آغا خان یونیورسٹی ایگزامینیشن بورڈ

AGA KHAN UNIVERSITY EXAMINATION BOARD

Notes from E-Marking Centre on HSSC-I Biology Annual Examinations 2024

Introduction

This document has been produced for the teachers and candidates of Higher Secondary School Certificate (HSSC) Part I Biology. It contains comments on candidates' responses to the 2024 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 that 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 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 SLOs 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

Most candidates did well in their responses, especially regarding insect adaptations and their economic impacts. They also excelled in describing cuticular and stomatal transpiration and understanding their significance. However, it is crucial for teachers to emphasise the following areas and offer additional drills and practice to ensure a thorough understanding:

- Assessment of protein structural levels with various examples.
- Construction and interpretation of graphs related to factors influencing enzyme activity.
- Understanding absorption spectra of different plant pigments through graphs.
- Recognition of the nature of respiratory organ damage in emphysema.
- Application of cell organelle functions to various scenarios.

Note: Candidates' responses shown in this report have not been corrected for grammar, spelling, format, or information.

DETAILED COMMENTS

Constructed Response Questions (CRQs)

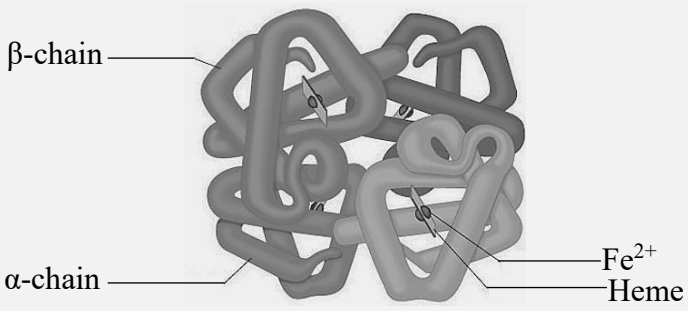
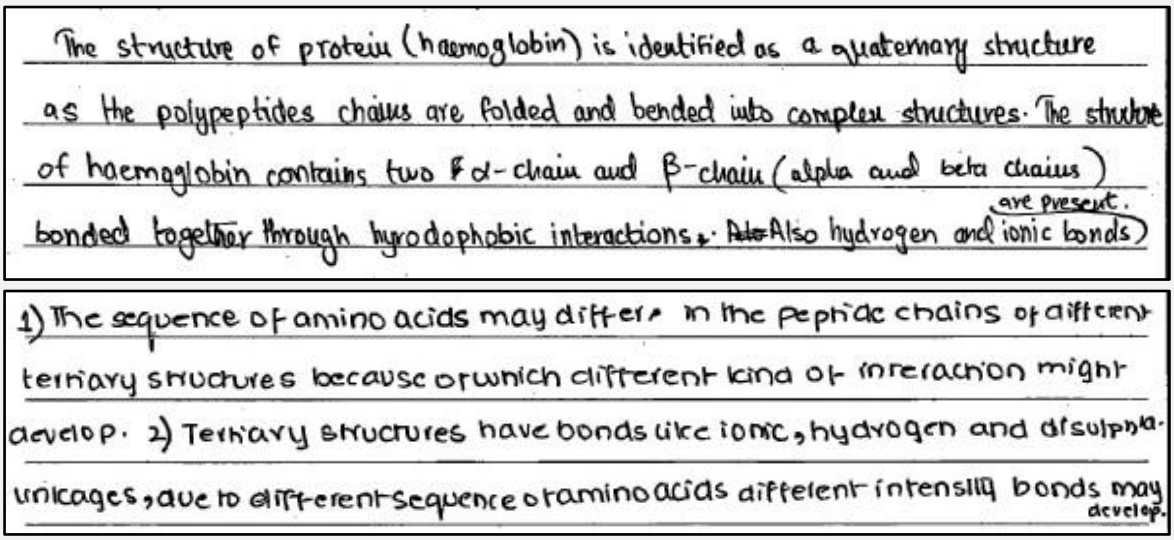
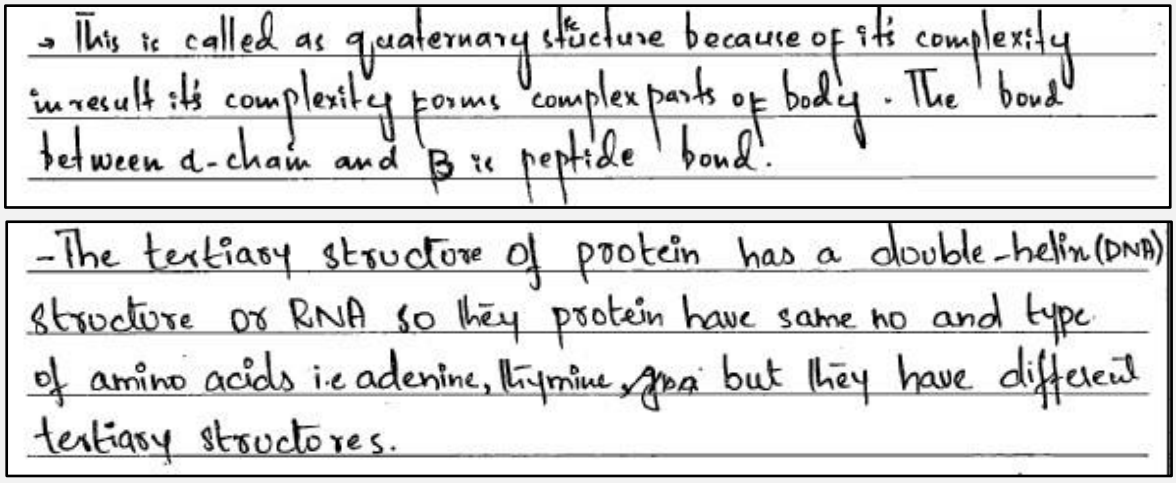
Question No. 1	
Question Text	The given diagram shows the quaternary structure of a protein (haemoglobin).  a. Why is this protein identified as a quaternary structure? Identify any ONE type of interaction (bond) found between α-chain and β-chain. b. Two proteins with the same number and type of amino acids may have different tertiary structures. Support the given statement by giving TWO reasons.
SLO No.	2.6.7
SLO Text	Differentiate among levels of organisation of proteins, i.e. a. primary b. secondary c. tertiary d. quaternary.
Max Marks	4
Cognitive Level	U*
Checking Hints	a. 1 mark for giving the reason 1 mark for identifying each type of interaction (any ONE required) b. 1 mark for giving each reason (any TWO required)
Overall Performance	Part (a) was well executed, with most candidates successfully explaining why haemoglobin is designated as a quaternary protein. However, in part (b), candidates struggled to provide two reasons for proteins with the same number and type of amino acids may have different tertiary structures.
Description of Better Responses	*Better responses* of part 'a' included descriptions of haemoglobin's structure, detailing its composition of four polypeptide chains (two identical alpha chains and two identical beta chains). These responses also accurately identified the interactions between these chains, such as hydrogen bonding, ionic bonding, hydrophobic interactions, disulfide bridges, and Van der Waals forces. Moreover, the *better responses* of part 'b' highlighted the importance of amino acid sequence (primary structure), local and non-local interactions and folding pathways. These responses accurately described how variations in these factors lead to different folding patterns and final protein structures, demonstrating a comprehensive understanding of protein biochemistry.

Image of Better Response	
Description of Weaker Responses	*Weaker responses* of part 'a' indicated that haemoglobin is considered a quaternary structure merely because it is a complex molecule. Additionally, these responses incorrectly identified the interactions among haemoglobin' s polypeptide chains as peptide or covalent bonds, reflecting a poor understanding of the concept. To improve, candidates should study the specific criteria that define quaternary structures, such as multiple polypeptide chains and the correct types of interactions (hydrogen bonds, ionic bonds, hydrophobic interactions, disulfide bridges, and Van der Waals forces). *Weaker responses* of part 'b' failed to explain why two proteins with the same number and type of amino acids can have different tertiary structures. Instead, they provided irrelevant answers, such as incorrectly classifying DNA as a tertiary protein and identifying nitrogenous bases as amino acids. To address this, candidates should focus on understanding the factors influencing protein folding, including amino acid sequence, and both local and non-local interactions.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

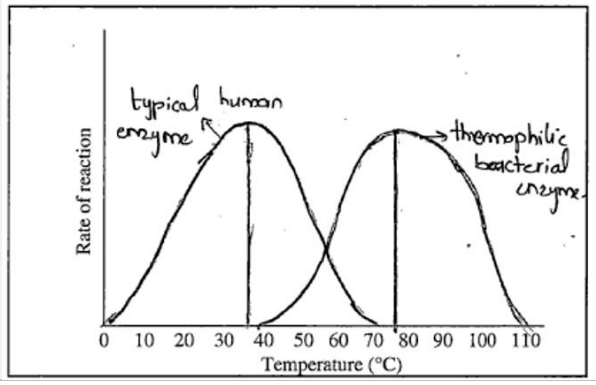
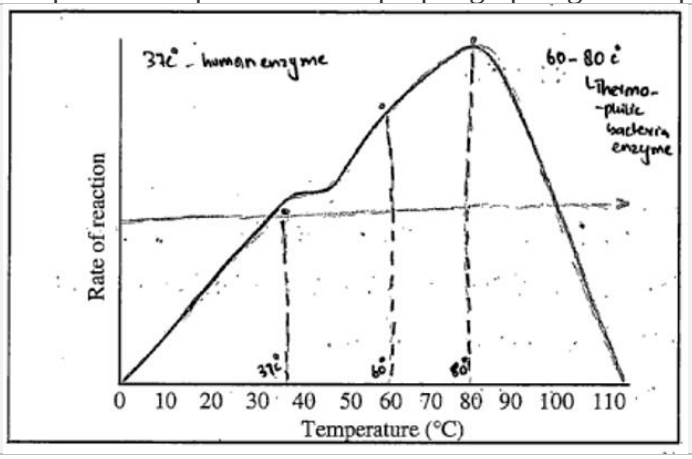
Maximising SLO Achievement	Preferred Pedagogy** Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide)	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login

• Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration ** For description of each Pedagogy, refer to Annexure A	

Any Additional Suggestion: Teachers should incorporate visual aids and interactive models to demonstrate protein structures and folding pathways. They can also use animations to illustrate how the primary structure influences the tertiary structure.

