آغا خان یونیورسٹی ایگزامینیشن بورڈ

AGA KHAN UNIVERSITY EXAMINATION BOARD

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

Introduction

This document has been produced for the teachers and candidates of Higher Secondary School Certificate (HSSC) Part II Biology. It contains comments on candidates' responses to the 2024 HSSC-II 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 successfully constructed strong responses, particularly in recognising the key characteristics of cancerous cells. Many also excelled in describing the physiological and behavioural adaptations in animals for regulating body temperature in cold environments. However, to ensure a deeper understanding, it is crucial for teachers to emphasise the following content areas and provide candidates with additional practice:

- Comparison of the sympathetic and parasympathetic nervous systems across various aspects.
- Comprehension of reasoning questions related to different diseases, such as type-II diabetes mellitus (non-insulin-dependent diabetes) and osteoarthritis.
- Understanding the factors that drive cell differentiation during embryonic development.
- Adeptness of analytical questions concerning the different stages of DNA replication.

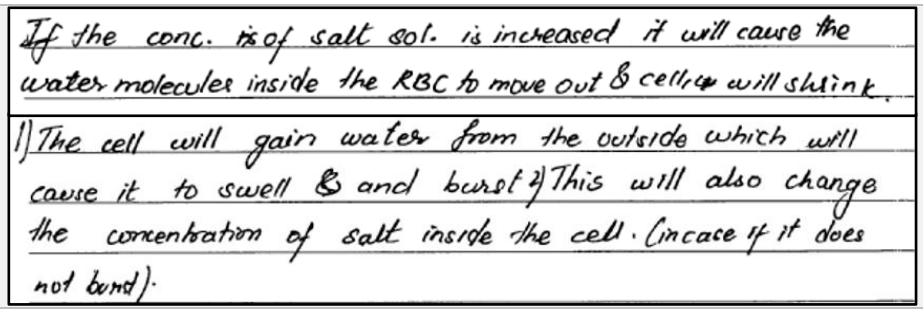
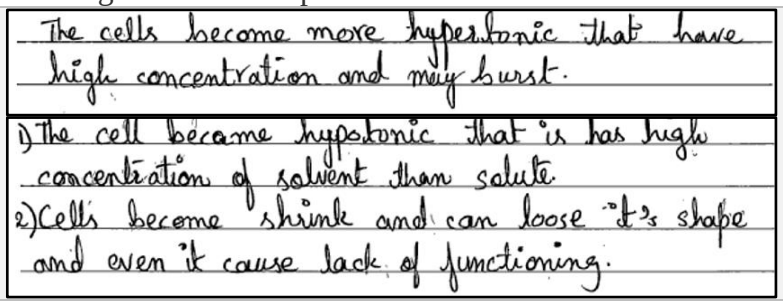
- Insight into how restriction enzymes cut DNA and facilitate the insertion of desired genes.
- A thorough understanding of how the distribution of auxin within plant cells drives phototropic and geotropic movements in plants.

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

DETAILED COMMENTS

Constructed Response Questions (CRQs)

<table>
<tr><th colspan="2">Question No. 1</th></tr>
<tr><td>Question Text</td><td>Five human red blood cells are placed in salt solutions of different concentrations.
<table><tr><th>Label of red blood cells</th><th>Concentrations of salt solution (in percentage)</th></tr><tr><td>1</td><td>0.2</td></tr><tr><td>2</td><td>0.3</td></tr><tr><td>3</td><td>0.4</td></tr><tr><td>4</td><td>0.5</td></tr><tr><td>5</td><td>0.6</td></tr></table>
a. What will be the effect of increasing concentration of salt solution on red blood cells?
b. Write any TWO changes that will occur in cell 4 if it is placed in 0.1% salt solution.</td></tr>
<tr><td>SLO No.</td><td>15.1.2 and15.3.1</td></tr>
<tr><td>SLO Text</td><td>Describe the significance of homeostasis.
Define osmosis, water potential, pressure potential and solute potential.</td></tr>
<tr><td>Max Marks</td><td>3</td></tr>
<tr><td>Cognitive Level</td><td>U*</td></tr>
<tr><td>Checking Hints</td><td>a. 1 mark for writing the effect on red blood cells
b. 1 mark for describing each change (TWO required)</td></tr>
<tr><td>Overall Performance</td><td>Overall, candidates demonstrated a moderate understanding of the effects of osmotic pressure on red blood cells in varying salt concentrations. They correctly identified general trends, such as cell shrinkage in hypertonic solutions and swelling in hypotonic solutions, but their explanations often lacked precision.</td></tr>
<tr><td>Description of Better Responses</td><td>Better responses in part a, correctly identified that red blood cells will shrink or plasmolysed as salt concentration increases, accurately linking the concentration gradient to osmotic pressure and its effect on cell volume.
In part b, the better responses provided a comprehensive explanation of changes in cell 4 when placed in a 0.1% salt solution. They concisely described swelling as water enters the cell due to the lower solute concentration outside, causing the cell to swell. Additionally, they accurately explained haemolysis, noting that if too much water enters, the cell may burst due to excess pressure.</td></tr>
</table>

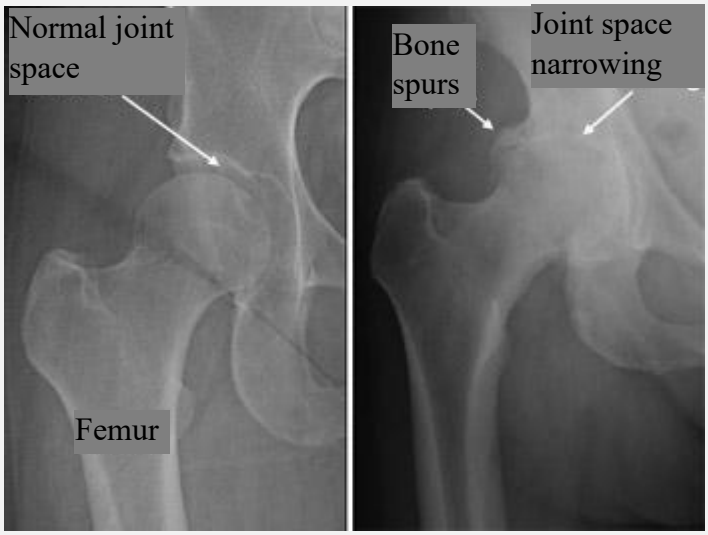
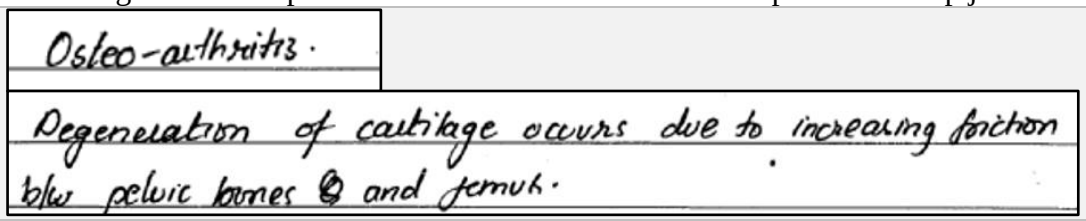
Image of Better Response	
Description of Weaker Responses	*Weaker responses* in part a, often demonstrated confusion between hypotonic and hypertonic solutions, leading to incorrect descriptions of how increasing salt concentration causes red blood cells to shrink. In part b, these responses also misused scientific terminology when describing the changes in cell **4** in a 0.1% salt solution. Common misconceptions among candidates include incorrect explanations of swelling and haemolysis, which indicates a need for a better understanding of water movement in hypotonic solutions leads to cell swelling and potential bursting due to excess pressure.
Image of Weaker Response	

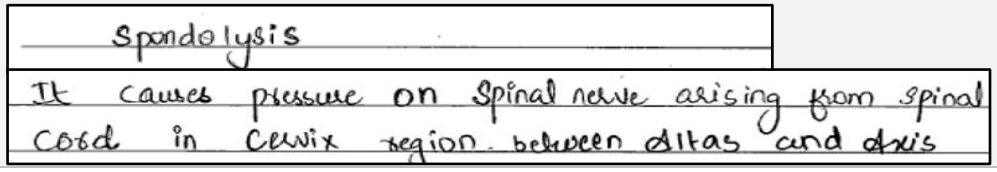
Suggestions for improvement (Highlight all that apply)

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 ** For description of each Pedagogy, refer to Annexure A	• 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 should present hypothetical scenarios and ask candidates to predict and explain the outcomes using their knowledge of osmosis. This approach will encourage deeper comprehension and facilitate the application of their understanding.

