

**AGA KHAN UNIVERSITY EXAMINATION BOARD**  
Notes from E-Marking Centre SSC-I Biology Annual Examinations 2023

### **Introduction**

This document has been prepared for the teachers and candidates of Secondary School Certificate (SSC) Part I (Class IX) Biology. It contains comments on candidates' responses to the 2023 SSC-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 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.

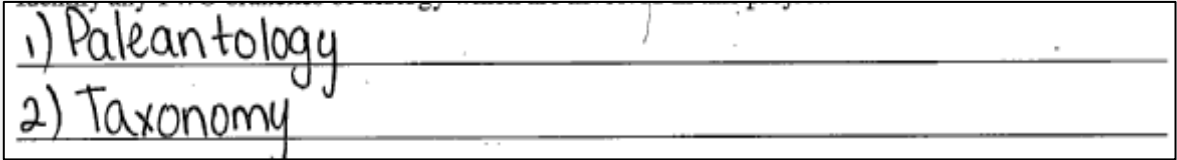
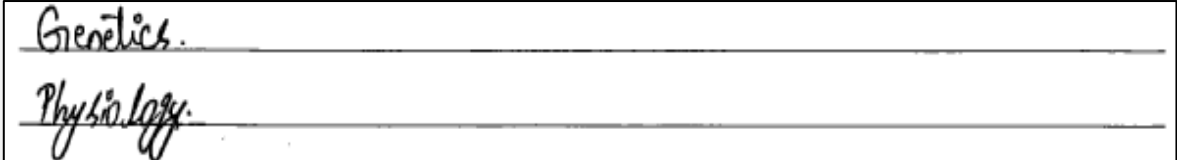
### **General Observations**

Most candidates outperformed in some concepts, such as, five kingdom classification system, functions of cell membrane and structural features of blood vessels and their respective functions. However, in other questions, the understanding of the command words and the stimuli was weak. Mentioned below are a few concepts that teachers need to focus so that the candidates may perform better.


- Role of co-factor in an enzyme-catalysed reaction
- Structural-functional relationship between the parts of chloroplast

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

**DETAILED COMMENTS**  
**Constructed Response Questions (CRQs)**

<b>Question No. 1</b>	
<b>Question Text</b>	A biological research department is working on a project in which the biologists have to study the fossils, with reference to their chemical composition, origin and binomial nomenclature. Identify any TWO branches of biology which are involved in this project.
<b>SLO No.</b>	1.2.1
<b>SLO Text</b>	Discuss the significance of the branches of biology, i.e., morphology, anatomy, physiology, embryology, taxonomy, cell biology, histology, paleontology, environmental biology, biotechnology, sociobiology, parasitology, immunology, entomology, genetics and pharmacology with suitable examples;
<b>Max. Marks</b>	2
<b>Cognitive Level</b>	U*
<b>Checking Hints</b>	1 mark for each correct identification (2 required).
<b>Overall Performance</b>	Majority of the candidates shown good comprehension of stem and correctly identified the branches of biology. However, few candidates struggled to identify the pertinent branches of biology.
<b>Description of Better Responses</b>	Better responses of candidates reflected intelligent use of key terms, i.e., study of fossils and binomial nomenclature to identify the relevant branches of biology, paleontology, and taxonomy.
<b>Image of Better Response</b>	
<b>Description of Weaker Responses</b>	In weaker responses, candidates identified irrelevant branches of biology such as pharmacology, environmental biology, biotechnology, entomology, etc. This indicates that candidates struggled to comprehend the information (stem) and focused only on the question. Moreover, in a few responses, candidates showed careless reading of the information given in the stem, thus provided wrong answers such as cell biology, entomology and other unrelated branches.
<b>Image of Weaker Response</b>	

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy** Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>• Understand the expectations of the command words</li> <li>• Look at the cognitive level</li> <li>• Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>• Go through the past paper questions on that particular concept</li> <li>• Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>• Story Board</li> <li>• Cause and Effect</li> <li>• Fish and Bone</li> <li>• Concept Mapping</li> <li>• Audio Visual resources</li> <li>• Think, Pair and Share</li> <li>• Questioning Technique (Socratic approach)</li> <li>• Practical Demonstration</li> </ul> <p>** For description of each pedagogy, refer to Annexure A</p>	<ul style="list-style-type: none"> <li>• Past paper questions</li> <li>• Discussion on E-Marking Notes</li> <li>• AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

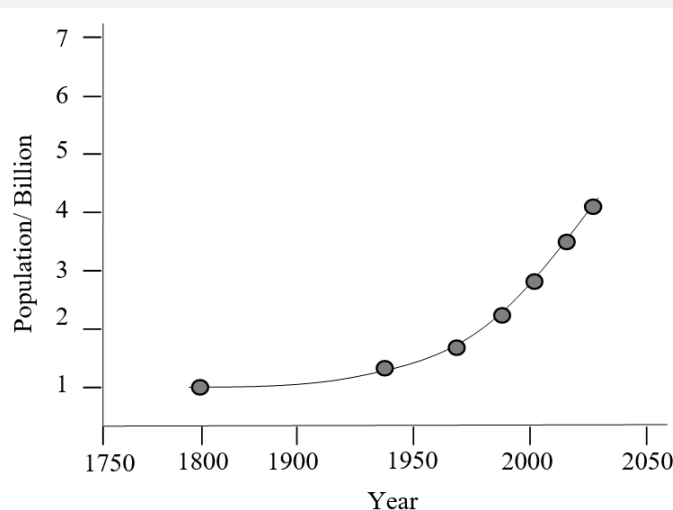
**Any Additional Suggestion:**

Teachers are advised to relate branches of biology to everyday life and discuss the various professions that emerge from the field. Moreover, students and teachers can also refer to the notes provided in the AKU-EB Biology syllabus on page 8, specifically the ‘Subject Rationale of AKU-EB Biology,’ where the scope of biology is outlined.