*K = Knowledge U = Understanding A = Application and other higher-order cognitive skills

Question No. 2	
Question Text	Draw TWO generalised curves on the given template to show the effect of temperature on the rate of enzyme-catalysed reaction for each of the following: • A typical human enzyme • A thermophilic bacterial enzyme
SLO No.	3.4.1 and 3.4.2
SLO Text	Verify the effect of different factors, i.e., pH and temperature on the rate of enzyme action using graph.(Compare optimum temperature of human body enzymes and thermophilic bacteria.)
Max Marks	2
Cognitive Level	A
Checking Hints	1 mark for drawing the correct curve showing optimum temperature range between 37-42°C for human enzyme. 1 mark for drawing the correct curve showing optimum temperature range between 75-90°C for thermophilic bacterial enzyme.
Overall Performance	The overall performance of candidates indicates a significant need to improve skills in constructing graphs that illustrate the effect of temperature on enzyme activity in humans and thermophilic bacteria.
Description of Better Responses	In *better responses*, candidates demonstrated a strong grasp of enzyme kinetics by accurately drawing the curves for the effect of temperature on enzyme-catalysed reactions. They correctly depicted the curve for a typical human enzyme with an optimum temperature range of 37-42°C, reflecting the enzyme's activity within human body temperatures. Additionally, they accurately illustrated the curve for a thermophilic bacterial enzyme, highlighting an optimum temperature range of 75-90°C, suitable for high-temperature environments. The curves were well-organised and clearly labelled, showcasing a solid understanding of how temperature affects enzyme activity in different organisms.

Images of Better Responses	
Description of Weaker Responses	*Weaker responses* displayed several inaccuracies in depicting the effect of temperature on enzyme-catalysed reactions. The curve for the human enzyme was incorrectly drawn highlighting an optimum temperature range beyond the expected one, i.e., 37-42°C. The curve for the thermophilic bacterial enzyme also showed an incorrect optimum range, failing to reflect the typical 75-90°C range. Additionally, the curves were poorly labelled and lacked clarity, making it difficult to understand the temperature effects on enzyme activity. These errors indicate a need for a more accurate understanding of enzyme temperature dependence and proper graphing techniques.
Images of Weaker Responses	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
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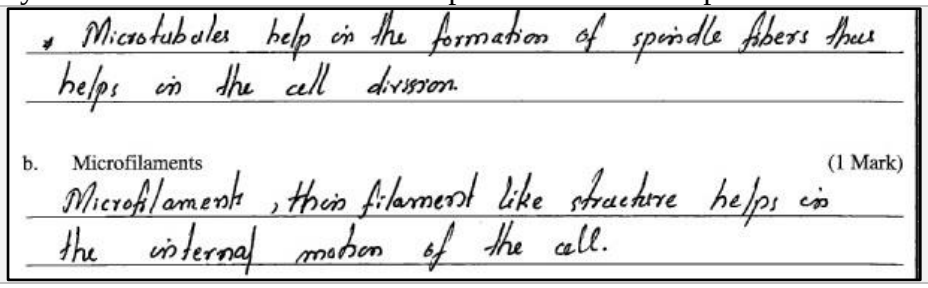
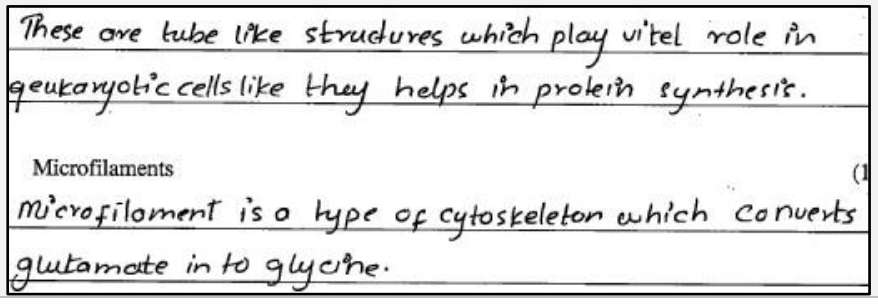
Any Additional Suggestion: Teachers should use examples of enzyme activity graphs to demonstrate proper construction and interpretation. Further, they should offer practice exercises to reinforce these skills.

Question No. 3	
Question Text	Mention any ONE function of each of the following parts of cytoskeleton in eukaryotic cells: a. Microtubules b. Microfilaments
SLO No.	4.4.1
SLO Text	Explain structure, chemical composition and functions of the cellular organelles of animal and plant cell as revealed through the electron microscope: a. cell wall b. cell membrane with reference to Fluid Mosaic Model c. cytoplasm d. endoplasmic reticulum e. ribosomes f. mitochondria g. Golgi apparatus h. lysosomes i. vacuoles j. cytoskeleton k. centrioles l. plastids m. nucleus.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for each function of microtubules 1 mark for each function of microfilament
Overall Performance	Overall, candidates' performance on this question was good. However, a more in-depth review of cytoskeletal functions and their biological significance is recommended.
Description of Better Responses	*Better responses* demonstrated a comprehensive understanding of the functions of cytoskeletal components in eukaryotic cells. These responses accurately identified the roles of microtubules, such as organising and maintaining cell shape and polarity, chromosome movements, intracellular transport and cell motility through cilia and flagella. Additionally, candidates correctly described the functions of microfilaments, including muscle contraction, cytoplasmic streaming, cytokinesis, maintenance of cell shape and intracellular transport. Their responses were detailed and well-organised, showcasing a strong grasp of cytoskeletal functions and their importance in cellular processes.
Image of Better Response	 Microtubules help in the formation of spindle fibers thus helps in the cell division. b. Microfilaments (1 Mark) Microfilaments, their filament like structure helps in the internal motion of the cell.
Description of Weaker Responses	*Weaker responses* showed significant gaps in understanding the functions of cytoskeletal components in eukaryotic cells. These responses merely described microtubules as tube-like structures or incorrectly stated their involvement in protein synthesis, rather than detailing their roles in maintaining cell shape, chromosome movements, or intracellular transport. Similarly, microfilaments were often only identified as filamentous structures, without mentioning their key functions in muscle contraction, cytoplasmic streaming, or cytokinesis.
Image of Weaker Response	 These are tube like structures which play vitel role in eukaryotic cells like they helps in protein synthesis. Microfilaments Microfilament is a type of cytoskeleton which converts glutamate into glycine.

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
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Any Additional Suggestion: Teachers should offer detailed feedback on assessments to highlight the functions of each component of cytoskeleton.		

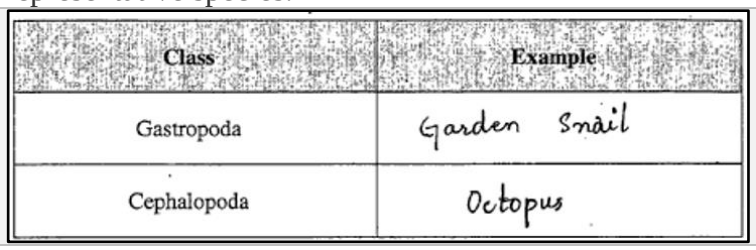
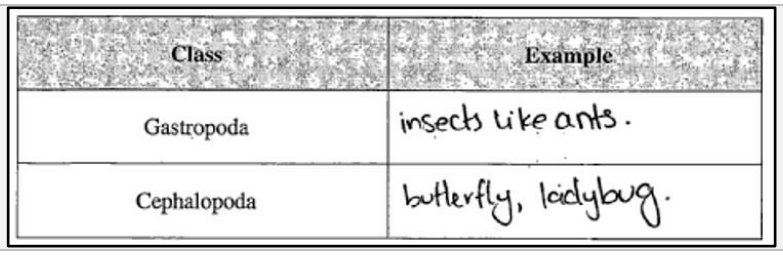
Question No. 4	
Question Text	Write any ONE example of each class of phylum mollusca in the given table. **Class** / **Example** Gastropoda Cephalopoda
SLO No.	10.9.2
SLO Text	Describe characteristics of classes of molluscs, i.e., a. gastropoda b. bivalvia c. cephalopoda.
Max Marks	2
Cognitive Level	K
Checking Hints	1 mark for an example of gastropoda 1 mark for an example of cephalopoda
Overall Performance	Overall, the performance of candidates was good. Most were able to correctly identify examples of gastropods and cephalopods. However, some students provided incorrect examples, indicating a need for further review.
Description of Better Responses	In *better responses*, candidates' accurately identified examples of each class within the phylum Mollusca. They correctly listed snail/ slug for gastropoda and octopus/ squid/ cuttle fish for cephalopoda, demonstrating a clear understanding of the classifications and representative species.
Image of Better Response	
Description of Weaker Responses	*Weaker responses* illustrated misunderstandings by providing vague or irrelevant examples, such as liver fluke or earthworm for gastropoda and starfish or butterfly for cephalopoda. These inaccuracies indicate a need for clearer knowledge of molluscan classes and their representative species.