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

Question No. 2	
Question Text	The given image shows X-rays of a normal and overweight patient's hip joints.  Normal hip joint — Hip joint of an overweight patient a. Identify the skeletal disease based on the features shown in the joint of an overweight patient. b. Write any ONE change (other than shown in the image) that occurs in the hip joint of the patient.
SLO No.	16.4.8
SLO Text	Discuss skeleton related diseases and their preventive measures, i.e., a. disc slip b. spondylitis c. sciatica d. osteoarthritis.
Max Marks	2
Cognitive Level	U
Checking Hints	a. 1 mark for the correct identification of disease b. 1 mark for writing the changes in joint (any TWO required)
Overall Performance	Candidates displayed an average level of understanding of the disease, identifying osteoarthritis with varying degrees of accuracy. While the responses demonstrated a basic grasp of the condition, there is room for improvement in detailing and applying medical terminology and concepts more accurately.
Description of Better Responses	In *better responses* to part a, candidates correctly identified osteoarthritis as the disease based on features shown in the image, such as bone spurs and narrowing of the joint space. They demonstrated an understanding of the condition's link to joint degeneration in overweight patients. For part b, candidates accurately mentioned changes such as reduced cartilage, swelling, inflammation, a thickened synovial membrane and bone erosion, reflecting a clear comprehension of osteoarthritis and its impact on the hip joint.
Images of Better Responses	 Osteo-arthritis. Degeneration of cartilage occurs due to increasing friction b/w pelvic bones & and femur.
Description of Weaker Responses	In *weaker responses* to part a, candidates failed to accurately identify the disease, confusing osteoarthritis with other joint conditions such as sciatica, disc slip or spondylitis. Many responses simply copied features from the question, such as bone spurs and joint space narrowing, without providing correct information. In part b, candidates provided vague or incorrect descriptions of changes in the hip joint, using general terms rather than addressing

	specific pathological processes like cartilage breakdown or inflammation. These responses indicated a limited understanding of osteoarthritis and its clinical manifestations.
Images of Weaker Responses	

Suggestions for improvement (Highlight all that apply)

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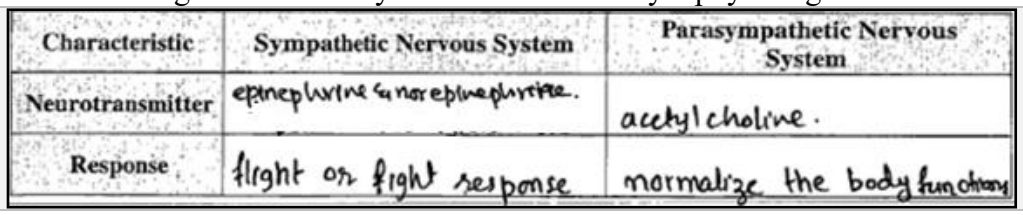
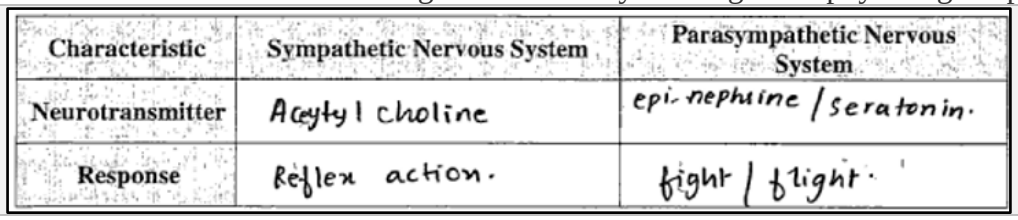
Any Additional Suggestion: Teachers should provide detailed feedback on assignments and exam papers, pointing out areas where responses were too general or lacked specificity. This feedback should be used as a tool to guide further study and enhance candidates' performance.		

Question No. 3

Question Text	Differentiate between the sympathetic and parasympathetic nervous systems in the given table.

Characteristic	Sympathetic Nervous System	Parasympathetic Nervous System
Neurotransmitter		
Response		

SLO No.	17.4.5
SLO Text	Differentiate between sympathetic and parasympathetic nervous system.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for each difference (TWO required)
Overall Performance	The overall performance of candidates on this question was below average. Most candidates struggled to accurately identify the neurotransmitters involved in the sympathetic and parasympathetic nervous systems. While some responses correctly described the functions of both systems, many candidates failed to distinguish between them clearly. This indicated a need for improved understanding and differentiation of the sympathetic and parasympathetic systems.

Description of Better Responses	In *better responses*, candidates correctly identified the neurotransmitters and functions of both the sympathetic and parasympathetic nervous systems. They accurately noted that the sympathetic nervous system uses noradrenaline/ norepinephrine and is involved in the fight-or-flight response, while the parasympathetic nervous system uses acetylcholine and is responsible for rest-and-digest functions. These responses demonstrated a clear understanding of how each system affects the body's physiological state.
Image of Better Response	
Description of Weaker Responses	In *weaker responses*, candidates struggled to correctly identify the neurotransmitters and functions of both the sympathetic and parasympathetic nervous systems. Many responses incorrectly described the neurotransmitters or confused the functions of the two systems. Common misconceptions included attributing the fight-or-flight response to acetylcholine or suggesting that noradrenaline is involved in rest-and-digest functions. These errors indicated a lack of understanding of how each system regulates physiological processes.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Preferred Pedagogy Used for this SLO	Assessment Strategies
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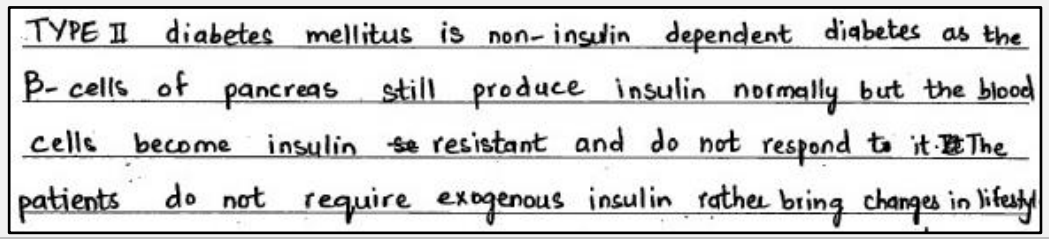
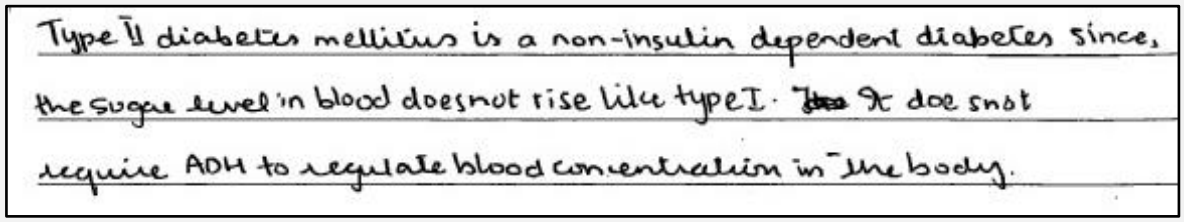
Any Additional Suggestion: Teachers can use tables or charts to visually compare the sympathetic and parasympathetic nervous systems, emphasising differences in neurotransmitters, functions and physiological effects.

Question No. 4	
Question Text	Describe why type-II diabetes mellitus is referred as non-insulin dependent diabetes.
SLO No.	22.7.2
SLO Text	Differentiate between type I and type II of diabetes mellitus.
Max Marks	2
Cognitive Level	U

Checking Hints	1 mark for each point (any TWO required)
Overall Performance	The overall performance of candidates on this question was below average. Most answers lacked depth and failed to address the key mechanisms underlying type-II diabetes. This suggests a need for a deeper focus on the pathophysiology of diabetes to enhance candidates' comprehension and performance in future assessments.
Description of Better Responses	In *better responses*, candidates correctly noted that individuals with type-II diabetes produce endogenous insulin, but their body cells develop resistance due to changes in insulin receptors, impairing glucose uptake. Additionally, they mentioned the progressive insulin deficiency in susceptible individuals due to the pancreatic β cells' inability to meet increased insulin demand. The comprehensive responses demonstrated a clear understanding of the pathophysiology of type-II diabetes, addressing both insulin resistance and progressive insulin deficiency effectively.
Image of Better Response	 TYPE II diabetes mellitus is non-insulin dependent diabetes as the β-cells of pancreas still produce insulin normally but the blood cells become insulin ~~se~~ resistant and do not respond to it. The patients do not require exogenous insulin rather bring changes in lifestyle
Description of Weaker Responses	*Weaker responses* provided inaccurate explanations of type-II diabetes. These responses incorrectly stated that patients with type-II diabetes do not produce insulin and referred to it as non-insulin dependent diabetes. This demonstrates a fundamental misunderstanding of the condition, as type-II diabetes is characterised by the body's cells developing resistance to insulin rather than a lack of insulin production. These responses lacked details about insulin resistance and the gradual decline in pancreatic β cells' function.
Image of Weaker Response	 Type II diabetes mellitus is a non-insulin dependent diabetes since, the sugar level in blood doesnot rise like type I. ~~The~~ It doe snot require ADH to regulate blood concentration in the body.