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

### Question No. 2

**Question Text** Consider the given graph.



Using the information in the given graph,  
 a. identify the dependent and independent variables.  
 b. interpret the trend in population.

**SLO No.** 2.1.2

**SLO Text** Solve a biological problem following the scientific method;  
 e. Organise data appropriately using techniques such as tables and graphs;  
 f. Analyse data to make predictions, decisions or draw conclusions;

**Max. Marks** 3

**Cognitive Level** A

**Checking Hints**  
 a. 1 mark for identifying each dependent and independent variable (2 required).  
 b. 1 mark for the correct interpretation (it may vary candidate wise). They may interpret the graph year-wise.

**Overall Performance 2a** A significant number of candidates scored full marks in this question showing a strong grasp on components of a graph, i.e., independent and dependent variables on x-axis and y-axis respectively.

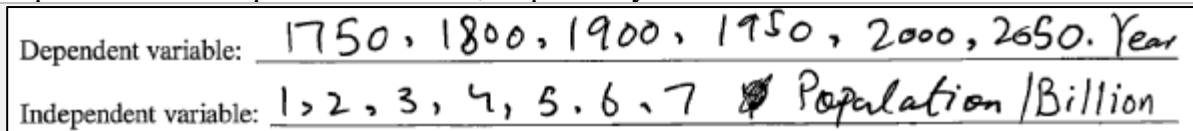
**Description of Better Responses** In better responses, candidates exhibited a sound comprehension of independent and dependent variables. They correctly identified independent and dependent variables as year and population, respectively.

**Image of Better Response**

Dependent variable: Population (y)

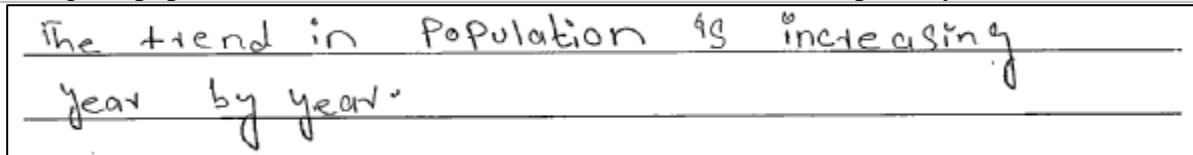
Independent variable: Year (x)

**Description of Weaker Responses** Weaker responses displayed candidates' confusion between independent and dependent variables. Such candidates incorrectly selected 'year' and 'population' as dependent and independent variables, respectively. Additionally, some candidates included numeric data against each variable, such as writing '1900, 2000, and 25050' under the category of the dependent variable, and '1, 2, and 3 billion' under independent variable. Another common incorrect approach in these responses was dividing the parameter 'year' into ranges, for example, '1750 to 1900' and '1950 to 2050,' and associating these ranges with dependent and independent variables, respectively.

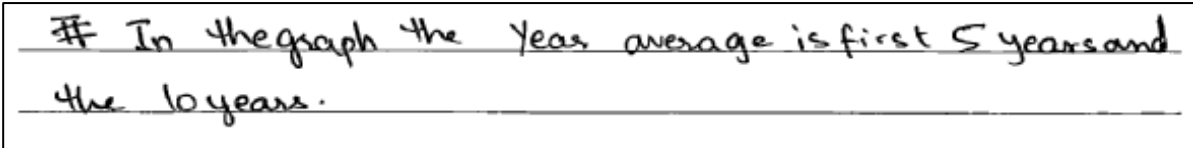
**Image of Weaker Response** 

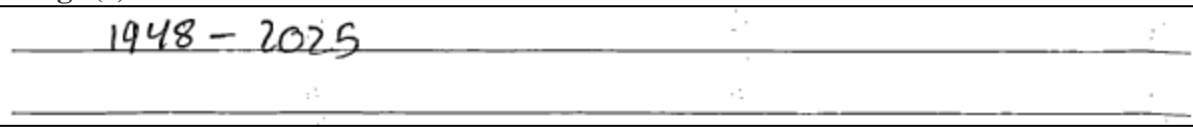
**Overall Performance 2b** In this question, candidates effectively interpreted the population trend. This indicates that the candidates applied their understanding of variables and their behaviour in a graph to analyse and comprehend the data accurately. Their ability to correctly identify the independent and dependent variables and interpret the relationship between them reflects their strong grasp of graph analysis and data interpretation skills.

**Description of Better Responses** Better responses reflected candidates' clear understanding of parameters given in the graph. Moreover, candidates wisely used data given in the graph to correctly interpret the increasing trend of population with change in year. Additionally, some other candidates have interpreted change in population from 1800 to 1950 and from 1950 to 2050 separately.


**Image of Better Response** 

**Description of Weaker Responses** In weaker responses, candidates struggled to correctly interpret the population trend. In these responses, candidates made incorrect generalised statements, such as claiming that the year and population are inversely proportional. Moreover, some candidates described the reasons for the increasing population in Pakistan. Following are the reasons that hindered their interpretation: a shallow understanding of graph parameters, a weaker analysis of data patterns, and misconceptions about cause-and-effect relationships in graphs.