Image of Weaker Response	

Class	Example
Gastropoda	insects like ants.
Cephalopoda	butterfly, ladybug.

Suggestions for improvement (Highlight all that apply)

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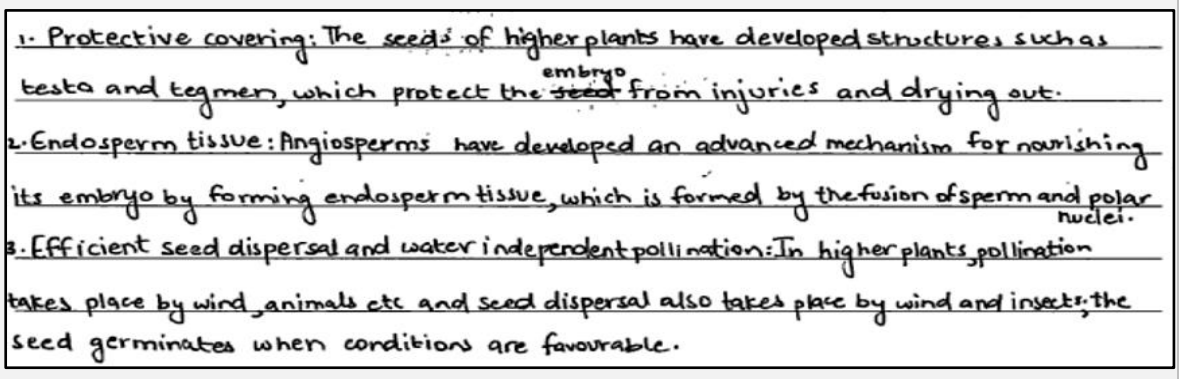
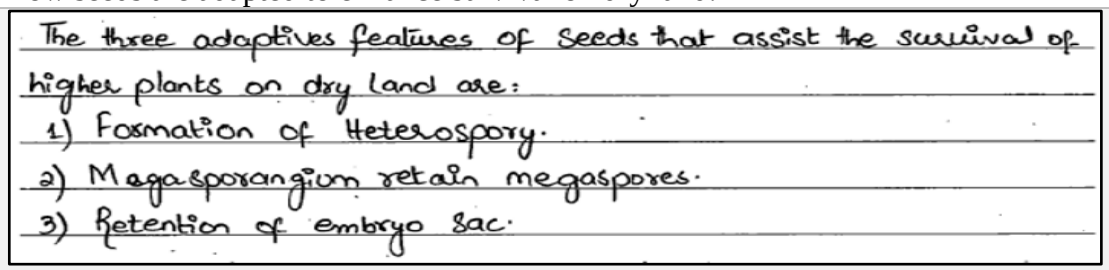
Any Additional Suggestion: Teacher can use quizzes and flashcards to reinforce the correct examples and characteristics of each molluscan class.		

Question No. 5	
Question Text	Describe any THREE adaptive features of seeds that assist the survival of higher plants on dry land.
SLO No.	9.4.5
SLO Text	Discuss that vascular plants are the most successful group of land plants.
Max Marks	3
Cognitive Level	U
Checking Hints	1 mark for writing each feature (any THREE required)
Overall Performance	The overall performance on this question was average. Candidates provided some relevant information about seed adaptations but often missed key details or included unrelated aspects, such as evolutionary steps. These responses showed a basic understanding but lacked depth and specificity in describing how seeds are adapted for the survival on dry land.
Description of Better Responses	*Better responses* demonstrated a thorough understanding of the adaptive features of seeds that enhance the survival of higher plants on dry land. These responses accurately mentioned key adaptations, such as the diploid embryo germinates into a sporophyte, the presence of storage tissue like endosperm to sustain growth, and the protective seed coat that prevents desiccation and supports dormancy until favourable conditions arise. Additionally, these responses indicated the effective seed dispersal mechanisms, which

	reduce competition with the parent plant. Hence, these responses were detailed and well-organised, showcasing a solid grasp of seed adaptations and their evolutionary advantages.
Image of Better Response	
Description of Weaker Responses	In *weaker responses*, candidates demonstrated significant misunderstandings, as they erroneously focused on the steps of seed evolution rather than the adaptive features. They failed to mention key adaptations such as the diploid embryo, storage tissue, protective seed coat and mechanisms preventing desiccation. Additionally, they overlooked the importance of seed dormancy and dispersal strategies, indicating a need for a clearer understanding of how seeds are adapted to enhance survival on dry land.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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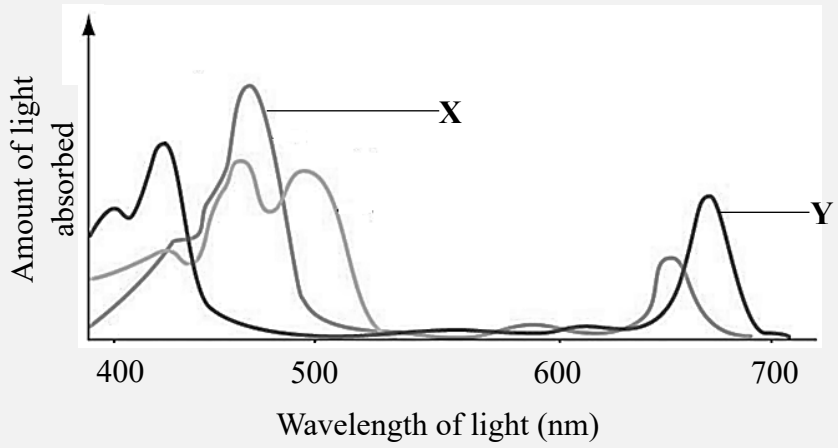
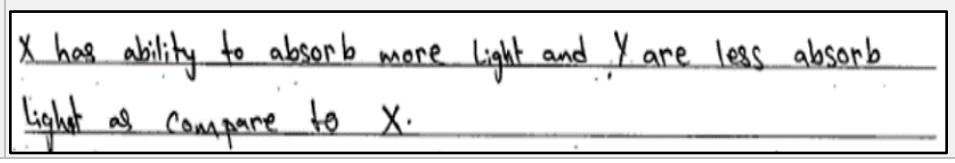
Any Additional Suggestion: Teachers can identify and correct common misconceptions, such as confusing evolutionary steps with adaptive features, through targeted lessons and feedback.		

Question No. 6	
Question Text	The given graph shows the absorption spectrum of two different pigments **X** and **Y**.  Based on the wavelength of light absorbed, identify pigments **X** and **Y**.
SLO No.	11.2.4 and 11.2.5
SLO Text	Describe chromatography and spectrophotometry. Explain the role of chlorophyll and other photosynthetic pigments, light, carbon dioxide and water in photosynthesis.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for the correct identification of pigment **X** 1 mark for the correct identification of pigment **Y**
Overall Performance	Overall, the performance was very weak on this question. There was a lack of understanding regarding the specific absorption spectra of chlorophylls 'a' and 'b'. The responses were frequently inaccurate, indicating a need for a more thorough review of pigment identification and absorption characteristics.
Description of Better Responses	In *better responses*, candidates correctly identified the pigments based on their absorption spectra. They accurately determined that pigment **X** is chlorophyll 'b' and pigment **Y** is chlorophyll 'a', reflecting a clear understanding of the absorption characteristics of these chlorophyll types.
Image of Better Response	 X is chlorophyll B and Y is chlorophyll A
Description of Weaker Responses	*Weaker responses* demonstrated confusion in identifying the pigments from their absorption spectra. Candidates provided irrelevant information by incorrectly referring to pigments like carotenoids or xanthophylls, which did not match the absorption patterns shown in the graph.
Image of Weaker Response	 X has ability to absorb more light and Y are less absorb light as compare to X.