Suggestions for improvement (Highlight all that apply)

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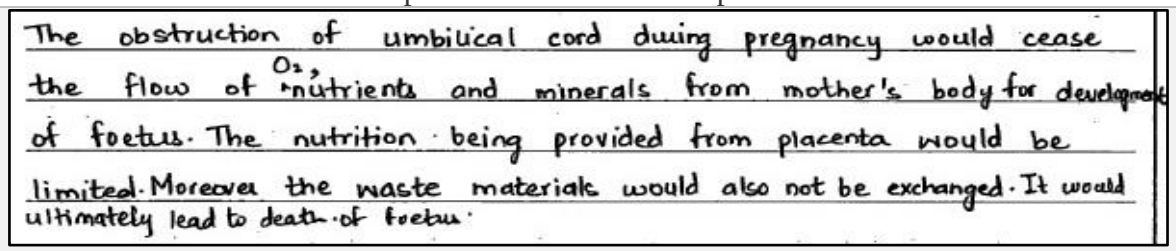
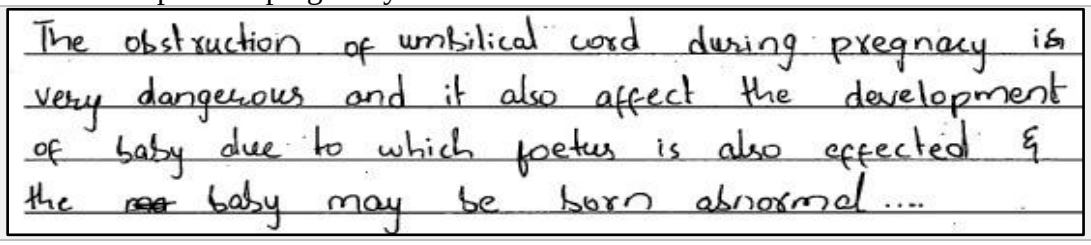
Any Additional Suggestion: Teachers can invite healthcare professionals or endocrinologists to deliver lectures, offering students real-world insights into diabetes management and treatment.

Question No. 5	
Question Text	How does the obstruction of umbilical cord during pregnancy affect the development of foetus?
SLO No.	18.6.7
SLO Text	Describe the roles of placenta, umbilical cord and extra-embryonic coats.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for each point (any TWO required)
Overall Performance	The overall performance of candidates on this question was average. While some responses demonstrated a solid understanding of the physiological implications of umbilical cord obstruction, many lacked depth and specificity. Candidates generally recognised that the obstruction could lead to foetal harm, but few detailed the exact mechanisms or consequences.
Description of Better Responses	*Better responses* effectively explained that obstruction of the umbilical cord disrupts the transport of nutrients and oxygen to the foetus and impedes the removal of waste products. Candidates accurately described the potential consequences, including foetal hypoxia, growth restriction, or miscarriage, due to the lack of essential exchanges between the placenta and foetus. They demonstrated a clear understanding of the critical role of the umbilical cord in foetal development and the severe impact of its obstruction.
Image of Better Response	 The obstruction of umbilical cord during pregnancy would cease the flow of O_2, nutrients and minerals from mother's body for development of foetus. The nutrition being provided from placenta would be limited. Moreover the waste materials would also not be exchanged. It would ultimately lead to death of foetus.
Description of Weaker Responses	*Weaker responses* lacked a clear understanding of the consequences of umbilical cord obstruction. Candidates failed to mention the disruption of nutrient and oxygen transport and the removal of waste products. Many responses were vague, simply stating that the foetus would not develop properly without explaining the specific mechanisms involved. Some incorrectly suggested that the obstruction would have minimal impact or focused on unrelated aspects of pregnancy.
Image of Weaker Response	 The obstruction of umbilical cord during pregnacy is very dangerous and it also affect the development of baby due to which foetus is also effected & the ~~aar~~ baby may be born abnormal ....

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies

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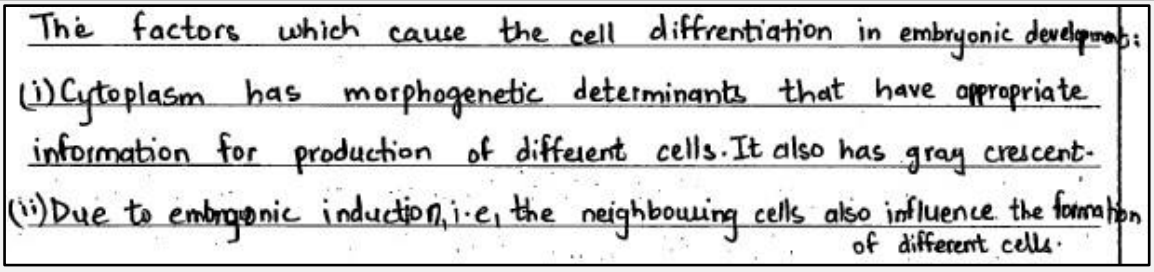
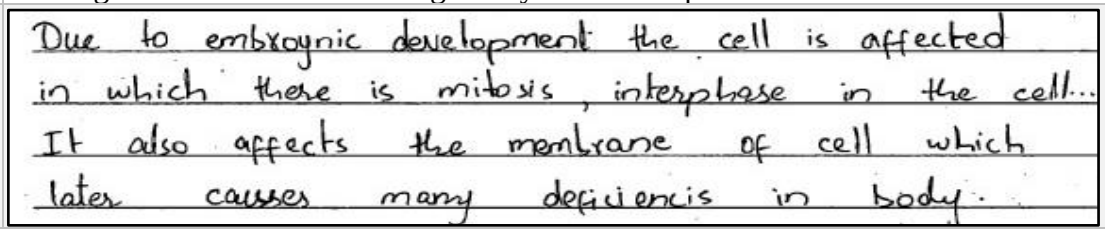
Any Additional Suggestion: Teachers should encourage candidates to explain concepts to each other during peer-teaching sessions. This approach can reinforce their understanding and help identify any gaps in knowledge.		

Question No. 6	
Question Text	Write any TWO factors which cause cell differentiation during the process of embryonic development.
SLO No.	19.6.3
SLO Text	Explain cell differentiation with examples.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for each point (any TWO required)
Overall Performance	The overall performance of candidates on this question was below par. Many responses lacked a clear understanding of the fundamental factors driving cell differentiation during embryonic development.
Description of Better Responses	*Better responses* accurately identified key factors causing cell differentiation during embryonic development. Candidates correctly mentioned cytoplasmic segregation of morphogenetic determinants during cleavage and induction or interaction with neighbouring cells. They demonstrated a clear understanding of how these processes influence cell fate and development. Additionally, some responses included alterations in gene expression, apoptosis and migration of cells during gastrulation, highlighting the complexity of differentiation. These responses were concise, well-structured, and effectively covered the primary mechanisms involved in embryonic cell differentiation, reflecting a strong grasp of developmental biology concepts.
Image of Better Response	
Description of Weaker Responses	*Weaker responses* generally failed to identify the key factors causing cell differentiation. Many candidates provided irrelevant information, such as focusing on unrelated processes or misinterpreting the mechanisms involved. Some answers lacked specificity or were

	overly vague, failing to address factors like cytoplasmic segregation, induction, or gene expression changes. These responses indicated a limited understanding of the core processes driving cell differentiation during embryonic development.
Image of Weaker Response	 Due to embryonic development the cell is affected in which there is mitosis, interphase in the cell... It also affects the membrane of cell which later causes many deficiencis in body.

Suggestions for improvement (Highlight all that apply)

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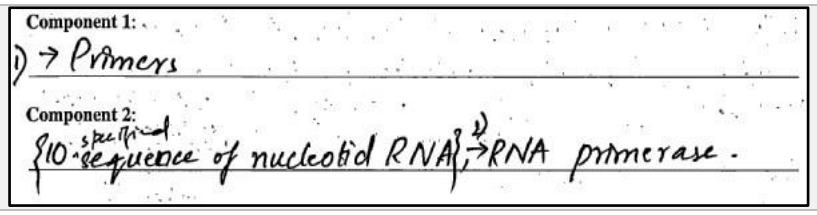
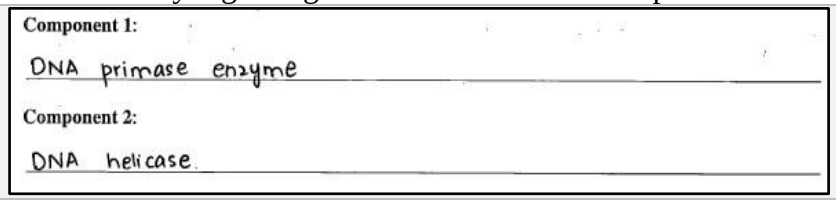
Any Additional Suggestion: Teachers should offer practice questions and quizzes specifically focusing on cell differentiation to help candidates familiarise themselves with the material and allowing them to test their knowledge.		