**Images of Better Responses** **Image (i)** 

**Image (ii)** 

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>• Understand the expectations of the command words</li> <li>• Look at the cognitive level</li> <li>• Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>• Go through the past paper questions on that particular concept</li> <li>• Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>• Story Board</li> <li>• Cause and Effect</li> <li>• Fish and Bone</li> <li>• Concept Mapping</li> <li>• Audio Visual resources</li> <li>• Think, Pair and Share</li> <li>• Questioning Technique (Socratic approach)</li> <li>• Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Past paper questions</li> <li>• Discussion on E-Marking Notes</li> <li>• AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestion:**

Teachers are advised to use real-life examples such as how the amount of water given to a plant affects its growth or how the temperature affects the rate at which ice melts. Encourage students to design simple experiments where students can manipulate one variable and observe its impact on the other. Moreover, connect the concept of independent and dependent variables to scientific experiments conducted in various fields. Discuss how variables are controlled and manipulated in experiments to establish cause-and-effect relationships.

### Question No. 3

<b>Question Text</b>	The five-kingdom classification system better explains the diversity of living organisms. Write any THREE points to support the given statement.
<b>SLO No.</b>	3.3.4
<b>SLO Text</b>	Discuss how the five-kingdom classification system better explains diversity of living organism;
<b>Max. Marks</b>	3
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for writing each point (any 3 required).
<b>Overall Performance</b>	Most of the candidates were able to write relevant points supporting the five-kingdom classification system as the best system for explaining the diversity of living organisms. However, some candidates struggled to understand the question's requirements and provided irrelevant answers, as they only focused on the significance of biodiversity.
<b>Description of Better Responses</b>	Better responses revealed candidates' thorough knowledge of significance of five kingdom classification system in the support of the statement with pertinent points. These valid points highlighted the diversity of living organisms in five kingdom classification system with reference to levels of organisation, mode of nutrition, evolutionary trend indicating gradual evolution of complex organisms from simpler ones and better placement of certain controversial groups like Cynobacteria, Fungi and Euglena. Marks were also awarded to candidates who compared two-kingdom and five-kingdom classification systems to support the statement.
<b>Image of Better Response</b>	
<b>Description of Weaker Responses</b>	Candidates who did not score well mostly failed to understand the demand of the question, thus rephrased the stem in various ways and provided vague answers. Such as, they listed names of five kingdoms, i.e., Plantae, Animalia, Monera, Protista and Fungi. Few other responses unpacked the term biodiversity and described its significance in the ecosystem.


Image of Weaker Response

→ Five kingdom classification includes kingdom Monera, Protista, Fungi, Plantae and Animalia.

→ In five kingdom classification, kingdoms are classified in five groups.

→ Five kingdom classification occurs in both plants and animals.

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Understand the expectations of the command words</li> <li>Look at the cognitive level</li> <li>Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>Go through the past paper questions on that particular concept</li> <li>Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual resources</li> <li>Think, Pair and Share</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestion:**

Teachers are highly recommended to inculcate the habit of careful reading of questions in candidates via worksheets and discussions. Moreover, while teaching this topic following strategies can also be applied:

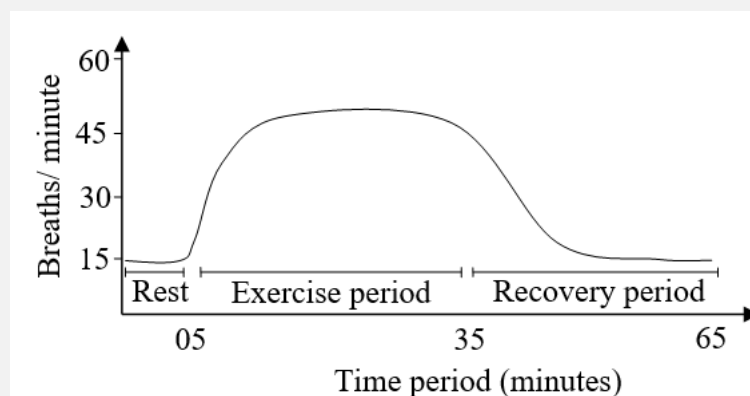
- Use visual aids like posters, diagrams, and infographics to represent the five-kingdom classification system and the diversity of living things it encompasses. Visuals can help students grasp complex concepts more easily.
- Comparative Analysis: Compare and contrast the five-kingdom classification system with earlier classification systems, like the Two kingdom or three kingdom systems, highlighting the improvements and advantages of the five-kingdom system.



### Question No. 4

**Question Text**

The given graph represents the effect of exercise on breathing rate.



- a. Identify the time period in which maximum amount of oxygen would be consumed by the body.
- b. Why does the breathing rate remain high at the beginning of the recovery period?
- c. Mention the physiological activity other than breathing rate that will also increase during exercise.

**SLO No.**

5.3.5

**SLO Text**

Determine the effect of exercise on the rate of breathing;

**Max. Marks**

3

**Cognitive Level**

A

**Checking Hints**

- a. 1 mark for correct identification of time period.
- b. 1 mark for writing correct reason.
- c. 1 mark for mentioning the correct physiological activity.

**Overall Performance 4a**

Candidates demonstrated good understanding of the concept, i.e., effect of exercise on breathing rate by correctly analysing each part (rest, exercise period and recovery period) of the graph. This also indicates that such candidates can correctly relate the concept of cellular respiration with the essence of gaseous exchange and cardiovascular system in the human body. However, some of the candidates failed to analyse the graph to correctly respond to the questions.

**Description of Better Responses**

In better responses, candidates meticulously studied each factor of the graph to identify the correct time period, i.e., 5-35 minutes/ exercise period.

**Image of Better Response**


from 5 to 35 minutes (1 Mark)

**Description of Weaker Responses**

In weaker responses, candidates incorrectly identified exercise period as recovery period; this might be either because candidates failed to relate the requirement of oxygen with that of exercise or carelessly read the question. Moreover, complete ignorance of the concept was also evident from the responses which have identified 65 minutes and rest period.