Suggestions for improvement (Highlight all that apply)

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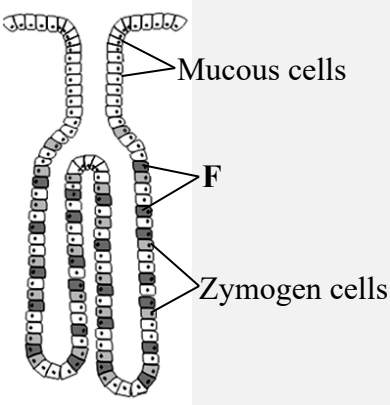
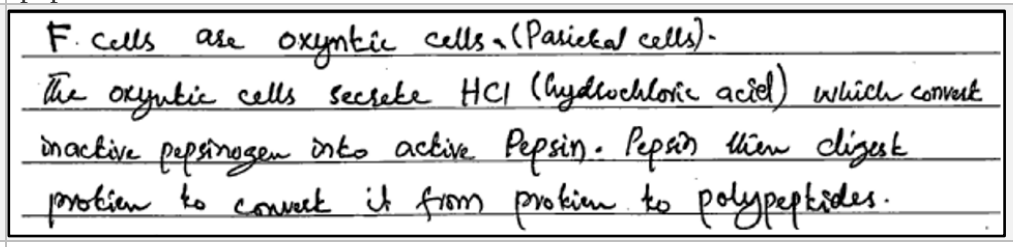
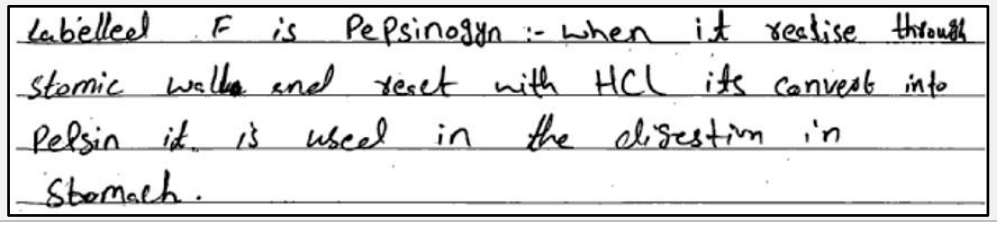
Any Additional Suggestion: Teachers should incorporate diagrams and graphs showing the absorption spectra of various pigments to help students visualise and differentiate between them.		

Question No. 7	
Question Text	The given diagram shows gastric glands in the stomach wall of a human being.  Identify the cells labelled as **F**. How do these cells help in the process of digestion?
SLO No.	12.4.1
SLO Text	Relate the function of each organ of the digestive system of the human with its structure: a. gastrointestinal tract (GIT) i. oral cavity ii. pharynx iii. oesophagus iv. stomach v. small intestine vi. large intestine vii. rectum and anus b. accessory digestive organs i. dentition ii. tongue iii. salivary glands (composition of saliva) iv. liver (gall bladder and composition of bile) v. pancreas (composition of pancreatic juice).
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for the correct identification 1 mark for writing about hydrochloric acid causes conversion of pepsinogen into pepsin
Overall Performance	Overall, the performance on this question was good. The responses demonstrated a solid grasp of the gastric digestive process. However, a few candidates illustrated minor inaccuracies, which suggest that reinforcing the specifics of gastric physiology could further enhance understanding.

Description of Better Responses	*Better responses* correctly identified the cells labelled as **F** as oxyntic cells or parietal cells. Furthermore, candidates accurately explained that these cells secrete hydrochloric acid, which creates an acidic environment in the stomach. This acidity facilitates the conversion of pepsinogen into pepsin, an enzyme crucial for digesting proteins into polypeptides and peptones.
Image of Better Response	
Description of Weaker Responses	*Weaker responses* showed several misconceptions. They frequently misidentified the cells labelled as **F**, confusing them with other cell types or providing incorrect labels. Furthermore, their explanations of the cells' functions were unclear, indicating some incorrect attributed roles such as enzyme production, mucus secretion, or germ killing, rather than focusing on hydrochloric acid secretion.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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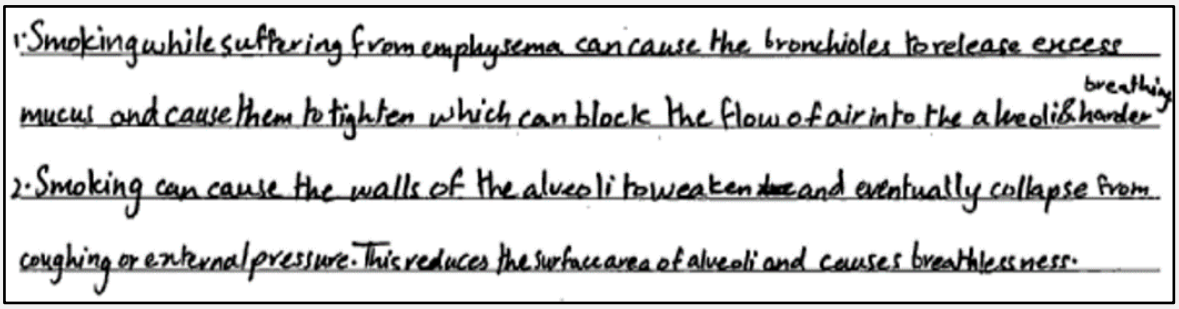
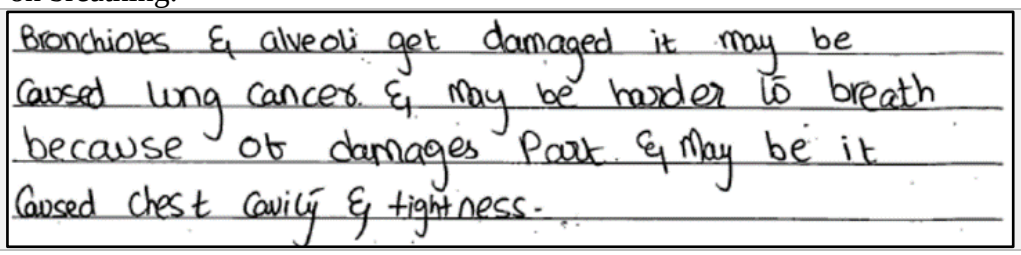
Any Additional Suggestion: Teachers should engage candidates with interactive activities, such as labelling diagrams or virtual simulations, to reinforce their understanding of gastric physiology.

Question No. 8	
Question Text	When a person suffering from emphysema smokes, the bronchioles and alveoli get damaged. Describe how the damage of each structure will make the breathing harder in this person.
SLO No.	13.4.1
SLO Text	Discuss causes, symptoms and preventive measures of: a. upper respiratory tract infections i. sinusitis ii. otitis media b. lower respiratory tract infections i. pneumonia ii. tuberculosis iii. emphysema iv. lung cancer.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for describing the damage to bronchioles 1 mark for describing the damage to alveoli
Overall Performance	Overall, the performance on this question was moderate. While some candidates provided a correct description of alveolar damage in emphysema, including the formation of larger alveoli with reduced surface area, there was often a lack of detail on how bronchioles are affected.
Description of Better Responses	In *better responses*, candidates provided a thorough description of how smoking worsens emphysema and impacts breathing. They accurately communicated how inflammation causes bronchioles to collapse during expiration, trapping air in the alveoli and impeding the diaphragm's function. Additionally, the explanation of how alveolar wall degeneration leads to the formation of larger, fewer alveoli with reduced surface area effectively highlighted the compromised gas exchange.
Image of Better Response	
Description of Weaker Responses	*Weaker responses* demonstrated a lack of essential knowledge regarding the damage to bronchioles in emphysema. Many candidates failed to address how bronchioles become inflamed and collapse during expiration, which is crucial for understanding the difficulty in breathing. Some responses only described the damage to alveoli, such as the formation of larger, fewer alveoli with reduced surface area, but did not connect this to the overall impact on breathing.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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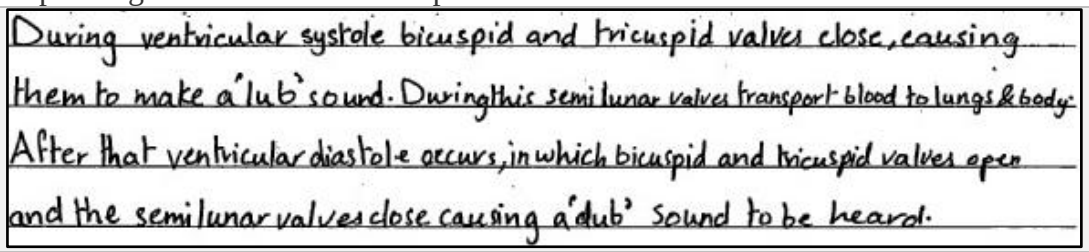
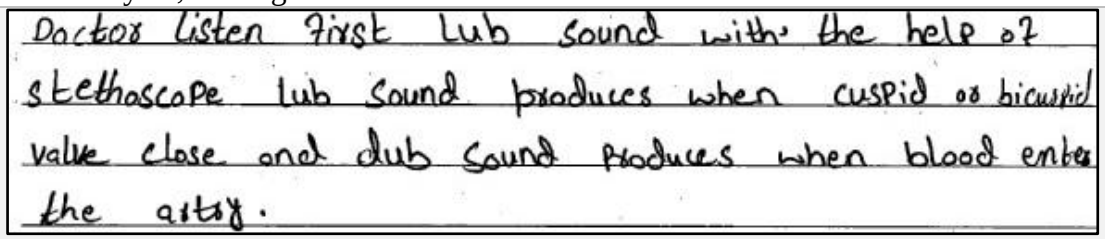
Any Additional Suggestion: Teachers can invite medical professionals to discuss emphysema or other diseases, providing real-world insights into the disease and its management.