Question No. 7	
Question Text	To initiate the process of DNA replication in a laboratory, polymerase enzymes are added along with DNA template and nucleotides. The result shows that the DNA does not replicate by using these components alone. Identify TWO other essential components which are missing in this process.
SLO No.	20.4.1
SLO Text	Illustrate semi-conservative replication of DNA.
Max Marks	2
Cognitive Level	U
Checking Hints	1 mark for identifying primase enzyme 1 mark for identifying RNA primer
Overall Performance	The overall performance of candidates on this question was below average. Many responses indicated a misunderstanding of the specific components required for the initiation of DNA replication.
Description of Better Responses	*Better responses* accurately identified the essential components missing in the DNA replication process such as primase enzyme and an RNA primer. These responses demonstrated a clear understanding of the roles these components play in initiating DNA replication.

Image of Better Response	
Description of Weaker Responses	*Weaker responses* often mentioned enzymes like ligase, helicase, or polymerase, which are not directly involved in the initiation of DNA replication. These responses demonstrated a misunderstanding of the specific components required to start replication. Candidates failed to identify the primase enzyme and RNA primer, which are crucial for providing the initial starting point for DNA polymerase. The incorrect focus on unrelated enzymes indicated a lack of clarity regarding the roles of different components in the DNA replication process.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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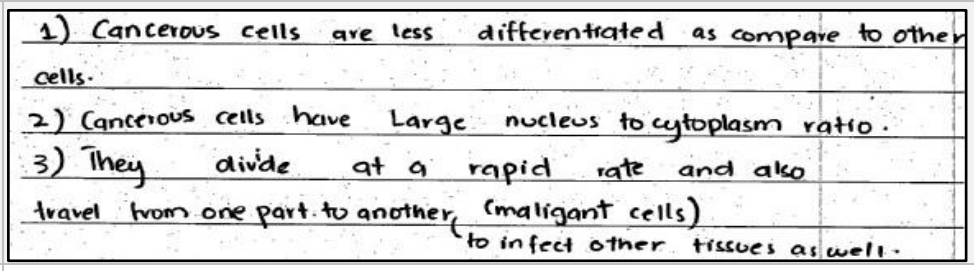
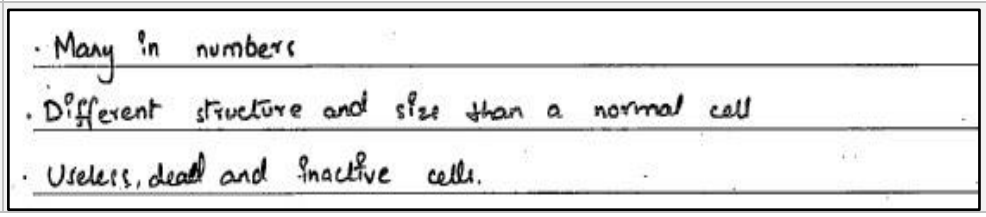
Any Additional Suggestion: Teachers should provide more focused instructions on the steps and components of DNA replication, including the roles of primase and RNA primer. Additional practice and targeted feedback could also help improve understanding and accuracy.

Question No. 8	
Question Text	Mention any THREE distinguishing characteristics of cancerous cells.
SLO No.	21.2.4
SLO Text	Describe cancer as uncontrolled cell division.
Max Marks	3
Cognitive Level	U
Checking Hints	1 mark for mentioning each characteristic (any THREE required)
Overall Performance	Overall, the candidates performed excellently. They accurately identified the distinguishing characteristics of cancerous cells and demonstrated a thorough understanding of the topic. Their responses were detailed and reflected a high level of insight into the complexities of cancer cell biology.

Description of Better Responses	In *better responses*, candidates accurately mentioned abnormal rapid division and growth, high nucleus-to-cytoplasm ratio with prominent nucleoli and undifferentiated or poorly differentiated cells. These responses demonstrated a clear understanding of the hallmarks of cancerous cells, reflecting a solid grasp of the physiological and structural changes associated with cancer. These responses were precise, relevant and covered the major distinguishing features comprehensively, showing an insightful understanding of cancerous cells.
Image of Better Response	
Description of Weaker Responses	*Weaker responses* were often superficial and failed to accurately identify key characteristics of cancerous cells. Many candidates provided vague or incomplete answers, mentioning general terms without specifying distinguishing features. For instance, some candidates listed broad concepts like 'rapid growth' without detailing its implications or the specific attributes of cancer cells. This lack of specificity and depth indicated a limited understanding of the fundamental characteristics that differentiate cancerous cells from normal cells.
Image of Weaker Response	

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Maximising SLO Achievement	Pedagogy Used for that SLO	Assessment Strategies
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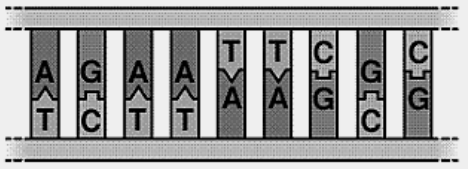
Any Additional Suggestion: Teachers can use concept mapping techniques to help candidates organise and visualise the relationships between different characteristics of cancerous cells.

Question No. 9	
Question Text	a. In recombinant DNA technology, how do restriction enzymes cleave DNA and facilitate the insertion of desired gene? b. Identify the four nucleotides sequence as a specific cutting site for restriction enzyme in the given part of DNA duplex. 
SLO No.	23.2.1
SLO Text	Explain steps of genetic engineering through recombinant DNA technology, i.e. a. isolation of the gene of interest b. amplifying the gene of interest c. insertion of the gene of interest in bacteria d. cloning of recombinant DNA.
Max Marks	2
Cognitive Level	U
Checking Hints	a. 1 mark for each point (TWO required) b. 1 mark for the correct identification of palindromic sequence
Overall Performance	The overall performance of candidates on this question was moderate. This indicates a general familiarity with the topic but highlights areas where more detailed knowledge and clarity are needed.
Description of Better Responses	*Better responses* accurately addressed both parts of the question. For part (a), candidates correctly explained that restriction enzymes cut DNA at specific palindromic sequences and produce staggered cuts, creating sticky ends that facilitate the insertion of desired genes. For part (b), they correctly identified the four-nucleotide sequence AATT or TTAA as a specific cutting site. These responses demonstrated a clear understanding of the mechanisms of restriction enzymes and their role in recombinant DNA technology.
Image of Better Response	Restriction enzymes cut the DNA at a specific sequence of nucleotides called Palindromic sequences In result, sticky ends are produce. The sticky ends being single stranded nucleotide sequence is complementary to vectors sticky ends in which gene is inserted. AATT is the palindromic sequence at which restriction enzyme will cut
Description of Weaker Responses	*Weaker responses* were often superficial and lacked detail. For part (a), candidates provided vague or incomplete explanations about restriction enzymes and their function, failing to address key concepts like palindromic sequences and sticky ends. For part (b), their responses often missed the correct sequence or were too general, not specifying the exact cutting site. These responses demonstrated a limited understanding of the precise mechanisms and technical aspects of restriction enzymes in recombinant DNA technology.
Image of Weaker Response	In recombinant DNA technology The enzyme are restricted but facilitate the insertion of gene by adding desire gene according to the nucleotide sequence. T T C C A A G G

Suggestions for improvement (Highlight all that apply)

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Any Additional Suggestion: Teachers should consider integrating case studies or real-world examples that demonstrate the practical applications of restriction enzymes in genetic engineering. This approach helps students see the relevance of the concepts and reinforces their learning through concrete, real-life scenarios.		

Extended Response Questions (ERQs)

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

Question No. 10(a)	
Question Text	Describe any THREE physiological and FOUR behavioural adaptations in animals for regulating their body temperature in cold environment.
SLO No.	15.9.2
SLO Text	Describe structural, physiological, behavioural adaptations in animals for temperature regulation.
Max Marks	7
Cognitive Level	U
Checking Hints	1 mark for describing each physiological adaptation (any THREE required) (*1 mark will be awarded when candidates state three adaptations only without any description)* 1 mark for describing each behavioural adaptation (any FOUR required) *(Marks will be awarded for any relevant behavioural adaptation)*
Overall Performance	Most candidates were drawn to this part of the question and demonstrated a strong understanding of both physiological and behavioural adaptations for thermoregulation in cold environments. Overall, their responses were comprehensive and precise, reflecting a high level of knowledge and insight into the topic.
Description of Better Responses	*Better responses* showed a comprehensive understanding of both physiological and behavioural adaptations in animals for thermoregulation in cold environments. Candidates accurately identified key structural adaptations, such as insulation through fur, fat, or feathers, and circulatory adaptations like vasoconstriction. They also highlighted the importance of behavioural strategies, including basking in the sun, huddling, and the use of external heat sources. The use of specific examples, like penguin chicks huddling and birds orienting their wings to the sun, demonstrated a strong grasp of the concepts. Additionally,