<b>Image of Weaker Response</b>	<u>The body will consume more oxygen in its recovery period (65 minutes).</u>
<b>Overall Performance 4b</b>	A significant number of candidates provided correct answers. However, some candidates provided vague and generalised answers. Moreover, they were unable to focus on the word WHY in their answers, hence, could not achieve the demand of the question.
<b>Description of Better Responses</b>	Better responses clearly displayed candidates' thorough understanding of the concepts by mentioning the correct reasons, i.e., to overcome oxygen debt/ to expel more CO <sub>2</sub> and return acid-base balance of the muscles to neutral. They correctly followed the command word and key words 'why' and 'beginning of recovery period' respectively. Additionally, few other reasons were also mentioned such as to prevent build-up of lactic acid and anaerobic respiration.
<b>Image of Better Response</b>	<u>To throw out the excessive carbon dioxide that has been produced in a big amount in the body.</u>
<b>Description of Weaker Responses</b>	In weaker responses, candidates overlooked the key term of the question thus only mentioned the time duration or recovery period which also shows their misconception of the topic.
<b>Image of Weaker Response</b>	<u>Because breathing rate is low after some time of the recovery period. That's why high beginning of recovery period.</u>
<b>Overall Performance 4c</b>	Most candidates effectively attempted this question. However, few were confused the term physiological with physical activity.
<b>Description of Better Responses</b>	Better responses demonstrated candidates' thorough reading of the question and a sound understanding of the effects of exercise on the cardiovascular system. Therefore, they clearly stated pulse rate and heart rate in their responses. A few responses also mentioned sweating and high blood pressure, which were also awarded marks.
<b>Image of Better Response</b>	<u>Heartbeat will also increase other than breathing rate during exercise.</u>
<b>Description of Weaker Responses</b>	In weak responses, candidates mostly mistakenly read or understood the 'physiology' as 'physical activity', which may be due to lack of understanding of subject-related vocabulary or carelessness in reading. Consequently, such responses wrote irrelevant answers related to causes of increase in breathing rate such as jogging, running, and playing games.
<b>Image of Weaker Response</b>	<u>Physical activities like playing football and cricket can also increase the breathing rate.</u>

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>• Understand the expectations of the command words</li> <li>• Look at the cognitive level</li> <li>• Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>• Go through the past paper questions on that particular concept</li> <li>• Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>• Story Board</li> <li>• Cause and Effect</li> <li>• Fish and Bone</li> <li>• Concept mapping</li> <li>• Audio Visual resources</li> <li>• Think, Pair and Share</li> <li>• Questioning Technique (Socratic approach)</li> <li>• Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Past paper questions</li> <li>• Discussion on E-Marking Notes</li> <li>• AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestion:**

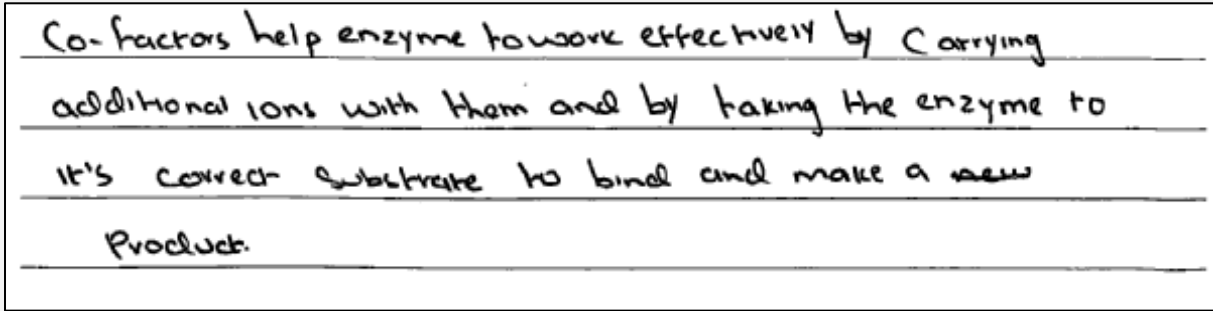
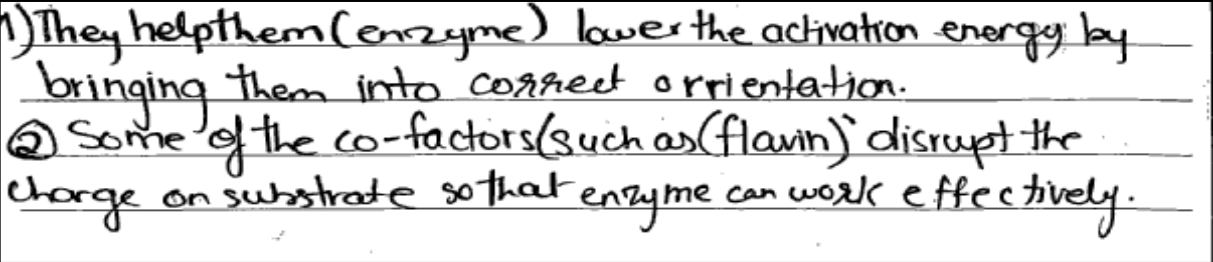
Teachers are strongly recommended the following strategies to overcome the issues that hinder good performance of candidates.

Emphasise Key Words: Remind students to carefully read the entire question and identify the key words that provide clues about what is being asked.

Break Down the Question: Guide students in breaking down the question into parts to understand its requirements fully.

Practical Experiments: Conduct simple experiments to measure heart rate and breathing rate before, during, and after exercise, allowing students to observe the physiological changes during recovery.