Question No. 9	
Question Text	A doctor listening to the heartbeat through a stethoscope hears two sounds, *lub* and *dub*. How are these two sounds produced?
SLO No.	14.7.5
SLO Text	Explain cardiac cycle (sequence of events and mechanism of heart excitation and contraction).
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for writing about the contraction of ventricles and closure of bicuspid or tricuspid valves 1 mark for writing about the relaxation of ventricles and closure of semilunar valves
Overall Performance	The explanations provided by the candidates were generally well-structured showcasing a solid grasp of heart valve functions and their role in producing the characteristic heart sounds. However, a few minor inaccuracies suggest that a brief review of the cardiac cycle could further enhance comprehension.
Description of Better Responses	In *better responses*, candidates accurately described the production of the '*lub*' and '*dub*' sounds in the heartbeat. The '*lub*' sound is correctly attributed to the closure of the bicuspid and tricuspid valves when the ventricles contract, pumping blood into the arteries. The '*dub*' sound is appropriately linked to the simultaneous closure of the semilunar valves at the base of the pulmonary artery and aorta during ventricular relaxation. These responses demonstrate a clear understanding of the cardiac cycle and valve functions, effectively explaining how these sounds are produced.
Image of Better Response	

Description of Weaker Responses	*Weaker responses* exhibited several misconceptions and incomplete explanations. Many candidates mentioned only one valve, such as the bicuspid valve, when describing the production of the '*lub'* sound, overlooking the role of the tricuspid valve. Additionally, some responses lacked clarity in explaining the '*dub'* sound, with incorrect or vague references to the semilunar valves. Others failed to differentiate between the phases of the cardiac cycle, leading to confusion about when each sound occurs.
Image of Weaker Response	 Doctor listen first lub sound with the hele of stethoscope lub sound produces when cuspid or bicuspid valve close and dub sound produces when blood enter the artry.

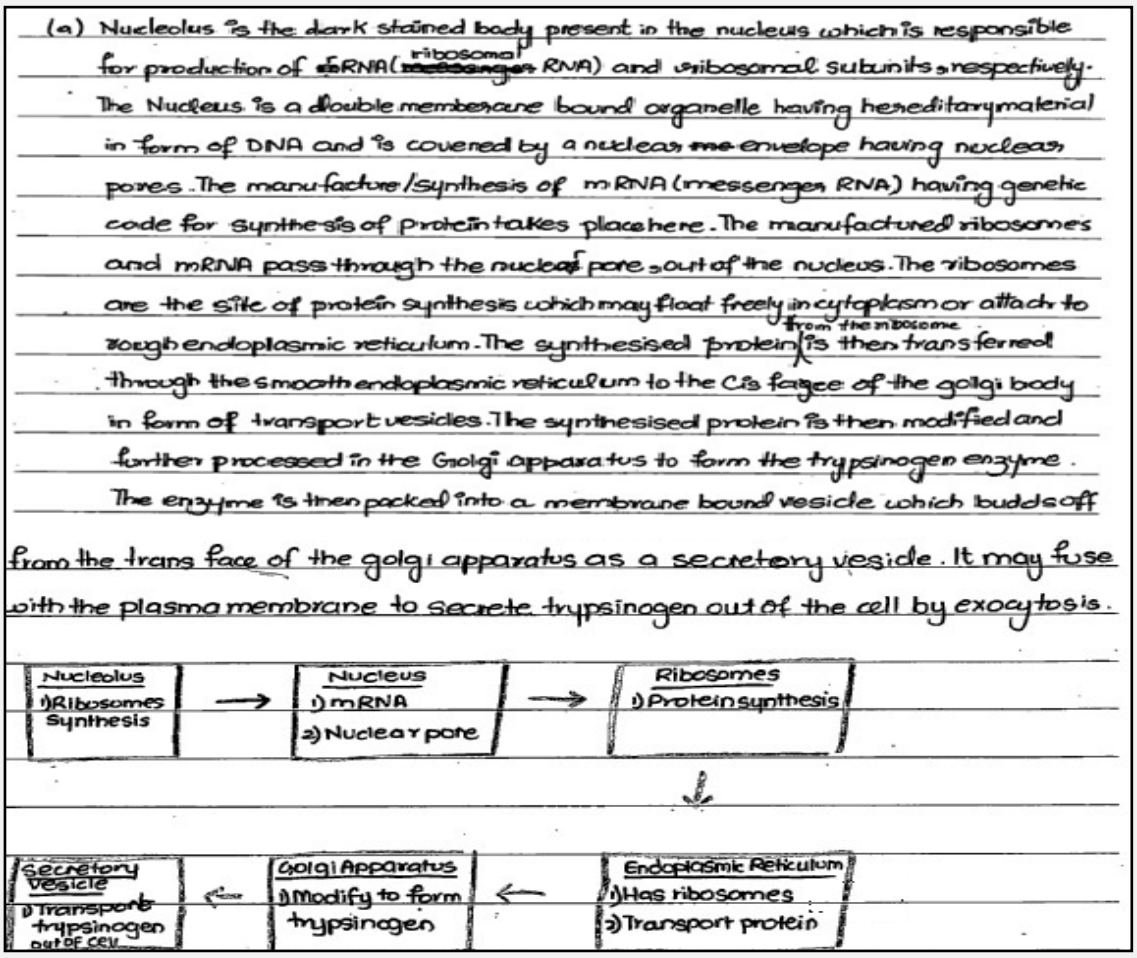
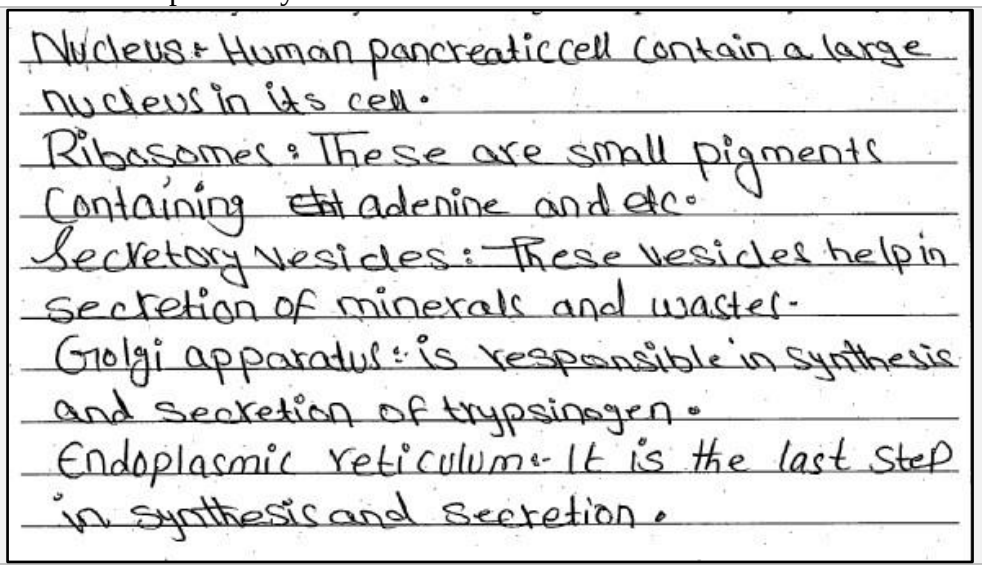
Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide) • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login
Any Additional Suggestion: Teachers can incorporate diagrams, animations and models of the heart to visually demonstrate valve functions and the production of heart sounds.		

Extended Response Questions (ERQs)

Extended response questions offered a choice between parts 'a' and 'b'

