/ models of animals and explore these topics through documentaries like 'planet earth'. Students must be given chance to brainstorm the adaptations by observing the physical features of specimens.

Example:



(i) ADAPTATIONS 8

① Arthropoda has 3 pairs of legs that are efficient-enough for good locomotion

② It's high growth rate leads to development of better features to have survival even in harsh environment

③ The skin of arthropoda also contributes to better survival and provide protection from damage

v Presence of special structures such as spring tail helps the members of this group to survive better on land than air

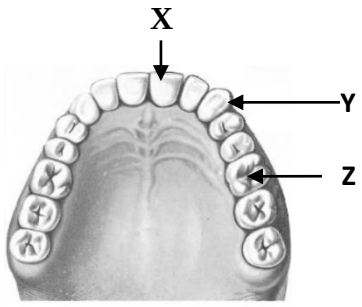
⇒ Impact On The Economy 8-

① Arthropods impact the economy by its use in industries or factories

② The use of these organism in bioremediation can effect the ecosystem in a positive way thus effecting the economy

Question 11b:

i. The labelled structures in the given diagram show different types of teeth.



Write the function of the parts labelled as **X**, **Y** and **Z** in the given diagram.

ii. Describe any FIVE steps involved in the movement of bolus from oral cavity to the stomach.

Better responses displayed good knowledge in the identification of different types of teeth, therefore, they were able to write the correct function of each labelled teeth, i.e. X, Y and Z to cut or tear food into small chewable pieces, grip and tear food, and to crush and grind food respectively. These responses showed an ability to compose their answer in a clear way and gave a good description of each step in a sequence.

Example:

Insisors, Canines, Premolar and Molars.

INSISORS:- These are labelled as (X) and are made for biting and cutting of food.

CANINES:- These are marked as (Y) and they are specidized for tearing and eating flesh. They are pointe and are present in carnivores that eats the meat of Animals. These teeths as being pointed helps in teaing and eating flesh of animals in humans they are less pointed since We are Omnivorous.

PREMOLARS AND MOLARS:- The structure labelled as (Z) are The Molars. Molars and premolars are flat and broad and are modified for grinding and chewing of food and breaking into smaller particles

STEPS INVOLVED IN MOVEMENT OF BOLOUS:-

Firstly the tounge Pushes Upward and backward Pushing the bolous into Phaynx.

The Soft Palate moves upward and closes the nasal cavity.

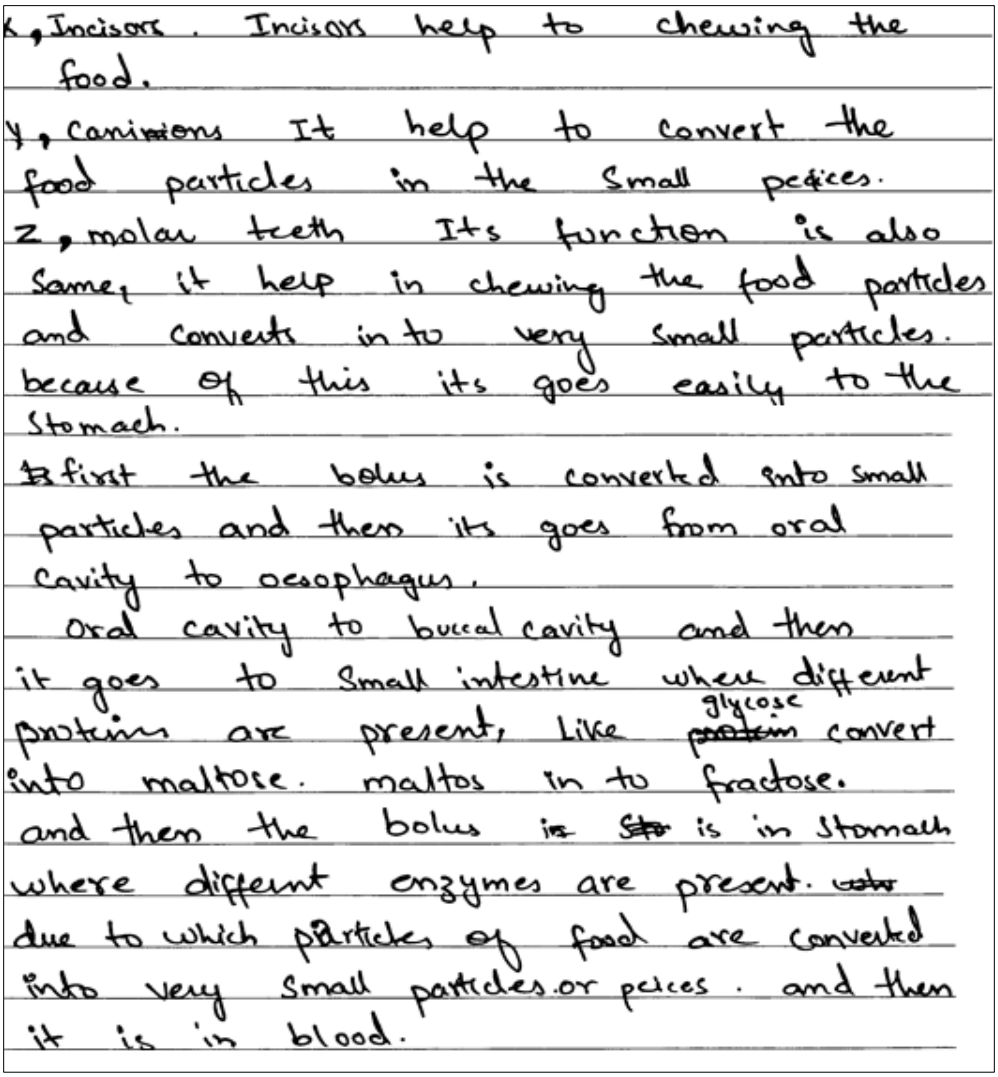
In Oesophagous the peristalcis movement that is the alternate wave contraction of Oesophagous due To contraction of cucular muscles and relaxation of math muscles moves the food down to Stomach and bolous finally reaches Stomach.

Weaker responses mentioned a generalised function of all types of teeth, i.e. cutting/ tearing of food. They did not specify the particular function of each type of tooth.

There was a wide range of weak responses starting from the very brief and vague which could not differentiate between bolus and food particles. Such responses mentioned digestion of food in the stomach/ peristalsis in stomach/ digestion in small intestine and oesophagus. They were unable to describe the role of the parts of oral cavity in movement of bolus into oesophagus. Most of the weaker responses struggled in the describing movement of larynx and epiglottis.

Each step in the movement of bolus from oral cavity to stomach is interlinked such as movement of tongue leads other steps to occur. It is recommended for candidates to understand and learn such topic using flowcharts.

Example:


x, Incisors. Incisors help to chewing the food.
y, Canines It help to convert the food particles in the small pecices.
z, molar teeth Its function is also same, it help in chewing the food particles and converts in to very small particles. because of this its goes easily to the stomach.
first the bolus is converted into small particles and then its goes from oral cavity to oesophagus.
Oral cavity to buccal cavity and then it goes to small intestine where diffevent proteins are present, Like glycose convert into maltose. maltos in to fractose. and then the bolus is is in stomach where diffevent enzymes are present. due to which particles of food are converted into very small particles or peices. and then it is in blood.