### Question No. 5

<b>Question Text</b>	Describe any TWO ways in which cofactors help enzymes to work effectively.
<b>SLO No.</b>	6.1.7
<b>SLO Text</b>	Explain how some enzymes require cofactor for their functioning;
<b>Max. Marks</b>	2
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for mentioning each way (any 2 required).
<b>Overall Performance 4a</b>	Numerous answers to this question did not achieve satisfactory scores, revealing a deficiency in comprehension and familiarity with the SLO. Only a small number of candidates offered incomplete responses, and a minority accurately described the concept.
<b>Description of Better Responses</b>	Better responses showed candidates' command over the SLO. These responses described that co-factor enable enzymes to work effectively by transferring/ adding/ removing ions or electrons or functional groups, interact with electrons in nearby atoms of substrate and alter the configuration of the active site of enzymes so that the substrate can bind properly.
<b>Images of Better Responses</b>	<p><b>Image (i)</b></p>  <p>Co-factors help enzyme to work effectively by carrying additional ions with them and by taking the enzyme to its correct substrate to bind and make a new product.</p> <p><b>Image (ii)</b></p>  <p>1) They help them (enzyme) lower the activation energy by bringing them into correct orientation. 2) Some of the co-factors (such as flavin) disrupt the charge on substrate so that enzyme can work effectively.</p>
<b>Description of Weaker Responses</b>	Weaker responses indicated following issues: Firstly, some candidates completely overlooked the term 'cofactors' and provided general characteristics of enzymes that were irrelevant to the question's demand. This indicates a lack of attention to detail and an incomplete understanding of the specific topic. Secondly, some candidates misunderstood the question and rephrased it to emphasise the importance of cofactors in enzyme-catalysed reactions, rather than addressing the key term 'ways'. This shows a misinterpretation of the question and a failure to provide the required information.

**Images of Weaker Responses**


**Image (i)**

1) The temperature affects the rate of activity of enzyme.  
 2) The pH can also affect the rate of activity of enzyme.

**Image (ii)**

enzymes are made up of protein.  
 enzyme do more of work in our body.

**Suggestions for Improvement (Highlighted part)**

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Understand the expectations of the command words</li> <li>Look at the cognitive level</li> <li>Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>Go through the past paper questions on that particular concept</li> <li>Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept mapping</li> <li>Audio Visual resources</li> <li>Think, Pair and Share</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestion:**

Teachers should prioritise teaching the role of cofactors in enzyme activity, drawing examples from 'Bioenergetics,' where numerous enzyme-catalysed metabolic pathways depend on various cofactors. Highlight the importance of key terms in questions to understand precisely what is being asked.

## Extended Response Questions (ERQs)

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

### Question No. 6a

<b>Question Text</b>	Describe any SIX functions of cell membrane in the human body.
<b>SLO No.</b>	4.2.2
<b>SLO Text</b>	Describe structure, composition and function of the components of an animal cell (cell membrane, nucleus, cytoplasm, Golgi bodies, mitochondria, lysosomes, vacuole, ribosomes, endoplasmic reticulum and centrioles);
<b>Max. Marks</b>	6
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for describing each function of cell membrane (any 6 required).
<b>Overall Performance</b>	Majority of candidates attempted part 'a' as compared to part 'b'. This shows their interest and strong understanding of the concept of 'cellular structures and functions'. Most of the candidates clearly described the functions of cell membrane either with reference to plant or animal cell. However, some provided functions of other cellular organelles.
<b>Description of Better Responses</b>	In better responses, candidates correctly responded the question by describing different functions of cell membrane. Such responses described semi-permeability and transport mechanisms (endocytosis, exocytosis, active and passive transport) with respect to regulation of entry and exit of materials for maintaining cell potential and internal environment. Likewise, the role of cell membrane was also emphasised as it separates the contents of the cell from its outside environment, thus protecting it from its surroundings and its role in protection from pathogens. Moreover, candidates showed good command in relating different structure/ components of cell membrane with their respective functions, such as, cell membrane is composed of lipids and proteins. Lipids help to give membranes their flexibility and proteins monitor and maintain the cell's chemical climate and assist to transfer molecules across the membrane. Additionally, the role of cell membrane in cell recognition and communication with adjacent cells was also highlighted.

**Image of Better Response**

- 1- protection: cell membrane provides protection to the inner part of cell. i.e cell organelles, cytoplasm e-t-c.
- 2- Semi permeable membrane: it act as Semi permeable membrane which allow movement of substances in and out of cell <sup>selectively.</sup>
- 3- Recognition of cells :- Cell membrane can also recognize other cells by recognizing chemical messages -
- 4- Endocytosis and Exocytosis :- help in process of endocytosis and exocytosis in some cells like in Amoeba -
- 5- Diffusion of Substance :- It also allow the process of diffusion across it by this process may substance diffuse <sup>out of cell -</sup> into and
- 6- Sense chemical messages :- The cell membrane can also sense the chemical messages from other cells.

**Description of Weaker Responses**

Candidates exhibited misunderstandings of the question and provided generalised answers, focusing on the structural features of the cell membrane. For instance, some responses highlighted that the cell membrane is composed of proteins and lipids. Additionally, a few candidates incorrectly mentioned that the cell membrane is present in both plant and animal cells, confusing it with the cell wall.


Furthermore, it was evident that some candidates hastily read the question and described functions of the cell wall, which is specific to plant cells, instead of addressing the functions of the cell membrane.

In addition to this, students demonstrated confusion by describing various organelles of cells, rather than concentrating on the functions of the cell membrane as requested. Some responses earned partial marks as they repeated the same function, such as 'movement of materials across the cell membrane,' multiple times, albeit rephrased differently.

Image of Weaker Response

1) It protects our cells.  
 2) In humans it is made up of chitin.  
 3) It is a boundary of cell.  
 4) In its surrounding everywhere is cells.  
 5) It gives energy to cell for its processes.  
 6) It has two sides inner and outer. Inner means which is inside the cell. Outer means outside of cell.