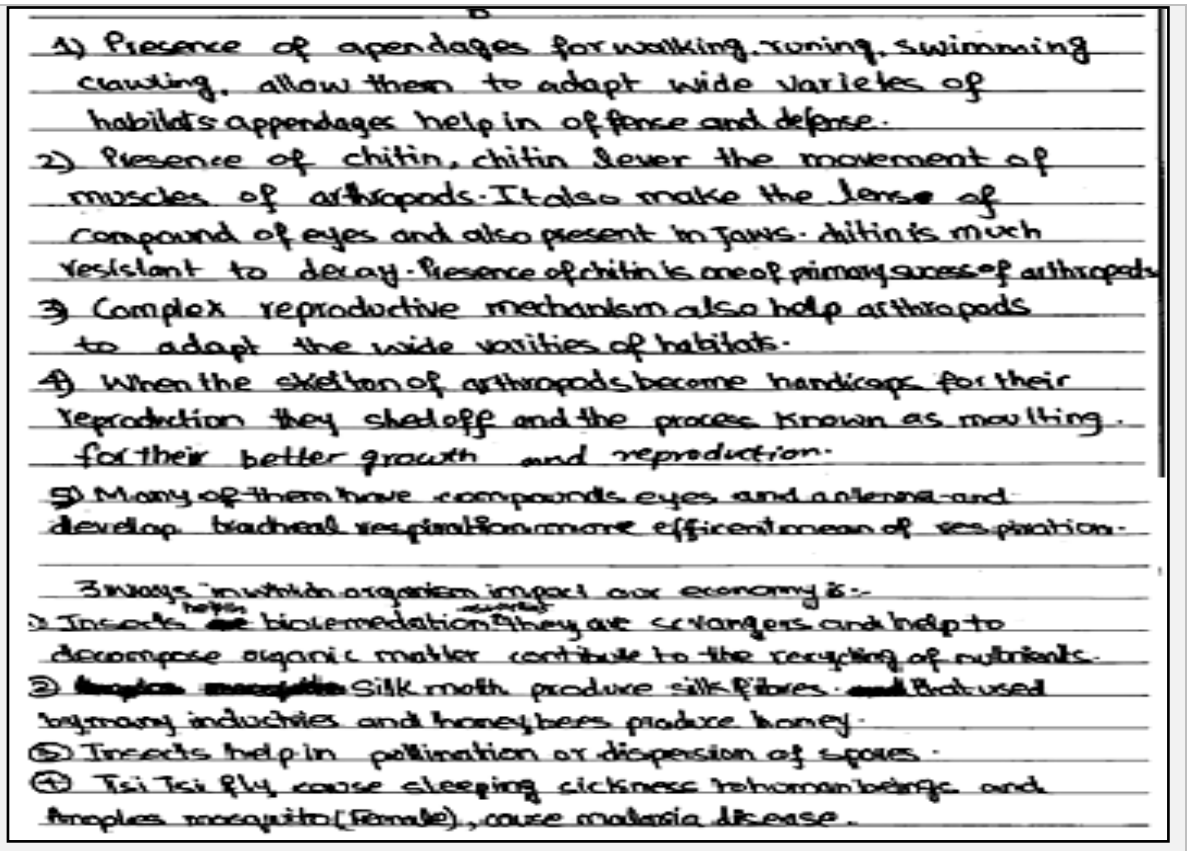
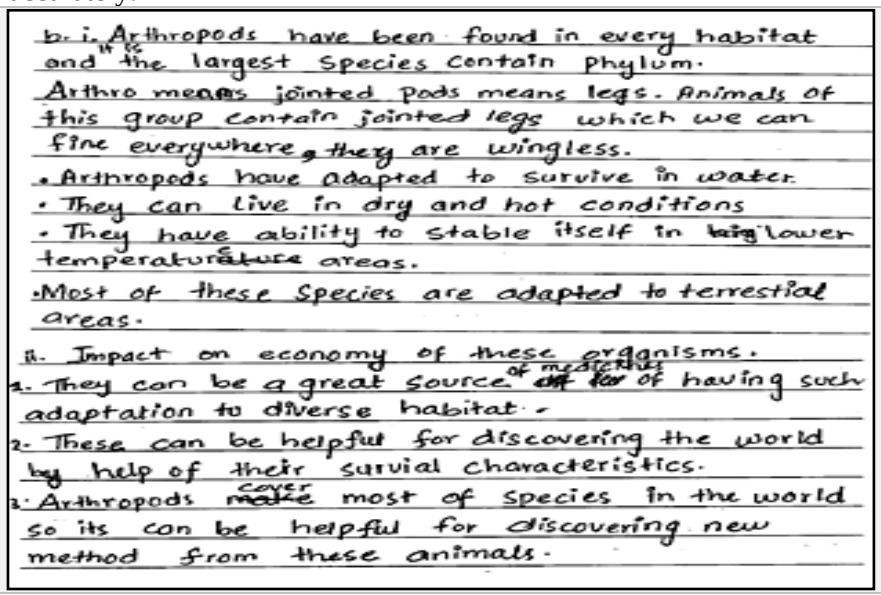
Question No. 10(a)	
Question Text	Human pancreatic cells secrete trypsinogen enzyme. Describe the role of each of the given organelles in the synthesis and secretion of trypsinogen. Nucleus — Ribosomes — Secretory vesicles Golgi apparatus — Nucleolus — Endoplasmic reticulum (**Note**: Your answer should be in the proper order of occurrence.)
SLO No.	4.4.1
SLO Text	Explain structure, chemical composition and functions of the cellular organelles of animal and plant cell as revealed through the electron microscope: a. cell wall b. cell membrane with reference to Fluid Mosaic Model c. cytoplasm d. endoplasmic reticulum e. ribosomes f. mitochondria g. Golgi apparatus h. lysosomes i. vacuoles j. cytoskeleton k. centrioles l. plastids m. nucleus.
Max Marks	7
Cognitive Level	U
Checking Hints	1 mark for describing the role of each organelle in the synthesis and secretion of trypsinogen (SIX required) 1 mark for the correct sequence of the process
Overall Performance	Fewer candidates attempted this part compared to part 'b'. The overall performance was average. While some candidates exhibited a basic understanding of organelle functions, many responses lacked depth and detail. This highlights a need for better comprehension of the coordinated cellular processes involved in protein synthesis and secretion.
Description of Better Responses	In *better response*, candidates provided a comprehensive and accurate description of the role of each organelle in the synthesis and secretion of trypsinogen, following the proper sequence of events. These responses correctly identified the nucleus as the site of DNA coding and mRNA synthesis, and the nucleolus as responsible for ribosome production. Ribosomes were accurately described as translating mRNA into trypsinogen. The endoplasmic reticulum was noted for synthesising and transporting trypsinogen to the Golgi apparatus, which modifies and packages it. Finally, the role of secretory vesicles in transporting and releasing trypsinogen via exocytosis was well-explained. The answers were clear and well-organised.

Image of Better Response	
Description of Weaker Responses	*Weaker responses* displayed several misconceptions and lacked detail. Many incorrectly identified the roles of the organelles, with some confusing the functions of the nucleus and nucleolus or misattributing the synthesis and transport processes. There was also frequent oversight of key steps, such as the modification of trypsinogen in the Golgi apparatus or the role of secretory vesicles in exocytosis. Additionally, the sequence of events was often out of order, indicating a need for a better understanding of the process. Overall, the responses lacked clarity and coherence, demonstrating gaps in knowledge regarding organelle functions in protein synthesis and secretion.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide) • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login
Any Additional Suggestion: Teachers can incorporate interactive activities such as role-playing or simulations where students can act out the functions of different organelles in the cell.		

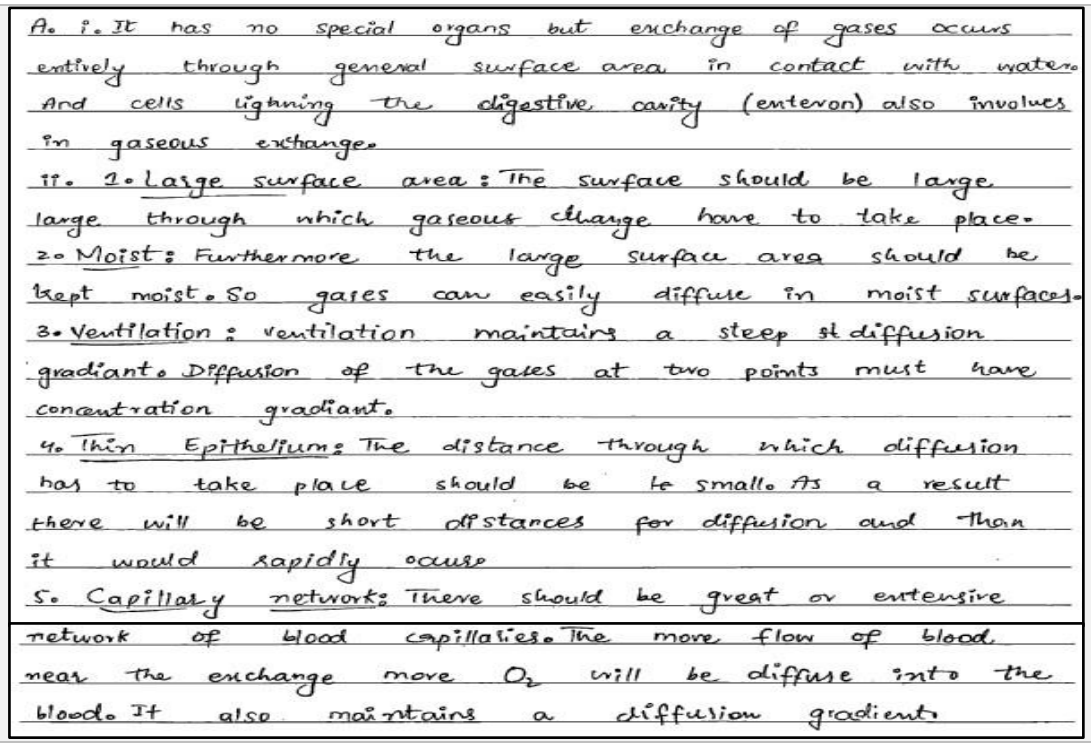
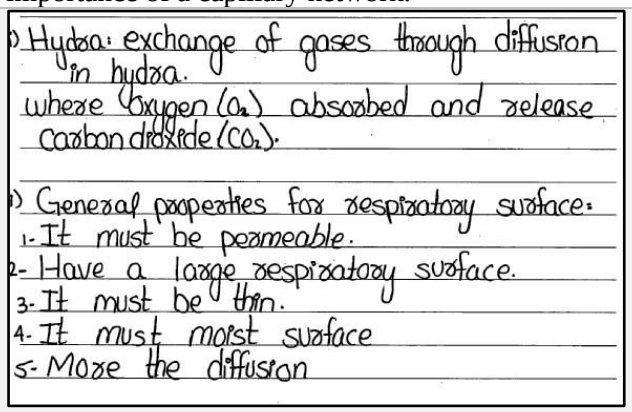
Question No. 10(b)	
Question Text	According to an article published by Nic Fleming on February10, 2015, "The most dominating form of life, in terms of their number on the Earth, is six-legged, shrimp-like springtails … The 6,000 known species of these wingless arthropods can be found in all manner of habitats all over the world, from beaches and cliffs to the Antarctic and the highest mountain ranges on the Earth." i. Explain any FOUR ways in which the organisms described in the given text have successfully adapted to diverse habitats. ii. Describe any THREE ways in which these organisms impact our economy.
SLO No.	10.8.4 (10.8.5)
SLO Text	Discuss economic importance (beneficial and harmful) of insects.(Discuss insects as a successful group of animals.)
Max Marks	7
Cognitive Level	U
Checking Hints	1 mark for each adaptation of insects (any FOUR required) 1 mark for giving each impact (positive or negative) on our economy (any THREE required)
Overall Performance	Most candidates favoured this part, and their overall performance was strong. The majority demonstrated a solid understanding of insect adaptations and their economic impact, indicating thorough preparation and a good command of the topic.
Description of Better Responses	Candidates who performed well demonstrated a comprehensive understanding of the adaptations and economic impacts of the described organisms. They clearly explained the small size of insects, emphasising their ability to use microhabitats for protection and resource utilisation. The role of the exoskeleton in water conservation and protection was accurately described. Candidates effectively discussed the significance of specialised appendages in locomotion, feeding, and reproduction. Their explanation of metamorphosis was thorough, illustrating the different habitats used during various life stages. For economic impacts, candidates accurately linked sericulture, apiculture, pest damage, disease vectors, pollination, seed dispersal and scavenging roles to economic effects, showcasing their strong understanding of the topic.