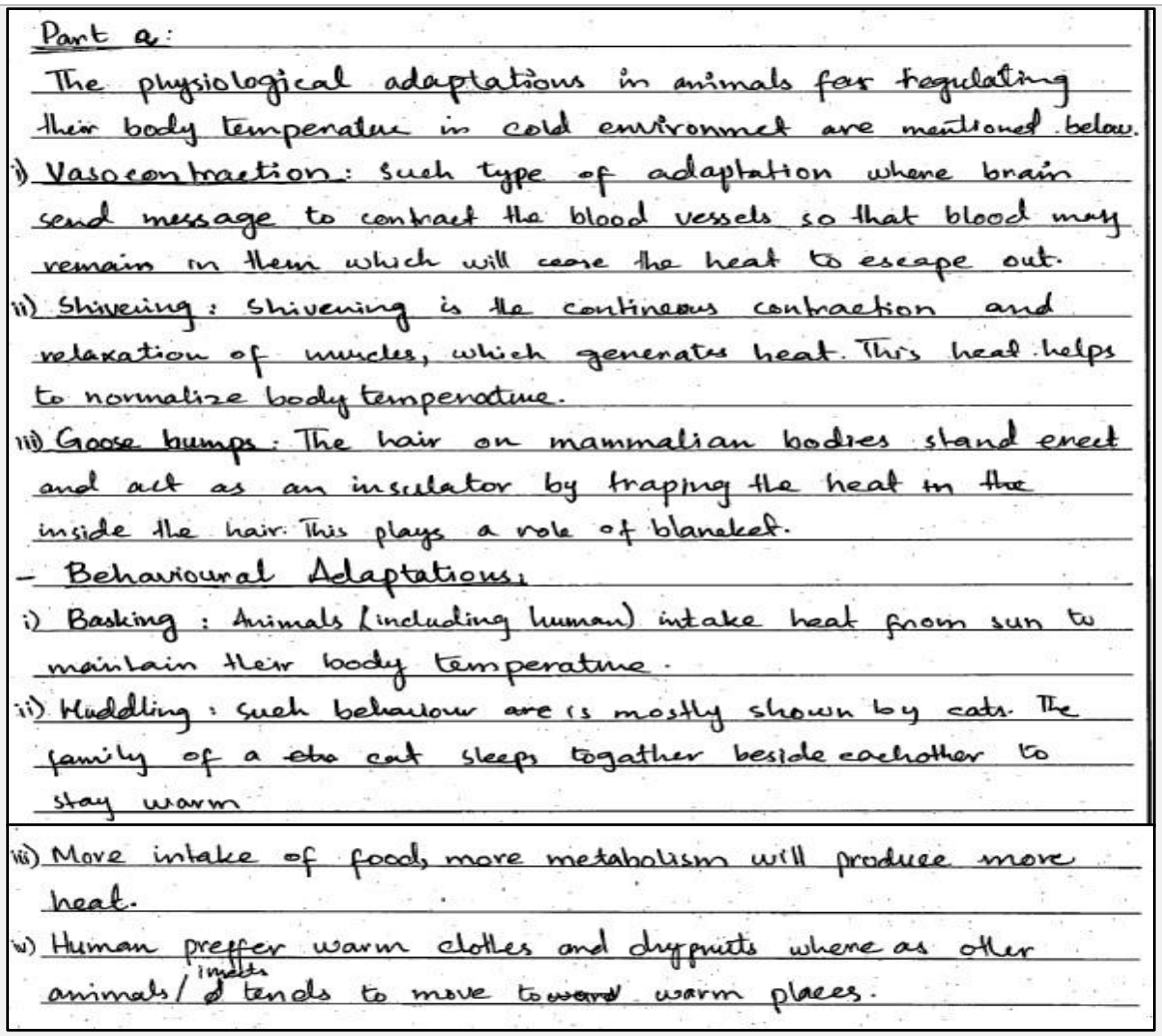
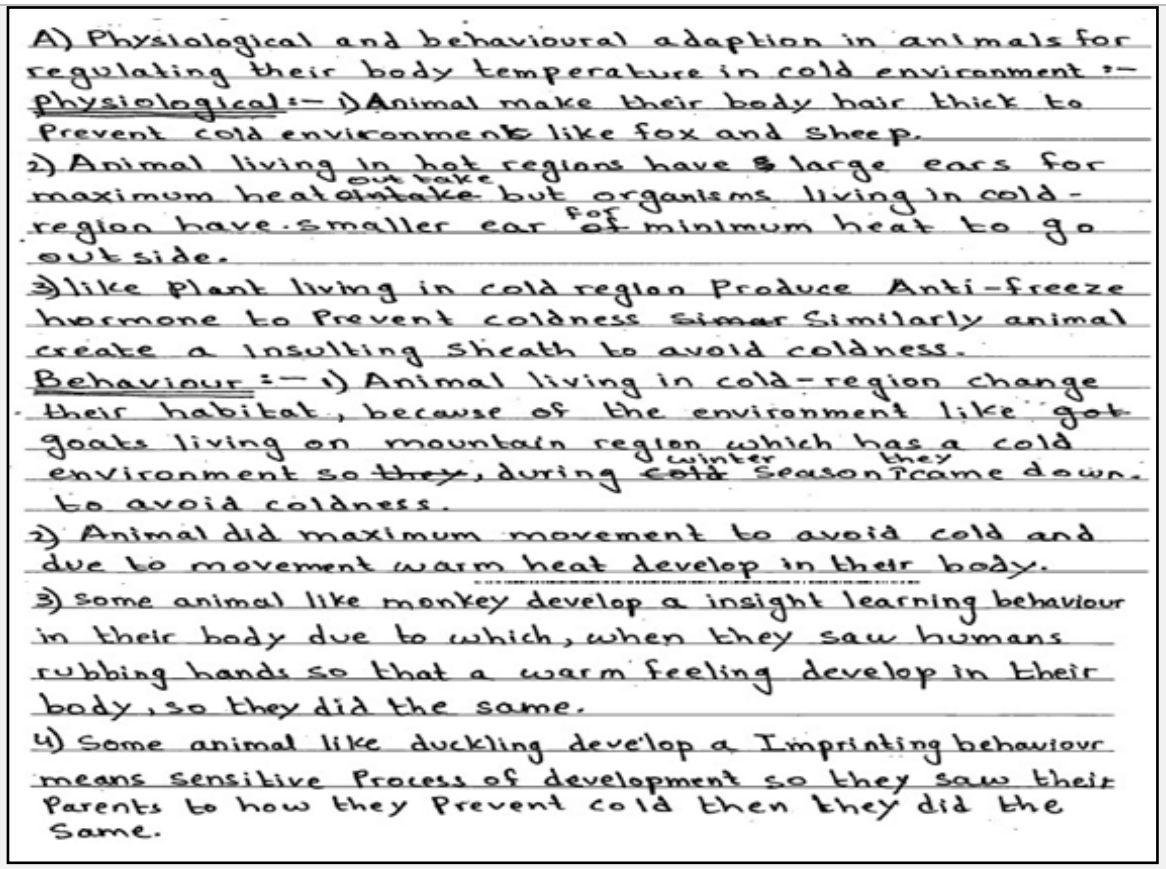
	they also included how these adaptations help animals maintain body temperature in cold conditions.
Image of Better Response	
Description of Weaker Responses	*Weaker responses* revealed some misunderstandings, with candidates often describing adaptations for thermoregulation in hot environments instead of cold. Common errors included mentioning sweating and panting—cooling mechanisms rather than focusing on heat retention strategies. Additionally, many candidates failed to explain how each adaptation works for thermoregulation in cold conditions. For example, they listed insulation methods without describing how fur, fat, or feathers minimise heat loss. Some also omitted the role of behaviours like basking or huddling in conserving heat.

Image of Weaker Response	

A) Physiological and behavioural adaption in animals for regulating their body temperature in cold environment :-
Physiological :- 1) Animal make their body hair thick to Prevent cold environment like fox and sheep.
2) Animal living in hot regions have large ears for maximum heat ~~intake~~ outtake but organisms living in cold-region have smaller ear of minimum heat to go out side.
3) like plant living in cold region Produce Anti-freeze hormone to Prevent coldness ~~Simar~~ Similarly animal create a insulting sheath to avoid coldness.
Behaviour :- 1) Animal living in cold-region change their habitat, because of the environment like goats living on mountain region which has a cold environment so ~~they~~, during ~~cold~~ winter season they came down. to avoid coldness.
2) Animal did maximum movement to avoid cold and due to movement warm heat develop in their body.
3) some animal like monkey develop a insight learning behaviour in their body due to which, when they saw humans rubbing hands so that a warm feeling develop in their body, so they did the same.
4) Some animal like duckling develop a Imprinting behaviour means sensitive Process of development so they saw their Parents to how they Prevent cold then they did the Same.