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>Understand the expectations of the command words</li> <li>Look at the cognitive level</li> <li>Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>Go through the past paper questions on that particular concept</li> <li>Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>Story Board</li> <li>Cause and Effect</li> <li>Fish and Bone</li> <li>Concept Mapping</li> <li>Audio Visual resources</li> <li>Think, Pair and Share</li> <li>Questioning Technique (Socratic approach)</li> <li>Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Past paper questions</li> <li>Discussion on E-Marking Notes</li> <li>AKU-EB Digital Learning Solution powered by Knowledge Platform</li> </ul> <p><a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></p> 

**Any Additional Suggestion:**

Teachers are advised to focus on the particular functions of cell membrane while teaching this topic. Moreover, this concept can also be emphasised in other related concepts such as absorption, transport of materials and respiration.



**Question No. 6b**

<b>Question Text</b>	Describe any THREE structural adaptations of chloroplast for harvesting light energy and carrying out photosynthesis.
<b>SLO No.</b>	7.2.4
<b>SLO Text</b>	Describe that chlorophyll traps light energy and converts it into chemical energy for the formation of carbohydrates and their subsequent storage;
<b>Max. Marks</b>	6
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for identifying each structure (3 required). 1 mark for describing the adaptation of each identified structure (3 required).
<b>Overall Performance</b>	A limited number of candidates opted for this question. Most of the responses struggled to relate the functions with that of different components of chloroplast. They either described the structure of chloroplast or only mentioned its generalised function. However, a few candidates were successful relate each part of the chloroplast with its respective function.
<b>Description of Better Responses</b>	Better responses showed candidates' ability to integrate the understanding of each part of chloroplast which enables it to harvest light energy to chemical energy. Such responses wrote about grana membrane/ thylakoid membrane, emphasising on its role to provide large surface area for the attachment of the photosynthetic pigments, electron carriers and enzymes that carry out light dependent reactions of photosynthesis, presence of network of proteins in grana which hold the photosynthetic pigments in a very precise manner that forms special units called photosystems allowing maximum absorption of light, presence of ATP synthase in granal membranes which manufacture ATP by chemiosmosis. Likewise, in these responses, candidates described the fluid of stroma which contains all enzymes needed to carry out the light independent stage and surrounding the grana so the products of the light dependent stage the grana can readily pass into the stroma. Additionally, presence of circular DNA and 70s ribosomes was also mentioned which quickly and easily codes and manufacture some of the proteins required for photosynthesis.

Image of  
Better  
Response

Chloroplast is double membrane bounded cell organelle, which plays a vital role in photosynthesis. Its three structural adaptations which helps in harnessing light energy and carrying photosynthesis are: <sup>it is also component of thylacoid membrane.</sup>

- (1) Chlorophyll :- It is a green pigmented molecules which gives green colour to plants. It absorbs light energy coming from the sun especially of ~~so~~ red and blue light. It is the source <sup>for</sup> of bringing light energy to carry out photosynthesis.
- (2) Thylacoid membranes: These are the membranes of sacs like shaped which contains the photosystems, co-enzymes etc <sup>and pigments</sup> which transfer of electrons <sup>occurs</sup> through electron transport chain. It is site for light reaction.
- (3) Stroma: It is a fluid which is responsible for dark reaction by the help of ATP and NADP <sup>from light reaction</sup> (as a fuel) and forms glucose.


Description  
of Weaker  
Responses

Weaker responses demonstrated either superficial knowledge or understanding of structure and function of chloroplast, or limited knowledge of the concept. Responses that showed shallow knowledge wrote about the general process of photosynthesis in plants with incomplete reference to the structure and function of chloroplast. Likewise, those which exhibited complete ignorance of the topic provided irrelevant answers such as structure of leaf, structure and function of stomata and structure and function of xylem and phloem. These kinds of responses indicated reproduction of memorised content of related topic and inability to comprehend or fulfil the demand of the question.

Image of  
Weaker  
Response

- i) In chloroplast tiny pores are present which absorb sunlight and the temperature of leave will be high.
- ii) chloroplast have stomata will open and close to transfer the particle. It balance the particle on both side.
- iii) The transpiration also occur in chloroplast the water ~~can~~ escape from the pores and the concentration of plant will be low there so water will move towards it and it will make a chain of flow of water from root.
- iv) chloroplast maintain the function of cell.

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>• Understand the expectations of the command words</li> <li>• Look at the cognitive level</li> <li>• Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>• Go through the past paper questions on that particular concept</li> <li>• Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>• Story Board</li> <li>• Cause and Effect</li> <li>• Fish and Bone</li> <li>• Concept Mapping</li> <li>• Audio Visual resources</li> <li>• Think, Pair and Share</li> <li>• Questioning Technique (Socratic approach)</li> <li>• Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Past paper questions</li> <li>• Discussion on E-Marking Notes</li> <li>• AKU-EB Digital Learning Solution powered by Knowledge Platform  <a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></li> </ul> 

**Any Additional Suggestion:** Teachers are advised to focus on each structure of chloroplast and relate this structural adaption with the respective function. This structural functional relationship can be developed by following ways:

Comparative Analysis: Compare chloroplasts to other cellular structures and organelles. Highlight how the unique features of chloroplasts, such as thylakoid membranes and pigments, are specialised for light absorption and photosynthesis.