Image of Better Response	
Description of Weaker Responses	*Weaker responses* demonstrated a lack of focus on the specific adaptations and economic impacts of insects, as asked in the question. Many candidates incorrectly described the general adaptations and importance of arthropods rather than focusing on insects. Common misconceptions included confusing the exoskeleton's role in insects with that in other arthropods and failing to specify the unique reproductive strategies and developmental stages of insects. Additionally, some responses incorrectly attributed economic impacts to non-insect arthropods, leading to vague or irrelevant examples. These responses lacked the precision and specificity needed to address the question accurately.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
• Identify the expectation of command words (use Command Word Guide) • Ensure the content is taught at the relevant cognitive level • Identify necessary content required (skills + concepts) • Review past paper questions on the concept • Utilise the resource guide for additional materials	• Story Board • Cause and Effect • Fish and Bone • Concept Mapping • Audio Visual Resources • Think, Pair and Share • Knowledge Platform videos • Questioning Technique (Socratic approach) • Practical Demonstration *K	• Past paper questions • Discussion on E-Marking Notes • AKU-EB Digital Learning Solution powered by Knowledge Platform https://akueb.knowledgeplatform.com/login
Any Additional Suggestion: Teachers can use practice questions to help candidates differentiate between adaptations of insects and other arthropods, ensuring clarity in their responses.		

Question No. 11(a)	
Question Text	i. How does gaseous exchange take place in hydra? ii. Describe any FIVE general properties of respiratory surfaces in higher animals.
SLO No.	13.2.1 ;13.2.2
SLO Text	Describe properties of respiratory surface. Describe process of gaseous exchange in hydra, earthworm and cockroach.
Max Marks	7
Cognitive Level	U
Checking Hints	i. 1 mark for writing entire general surface / skin in contact with water 1 mark for writing cells lining the digestive cavity/ surface lining of the enteron ii. 1 mark for describing each property (any FIVE required) 2 marks will be awarded if any FOUR properties are identified only
Overall Performance	A moderate number of candidates attempted this part of the question. However, those who did, demonstrated a strong understanding of gaseous exchange in hydra and the properties of respiratory surfaces in higher animals. The clarity of their responses reflects a solid grasp of the concepts and processes involved, indicating that the candidates were well-prepared and knowledgeable.
Description of Better Responses	Candidates who performed well provided accurate explanations of gaseous exchange in hydra, emphasising the role of the general surface and the digestive cavity. Their descriptions of the respiratory surfaces in higher animals were comprehensive, covering all essential features. They correctly identified and described the importance of a large surface area, moisture, thin epithelium, ventilation, capillary networks and permeability for efficient gas exchange. Their responses were well-organised, showing a clear understanding of how these properties facilitate respiration and the mechanisms involved in different organisms.

Image of Better Response	 A. i. It has no special organs but exchange of gases occurs entirely through general surface area in contact with water. And cells lighning the digestive cavity (enteron) also involves in gaseous exchange. ii. 1. Large surface area : The surface should be large large through which gaseous change have to take place. 2. Moist : Furthermore the large surface area should be kept moist. So gases can easily diffuse in moist surfaces. 3. Ventilation : ventilation maintains a steep st diffusion gradiant. Diffusion of the gases at two points must have concentration gradiant. 4. Thin Epithelium : The distance through which diffusion has to take place should be to small. As a result there will be short distances for diffusion and than it would rapidly occuse 5. Capillary network : There should be great or extensive network of blood capillaries. The more flow of blood near the exchange more O_2 will be diffuse into the blood. It also maintains a diffusion gradient.
Description of Weaker Responses	*Weaker responses* often lacked clarity and detail regarding gaseous exchange in hydra, with some candidates incorrectly stating that gas exchange occurs through specialised structures or internal organs. Common misconceptions included confusion between hydra and other organisms with more complex respiratory systems. In their discussion of respiratory surfaces in higher animals, these responses frequently missed key properties or inaccurately described them. For example, some candidates suggested that respiratory surfaces do not need to be moist or failed to mention the importance of a capillary network.
Image of Weaker Response	 i) Hydra: exchange of gases through diffusion in hydra. where Oxygen (O_2) absorbed and release carbon dioxide (CO_2). ii) General properties for respiratory surface: 1- It must be permeable. 2- Have a large respiratory surface. 3- It must be thin. 4- It must moist surface 5- More the diffusion

Suggestions for improvement (Highlight all that apply)

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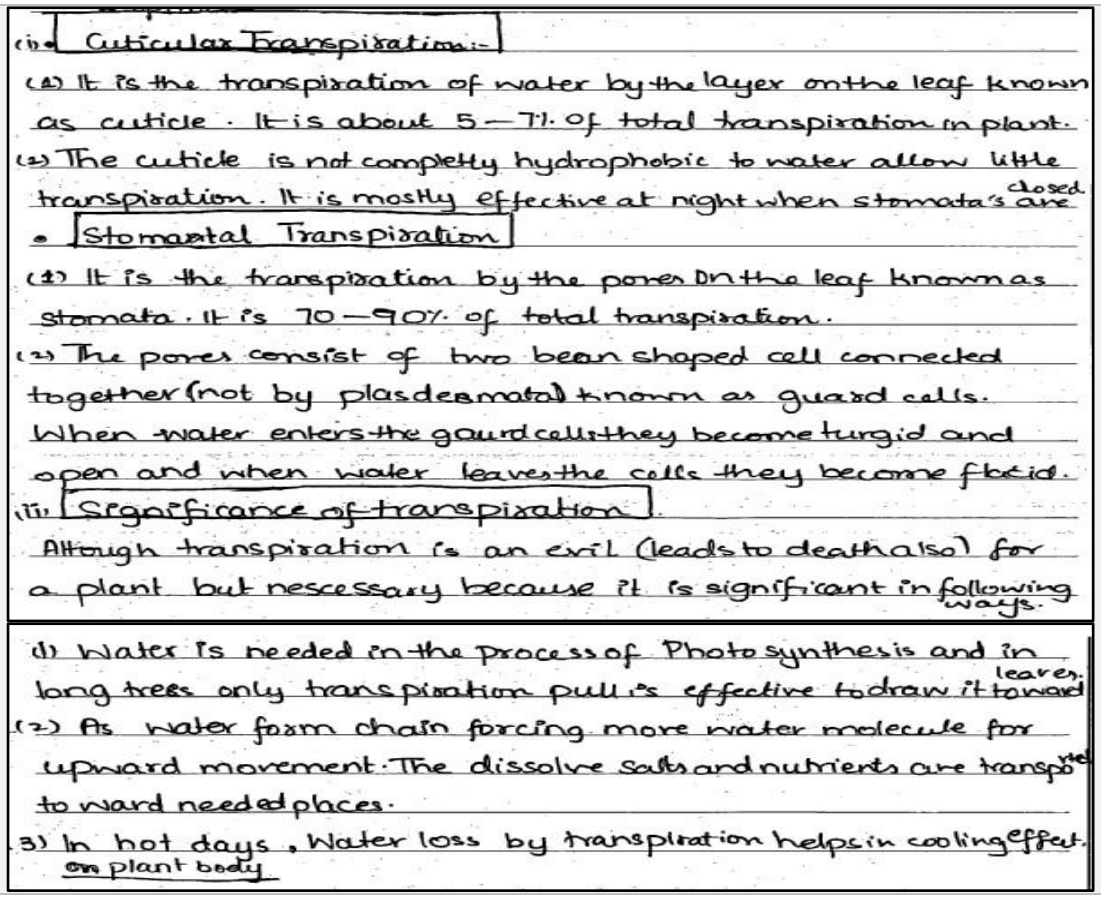
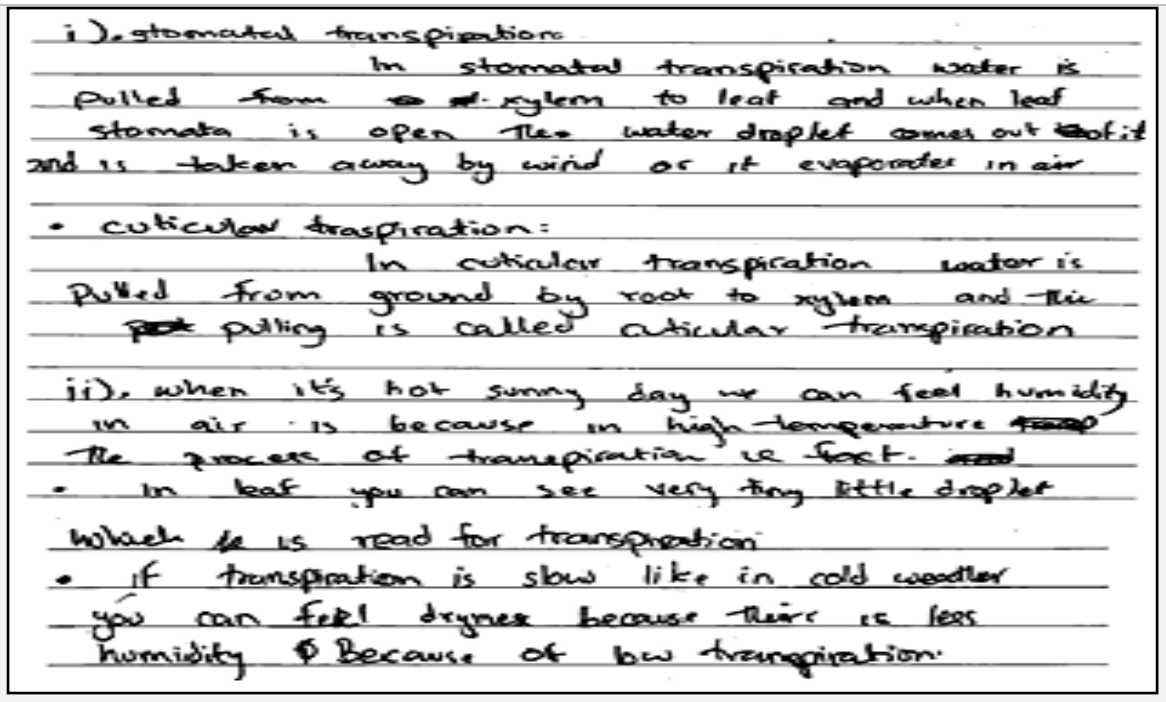
• Review past paper questions on the concept • Utilise the resource guide for additional materials	• Questioning Technique (Socratic approach) • Practical Demonstration	