Suggestions for improvement (Highlight all that apply)

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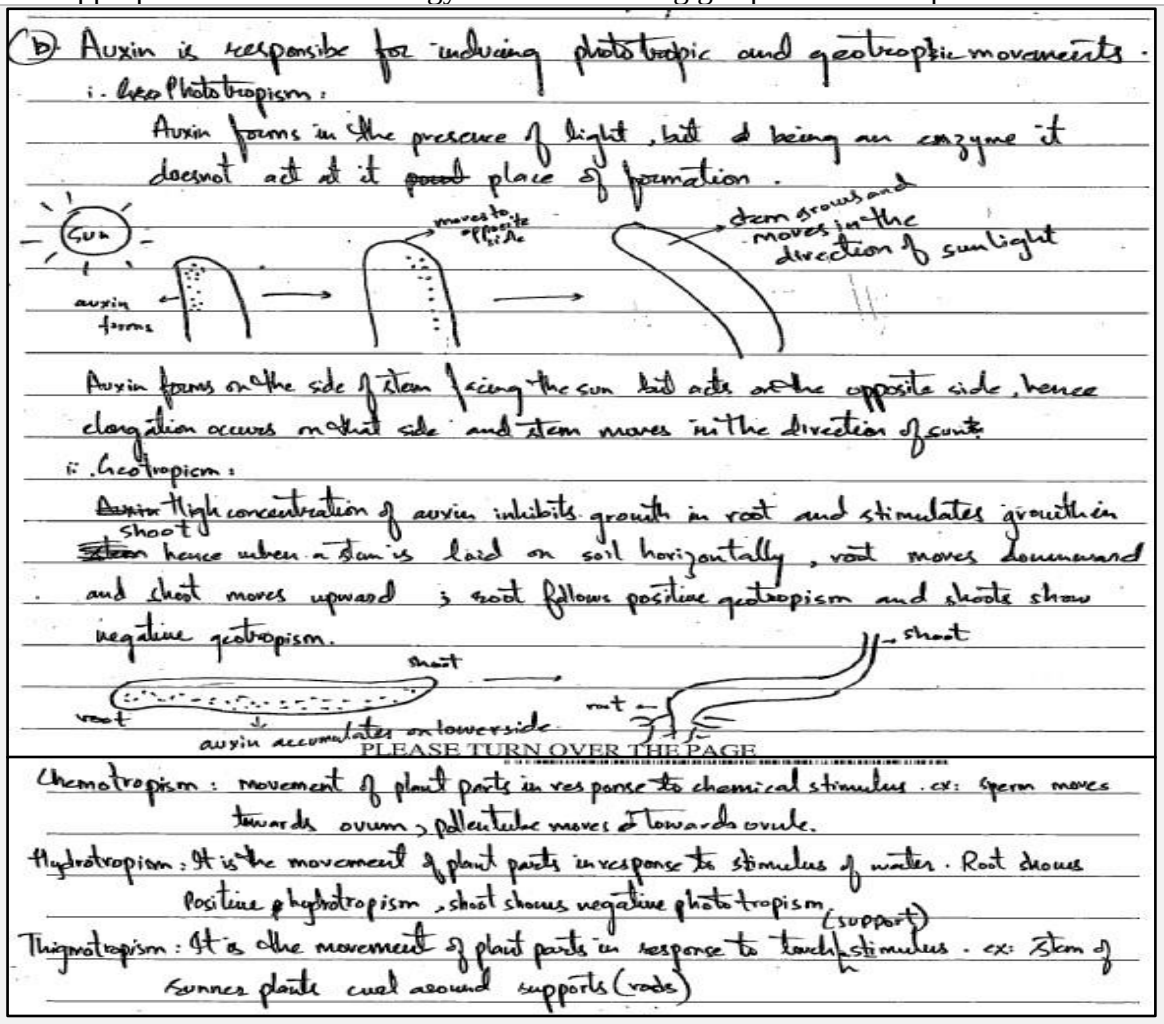
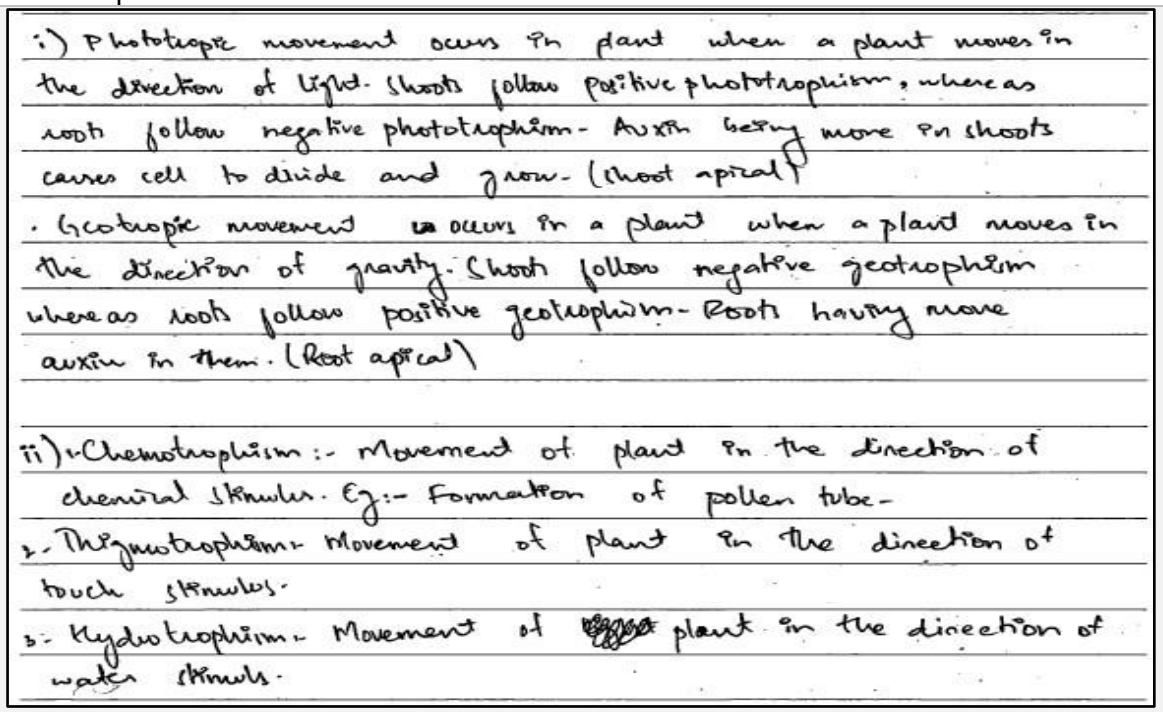
Any Additional Suggestion: Teachers should incorporate real-life examples and case studies to contextualise adaptations.

Question No. 10(b)	
Question Text	i. Describe how the distribution of auxin within the plant cells induces phototropic and geotropic movements in plants. ii. Describe any THREE types of tropic movements in plants other than phototropic and geotropic movements.
SLO No.	16.2.8 and16.2.5
SLO Text	Describe the role of growth substances (plant hormones) in plant movement. Describe types of tropic movements, i.e., geotropism, thigmotropism, hydrotropism, chemotropism and phototropism.

Max Marks	7
Cognitive Level	U
Checking Hints	i. 1 mark for each key point of phototropic movement (any TWO required) 1 mark for each key point of geotropic movement (any TWO required) ii. 1 mark for describing each type of movement (any THREE required) (**Note**: One mark will be awarded if a candidate has written only three names of tropic movements.)
Overall Performance	Fewer candidates attempted this part of the question, and their performance was average. Many responses lacked detail and precision, indicating a basic grasp of the concepts. To achieve higher marks, candidates need to provide more thorough explanations and demonstrate a deeper understanding of the material.
Description of Better Responses	In *better responses*, candidates demonstrated a solid understanding of auxin distribution in phototropic and geotropic movements. They accurately described how auxin redistributes to the shaded side in shoots, promoting cell elongation and positive phototropism, and how it inhibits cell elongation in roots, causing positive geotropism. Additionally, they correctly identified and explained other tropic movements, such as thigmotropism, chemotropism, and hydrotropism, providing clear examples and mechanisms. The detailed explanations and appropriate use of terminology reflected a strong grasp of the concepts.
Image of Better Response	
Description of Weaker Responses	In *weaker responses*, candidates generally struggled with part 'i', often failing to accurately describe how auxin distribution induces phototropic and geotropic movements. Many did not explain the role of auxin in promoting or inhibiting cell elongation in shoots and roots, leading to incomplete or incorrect answers. In part 'ii', while some candidates mentioned

	different types of tropic movements, they frequently omitted relevant examples, which weakened their responses. The lack of specific examples indicated a limited understanding of the topic.
Image of Weaker Response	

i) Phototropic movement occurs in plant when a plant moves in the direction of light. Shoots follow positive phototropism, whereas roots follow negative phototrophism. Auxin being more in shoots causes cell to divide and grow. (Shoot apical)

. Geotropic movement occurs in a plant when a plant moves in the direction of gravity. Shoots follow negative geotrophism whereas roots follow positive geotrophism. Roots having more auxin in them. (Root apical)

ii) Chemotrophism :- Movement of plant in the direction of chemical stimulus. Eg:- Formation of pollen tube.