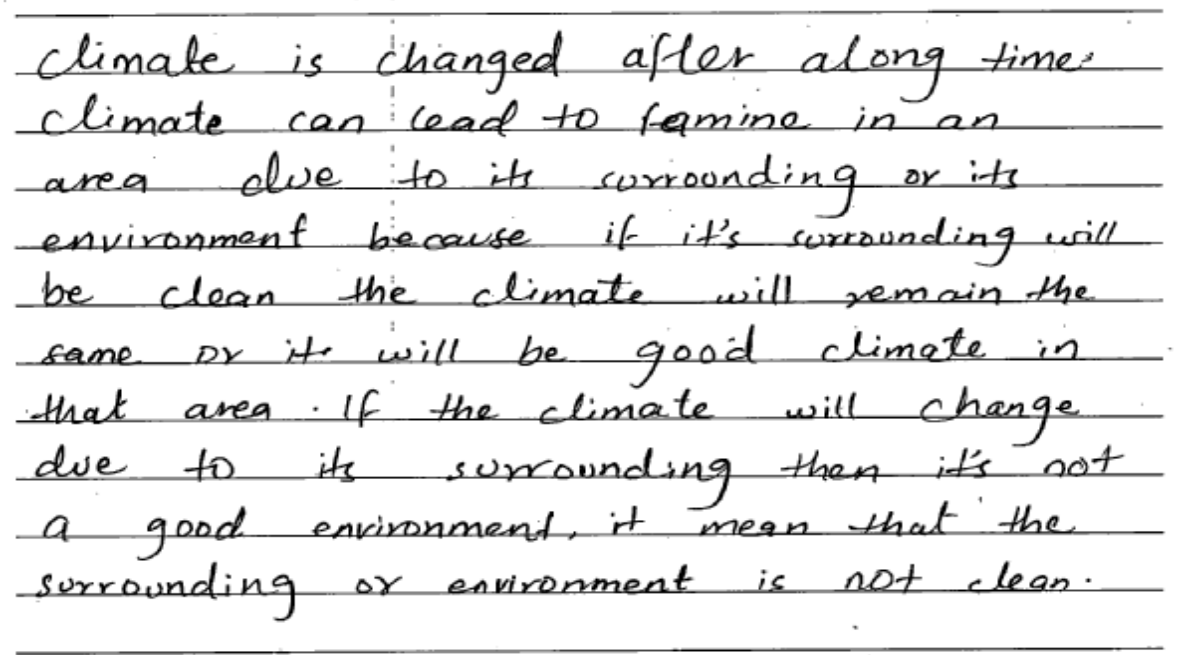
Analogies and Metaphors: Use analogies or metaphors to relate complex concepts to familiar experiences. For instance, you might compare the thylakoid membranes to stacks of pancakes, *papri*, small parathas to help students visualise the arrangement of chlorophyll and other pigments.

### Question No. 7a


<b>Question Text</b>	Analyse how climate change can lead to famine in an area.
<b>SLO No.</b>	8.4.2
<b>SLO Text</b>	Rationalise unequal distribution of food, drought and flooding and increasing population as the factors that contribute to famine;
<b>Max. Marks</b>	6
<b>Cognitive Level</b>	U
<b>Checking Hints</b>	1 mark for each point (6 required).
<b>Overall Performance</b>	A few candidates chose to attempt this question. Most of these candidates were successful to obtain maximum marks as they were able to gauge demand of the question. However, some candidates struggled to draft their answer with reference to the command word.
<b>Description of Better Responses</b>	In better responses, candidates demonstrated a strong grasp of the command word 'analyse' and its application while drafting their answers with reference to key words 'climate change' and 'famine'. These responses mentioned various causes of climate change and their effects on agriculture and livestock. For example, they highlighted how climate change causes shortage of water which directly or indirectly contribute to famine. Furthermore, they also elaborated how climate change causes drought which ultimately affects quality and quantity of crop yield. Moreover, they focused on flooding and heavy rain fall as an outcome of climate change which drastically affect soil quality, crop production and livestock.
<b>Image of Better Response</b>	<p>a) Climate change can lead to famine an area. As in the conditions of droughts when there are no rainfall, the soil becomes infertile and no crops can be grown on it and there would be no agriculture which can lead to famine in area. Floods can also lead to famine as flood is a condition when there is more than required amount of rainfall in an area which can lead to the being water being not washing away the minerals and nutrients of the soil leaving them not capable for agriculture and no crops can be grown there which may lead to famine in an area.</p>

**Description of Weaker Responses** Weaker responses reveal candidates' inability to relate effects of climate change with famine. Such responses described various causes of climate change, ignoring its effects on agriculture and livestock. These responses primarily explained global warming, ozone layer depletion and greenhouse effects. This indicated lack of understanding of the demands of the command words as well as the context of the question. Moreover, some responses provided ambiguous and vague answers indicating candidates' misconceptions related to 'famine'. These responses described famine as decrease in population due to shortage of natural resources. Likewise, loss of inhabitable land was also highlighted as result of flooding and drought condition without relating with famine.

**Image of Weaker Response**



Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>• Understand the expectations of the command words</li> <li>• Look at the cognitive level</li> <li>• Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> </ul>	<ul style="list-style-type: none"> <li>• Story Board</li> <li>• Cause and Effect</li> <li>• Fish and Bone</li> <li>• Concept Mapping</li> <li>• Audio Visual resources</li> <li>• Think, Pair and Share</li> <li>• Questioning Technique (Socratic approach)</li> <li>• Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Past paper questions</li> <li>• Discussion on E-Marking Notes</li> <li>• AKU-EB Digital Learning Solution powered by Knowledge Platform <a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></li> </ul> 

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|--|--|--|
| <ul style="list-style-type: none"><li>• Go through the past paper questions on that particular concept</li><li>• Refer to the resource guide for extra resources</li></ul> |  |  |
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**Any Additional Suggestion:** Teaching the analysis of how climate change can lead to famine in an area requires a comprehensive approach that fosters critical thinking, research skills, and an understanding of the complex interactions between climate, agriculture, and food security. Here are some effective teaching strategies for this topic:

Case Studies: Use real-world case studies of regions that have experienced famines due to climate change. Analyse the specific climatic changes, their impact on agricultural productivity, and the subsequent food shortages.