Any Additional Suggestion: Teachers should focus on explaining the underlying principles of respiration rather than just memorising facts. This will help students apply their knowledge to different scenarios.

Question No. 11(b)	
Question Text	i. Describe the following types of transpiration in plants in TWO points each. • Cuticular Transpiration • Stomatal Transpiration ii. Describe any THREE points of significance of transpiration in plants.
SLO No.	14.4.2 (14.4.5)
SLO Text	Differentiate among types of transpiration, i.e., cuticular, lenticular and stomatal transpiration. Discuss why transpiration is considered as a necessary evil.)
Max Marks	7
Cognitive Level	U
Checking Hints	1 mark for describing cuticular transpiration (any TWO points required) 1 mark for describing stomatal transpiration (any TWO points required) 1 mark for each point of significance of transpiration (THREE required)
Overall Performance	Most candidates attempted this part of the question, demonstrating a strong grasp of concepts related to transpiration. Overall, the responses were comprehensive and well-articulated, reflecting a deep understanding of plant physiology.
Description of Better Responses	In *better responses*, candidates demonstrated a strong understanding of transpiration types and their significance. They accurately described cuticular and stomatal transpiration, highlighting key features such as the role of the cuticle and the function of guard cells in transpiration. These responses effectively explained the significance of transpiration, including its role in water and nutrient absorption, cooling and maintaining turgidity. The well-structured responses addressed all aspects of the question with relevant and precise information.

Images of Better Responses	 (i) Cuticular Transpiration:- (1) It is the transpiration of water by the layer on the leaf known as cuticle. It is about 5—7% of total transpiration in plant. (2) The cuticle is not completly hydrophobic to water allow little transpiration. It is mostly effective at night when stomata's are closed. • Stomatal Transpiration (1) It is the transpiration by the pores on the leaf known as stomata. It is 70—90% of total transpiration. (2) The pores consist of two bean shaped cell connected together (not by plasdesmata) known as guard cells. When water enters the gaurd cells they become turgid and open and when water leaves the cells they become flaccid. (ii) Significance of transpiration Although transpiration is an evil (leads to death also) for a plant but nescessary because it is significant in following ways. (1) Water is needed in the process of Photosynthesis and in long trees only transpiration pull is effective to draw it toward leaves. (2) As water form chain forcing more water molecule for upward movement. The dissolve salts and nutrients are transported to ward needed places. 3) In hot days, Water loss by transpiration helps in cooling effect on plant body.
Description of Weaker Responses	*Weaker responses* demonstrated limited understanding of transpiration types and their significance. Many responses confused cuticular with stomatal transpiration, inaccurately describing the role of cuticle and guard cells. Some candidates mentioned irrelevant or incorrect points, such as overstating cuticular transpiration's contribution or misinterpreting the function of stomata. Additionally, some explanations of the significance of transpiration were incomplete or vague, lacking details on key processes like transpiration pull and cooling. Clarification on the specific functions and mechanisms of each type of transpiration is needed.
Image of Weaker Response	 i). stomatal transpiration: In stomatal transpiration water is pulled from xylem to leaf and when leaf stomata is open the water droplet comes out of it and is taken away by wind or it evaporates in air • cuticular trasporation: In cuticular transpiration water is pulled from ground by root to xylem and this pulling is called cuticular transpiration ii). when it's hot sunny day we can feel humidity in air is because in high temperature the process of transpiration is fast. • in leaf you can see very tiny little droplet which is read for transpiration • if transpiration is slow like in cold weather you can feel dryness because there is less humidity ∴ Because of low transpiration.

Suggestions for improvement (Highlight all that apply)

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Any Additional Suggestion: Teachers should facilitate candidates to review and provide feedback on each other's answers. This approach can help them gain different perspectives and enhance their own understanding.		

Annexure A: Pedagogies Used for Teaching the SLOs

Pedagogy: Storyboard
Description: A visual pedagogy that uses a series of illustrated panels to present a narrative, encouraging creativity and critical thinking. It helps learners organise ideas, sequence events, and comprehend complex concepts through storytelling.
Example: In a Literature class, students are tasked with creating storyboards to visually retell a novel. They draw key scenes, write captions, and present their stories to the class, enhancing their reading comprehension and fostering their imagination.

Pedagogy: Cause and Effect
Description: This pedagogy explores the relationships between actions and consequences. By analysing cause-and-effect relationships, learners develop a deeper understanding of how events are interconnected and how one action can lead to various outcomes.
Example: In a History class, students study the causes and effects of the Industrial Revolution. They research and discuss how technological advancements in manufacturing led to significant societal changes, such as urbanisation and labour reform movements.

Pedagogy: Fish and Bone
Description: A method that breaks down complex topics into main ideas (the fish) and supporting details (the bones). This visual approach enhances comprehension by highlighting essential concepts and their relevant explanations.
Example: During a Biology class on human anatomy, the teacher uses the fish and bone technique to teach about the human skeletal system. Teacher presents the main components of the human skeleton (fish) and elaborates on each bone's structure and function (bones).

Pedagogy: Concept Mapping
Description: An effective way to visually represent relationships between ideas. Learners create diagrams connecting key concepts, aiding in understanding the overall structure of a subject and fostering retention.
Example: In a Psychology assignment, students use concept mapping to explore the various theories of personality. They interlink different theories, such as Freud's psychoanalysis, Jung's analytical psychology, and Bandura's social-cognitive theory, to see how they relate to each other.

Pedagogy: Audio Visual Resources
Description: Incorporating multimedia elements like videos, images, and audio into lessons. This approach caters to different learning styles, making educational content more engaging and memorable.
Example: In a General Science class, the teacher uses a documentary-style video to teach about the solar system. The video includes stunning visual animations of the planets, interviews with astronomers, and background music, enhancing students' interest and understanding of space.

Pedagogy: Think, Pair, and Share
Description: A collaborative learning technique where students ponder a question or problem individually, then discuss their thoughts in pairs or small groups before sharing with the entire class. It fosters active participation, communication skills, and diverse perspectives.
Example: In a Literature in English class, the teacher poses a thought-provoking question about a novel's moral dilemma. Students first reflect individually, then pair up to exchange their opinions, and finally participate in a lively class discussion to explore different viewpoints.

Pedagogy: Questioning Technique (Socratic Approach)
Description: Based on Socratic dialogue, this method stimulates critical thinking by posing thought-provoking questions. It encourages learners to explore ideas, justify their reasoning, and discover knowledge through a process of inquiry.
Example: In an Ethics class, the instructor uses the Socratic approach to lead a discussion on the meaning of justice. By asking a series of probing questions, the students engage in a deeper exploration of ethical principles and societal values.

Pedagogy: Practical Demonstration
Description: A hands-on approach where learners observe real-life applications of theories or skills. Practical demonstrations enhance comprehension, skill acquisition, and problem-solving abilities by bridging theoretical concepts with real-world scenarios.
Example: In a Food and Nutrition class, the instructor demonstrates the proper technique for filleting a fish. Students observe and then practice the skill themselves, learning the practical application of knife skills and culinary precision.

(**Note:** The examples provided in this annexure serve as illustrations of various pedagogies. It is important to understand that these pedagogies are versatile and can be applied across subjects in numerous ways. Feel free to adapt and explore these techniques creatively to enhance learning outcomes in your specific context.)

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Additionally, we express our gratitude to the esteemed team of reviewers for their constructive feedback on overall performance, better and weaker responses, and validating teaching pedagogies along with suggestions for improvement.

These contributors include:

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