2. Thigmotrophism:- Movement of plant in the direction of touch stimulus.

3. Hydrotrophism:- Movement of plant in the direction of water stimuls.

Suggestions for improvement (Highlight all that apply)

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Any Additional Suggestion: Teachers can use analogies to simplify complex concepts, such as comparing auxin distribution to traffic control directing plant growth. Further, they can develop mnemonics to help candidates remember key points about auxin's role in phototropism and geotropism.		

Question No. 11(a)	
Question Text	i. Identify the site of antidiuretic hormone (ADH) formation. ii. Describe any ONE function and any ONE disorder caused by the hyposecretion of each of the following hormones. • Somatotrophin hormone (STH)/ Growth hormone • Thyroxine hormone/ T4 hormone • Antidiuretic hormone (ADH)/ Vasopressin
SLO No.	17.5.3
SLO Text	Explain endocrine glands of mammals, hormones secreted from them and their disorders.
Max Marks	7
Cognitive Level	U
Checking Hints	i. 1 mark for mentioning the site of formation of antidiuretic hormone ii. 1 mark for describing the function of each hormone (THREE required) 1 mark for describing the disorder as a result of hyposecretion of each hormone (THREE required)
Overall Performance	Most candidates attempted this part and exhibited a very good understanding of hormone functions and disorders. Their responses showed a strong grasp of the material, effectively linking the physiological roles of hormones with their clinical implications. Overall, the candidates' answers were thorough and reflected a high level of knowledge.
Description of Better Responses	In *better responses*, candidates provided accurate and detailed information. They correctly identified the hypothalamus as the site of antidiuretic hormone (ADH) formation. For each hormone, they effectively described one function and one disorder related to its hyposecretion. The explanation for somatotrophin hormone (STH) included its role in growth and the disorder of dwarfism. Thyroxine's function and disorders, including cretinism and myxedema, were well-articulated. For ADH, the function of water conservation and the disorder of diabetes insipidus were clearly explained. Overall, the responses demonstrated a strong understanding of hormonal functions and associated disorders.

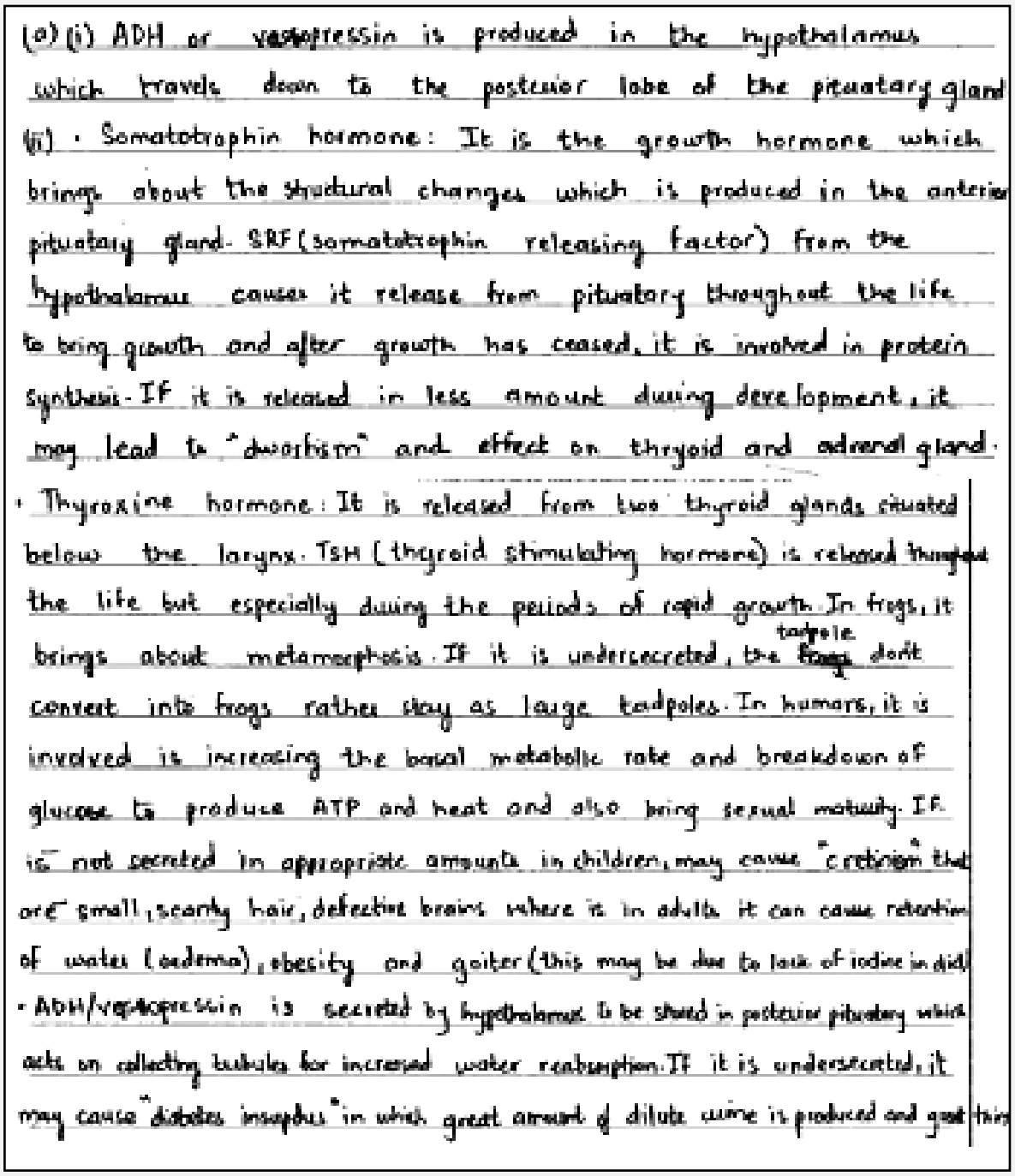
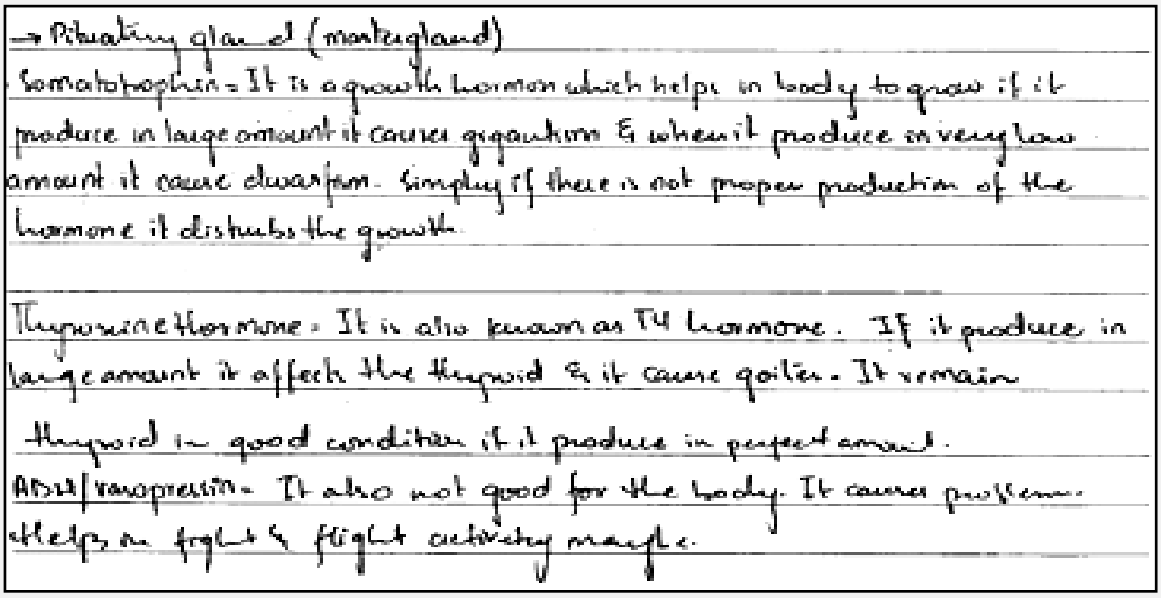
Image of Better Response	
Description of Weaker Responses	*Weaker responses* revealed several misunderstandings and omissions. Many candidates incorrectly identified the site of ADH formation as the pituitary gland instead of the hypothalamus. Common errors included inaccurate descriptions of hormone functions and disorders, with some confusing the roles of somatotrophin and thyroxine or providing incomplete details about related disorders. Additionally, there were misconceptions about ADH, with some candidates inaccurately describing the role of adrenaline instead of ADH.

Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

Maximising SLO Achievement	**Pedagogy Used for that SLO**	**Assessment Strategies**
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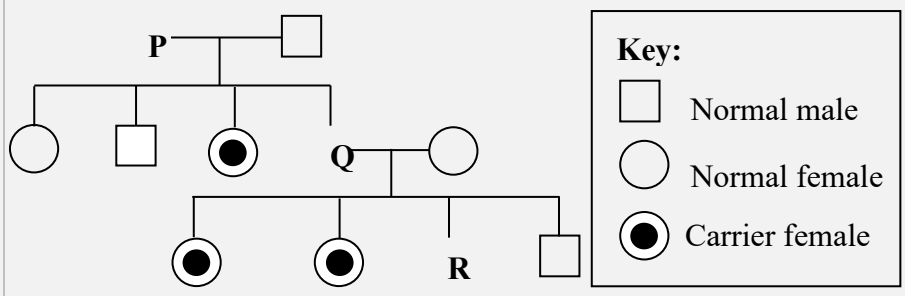
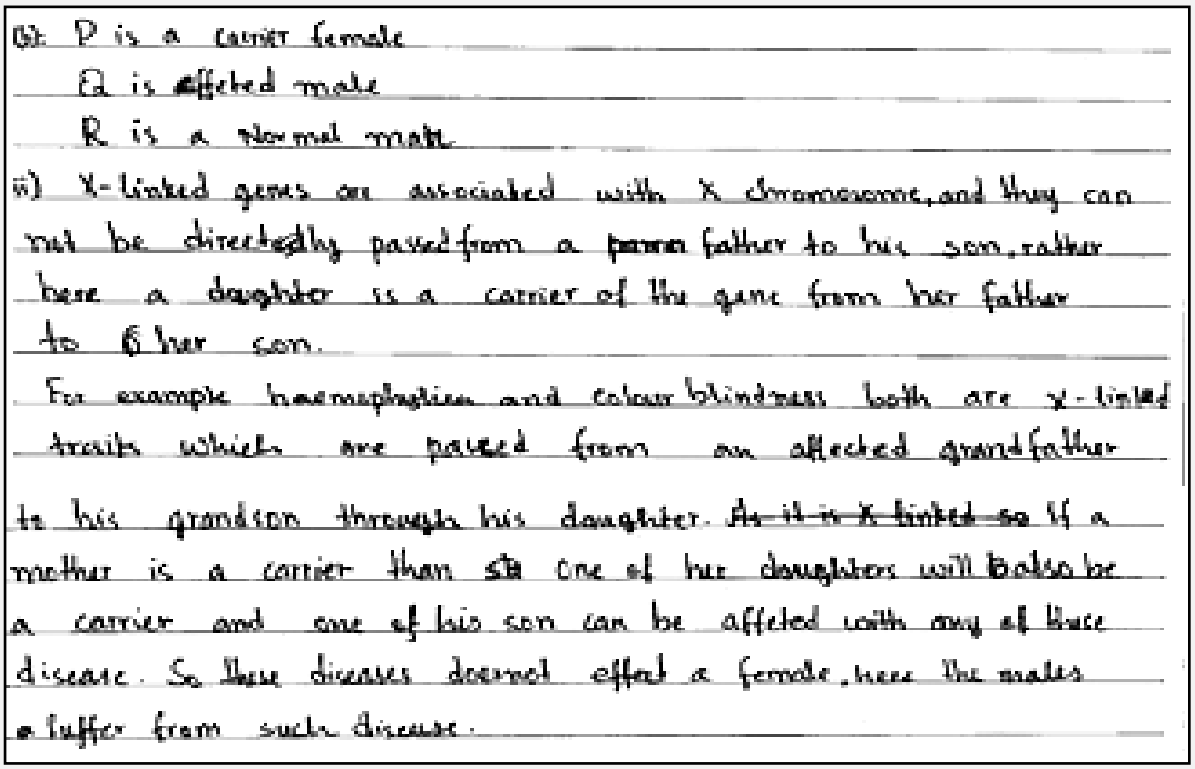
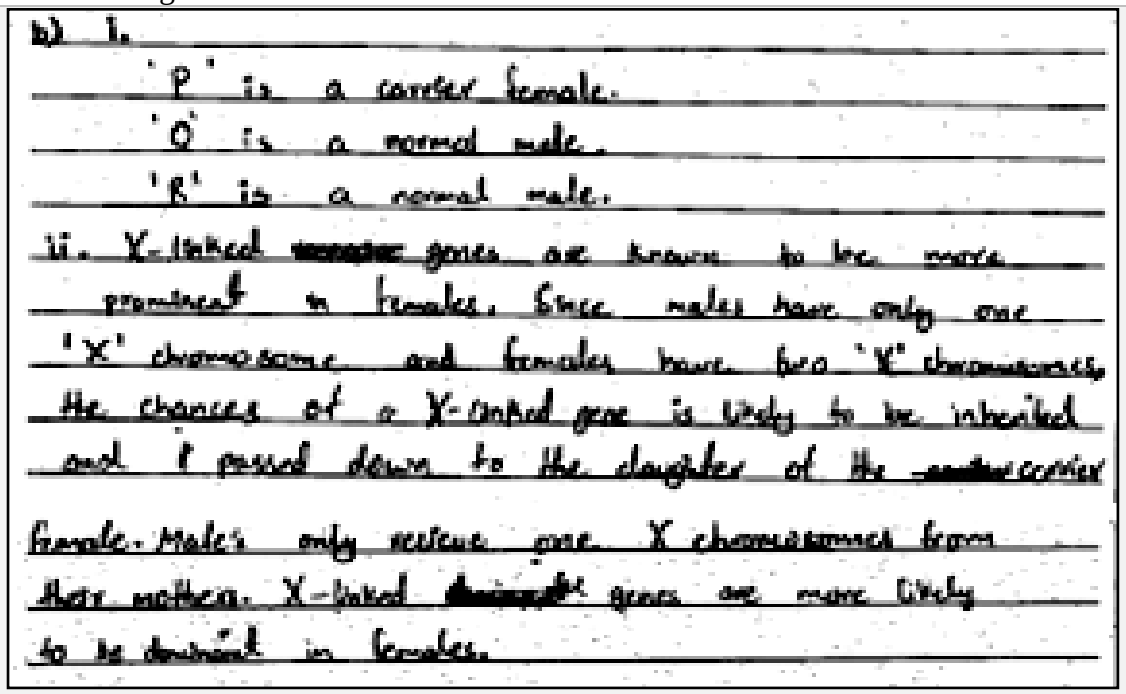
Any Additional Suggestion: Teachers should pose challenging scenarios related to hormone treatments and have students debate or analyse them. This encourages critical thinking and a more subtle understanding of the subject matter.		

Question No. 11(b)	
Question Text	The given pedigree shows inheritance of colour blindness in human.  i. Identify the phenotype of **P**, **Q** and **R** in the given pedigree. ii. Describe the pattern of inheritance of X-linked genes.
SLO No.	22.6.4
SLO Text	Illustrate sex-linked inheritance in human, i.e., a. colour blindness b. haemophilia.
Max Marks	7
Cognitive Level	A
Checking Hints	i. 1 mark for determining each phenotype of P, Q and R (THREE required) ii. 1 mark for describing each point (FOUR required)
Overall Performance	Fewer candidates attempted this part, but those who did, displayed a very strong understanding of X-linked inheritance. Their answers showed a thorough grasp of inheritance patterns and accurate application of genetic principles. Overall, the responses were detailed and reflected a high level of knowledge.
Description of Better Responses	*Better responses* demonstrated a strong understanding of X-linked inheritance. Candidates accurately identified the phenotypes of **P** as a carrier female, **Q** as a colour-blind male and **R** as a normal male. Their descriptions of X-linked gene inheritance were comprehensive and precise. They correctly explained that males cannot pass X-linked traits to their sons but can to their daughters and that females with one normal and one defective X chromosome are carriers. Additionally, they emphasised that X-linked diseases are more common in males and that affected males inherit the trait from their mothers. Overall, the responses were well-informed and thorough.

Images of Better Responses	
Description of Weaker Responses	*Weaker responses* demonstrated several misunderstandings and errors. Many candidates incorrectly identified the phenotypes of **P**, **Q** and **R**, such as confusing the carrier female with a colour-blind individual. Common mistakes included incorrect explanations of X-linked inheritance patterns, such as misunderstanding how traits are passed from parents to offspring or misinterpreting the frequency of X-linked disorders in males versus females. Some responses lacked clarity on how defective genes are transmitted, and there were inaccuracies in describing the roles of carriers and affected individuals.
Image of Weaker Response	

Suggestions for improvement (Highlight all that apply)

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Any Additional Suggestion: Teachers can have candidates role-play as genetic counsellors, explaining inheritance patterns and risks associated with X-linked disorders to families. This role-playing activity can enhance their understanding of complex concepts and improve their communication skills.		

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. The 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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