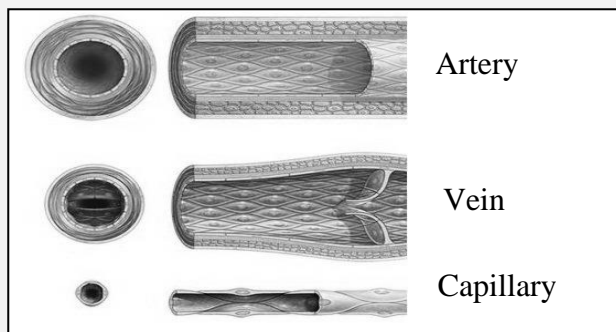
Data Analysis: Provide students with relevant data sets, such as temperature records, precipitation patterns, and crop yields, and guide them in analysing the trends and correlations between climate change and food scarcity.

Problem-Based Learning: Present students with hypothetical scenarios related to climate-induced famines and challenge them to devise strategies to address the underlying causes and prevent future crises.

**Question No. 7b**

**Question Text**

Each of the given blood vessels has a specialised structure which is adapted for its specific function.



- i. Identify ONE structural feature of each blood vessel.
- ii. Describe how each structural feature identified in part i enables the respective blood vessel to perform a specific function.

**SLO No.**

9.6.1

**SLO Text**

Compare the structure and function of an artery, a vein and a capillary;

**Max. Marks**

6

**Cognitive Level**

U

**Checking Hints**

- i.
  - 1 mark for writing about thick walls of artery.
  - 1 mark for the presence of valves in veins.
  - 1 mark for writing about single-cell thick epithelium of capillaries.
- ii.
  - 1 mark for writing about the ability of arteries to tolerate the pressure of blood.
  - 1 mark for writing about prevention of backward flow of blood in veins.
  - 1 mark for the exchange of material between blood and cells in capillaries.

**Overall Performance**

A large number of candidates attempted this part and performed well, indicating thorough understanding of structure and function of different blood vessels. Very few struggled to relate the given structures with their functions.

**Description of Better Responses**

In better responses, candidates demonstrated a clear understanding of the anatomy and physiology of blood vessels. They accurately linked the structural features of each blood vessel with their specific functions. For example:

Arteries: The responses mentioned that arteries have thick walls to withstand the high blood pressure generated by the heart's pumping action, allowing them to efficiently transport oxygenated blood away from the heart to various body tissues.

Veins: Students correctly pointed out that veins have valves to prevent the backflow of blood. These valves ensure that blood flows in one direction, toward the heart, and prevent pooling of blood in the lower extremities.

Capillaries: The responses highlighted that capillary have walls that are just one-cell thick. This thin structure enables efficient exchange of oxygen, nutrients, and waste products between blood and tissue fluid, facilitating the essential exchange of substances at the cellular level.

**Image of Better Response**

i) Artery:- Composed of three layers of cells i.e epidermis, elastic cells and muscle cells.

Veins contain valves in it.

\* Capillaries:- The walls of capillaries are one cell thick

ii) Since the oxygenated blood from heart is under high pressure so it can be transported to all parts of body, arteries provide a pathway for blood transport without breaking or damaging.

Veins have valves which prevent backflow of blood and so the blood moves in only one direction.

Capillaries are only one cell thick so absorption of digested material, salts etc in tissue fluid can be done efficiently.

**Description of Weaker Responses**

In weaker responses, candidates demonstrated a lack of attention to important instructions in the question, leading to incomplete and irrelevant answers. They failed to address the demands of the question and provided memorised general functions of each blood vessel, ignoring the structural features. Common mistakes included:

Ignoring Structural Features: Weaker responses overlooked the need to link the structural features of blood vessels to their specific functions, resulting in incomplete and inaccurate answers.

Generalised Functions: Candidates provided generic functions for arteries, veins, and capillaries, without considering their unique roles within the circulatory system.

Incorrect Description of Arteries and Veins: Some candidates mistakenly mentioned types of arteries (pulmonary, renal, femoral, hepatic) and veins (pulmonary, femoral, hepatic portal) without recognizing their functions in blood distribution to specific organs




Image of Weaker Response

i. → Artery carry Oxygenated blood.  
 → Vein carry deoxygenated blood.  
 → Capillary are blood vessels that connects artery and vein.

ii. → Because Artery has big Surface area.  
 → Because Vein has small and big Surface area both from starting it has small from ending it has big.  
 → Because Capillary is connected with Artery and vein in. Aorta. It maintains the pressure of blood in heart when Artery carry blood and vein leave blood from heart to body.

Suggestions for Improvement (Highlighted part)

How to Approach SLO	Pedagogy Used for that SLO	Assessment Strategies
<ul style="list-style-type: none"> <li>• Understand the expectations of the command words</li> <li>• Look at the cognitive level</li> <li>• Identify the content that is required to answer that question (both in terms of understanding of concepts and any skills that may be required like analysing or evaluating)</li> <li>• Go through the past paper questions on that particular concept</li> <li>• Refer to the resource guide for extra resources</li> </ul>	<ul style="list-style-type: none"> <li>• Story Board</li> <li>• Cause and Effect</li> <li>• Fish and Bone</li> <li>• Concept Mapping</li> <li>• Audio Visual resources</li> <li>• Think, Pair and Share</li> <li>• Questioning Technique (Socratic approach)</li> <li>• Practical Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Past paper questions</li> <li>• Discussion on E-Marking Notes</li> <li>• AKU-EB Digital Learning Solution powered by Knowledge Platform  <a href="https://akueb.knowledgeplatform.com/login">https://akueb.knowledgeplatform.com/login</a></li> </ul> 

**Any Additional Suggestion:** Teachers are advised to accustom students to relate the function of any body part with its structure.

## **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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