**Aga Khan University Examination Board**

**Notes from E-Marking Centre on SSC-II Biology Examination May 2017**

## Introduction

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

## E-Marking Notes

This includes overall comments on students' performance on every question and *some* specific examples of students' responses which support the mentioned comments. Please note that the descriptive comments represent an overall perception of the better and weaker responses as gathered from the e-marking session. 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

Candidates who did not score well were mostly unable to understand the demand of the question; often misinterpreting the command word and the stimulus. Furthermore, understanding of use of scientific terminology and interpretation of unseen diagrams and graphs was also weak. Mentioned below are few concepts that teachers need to focus in classrooms so that the candidates may perform better.

- Construction of pyramids of biomass and number
- DNA replication

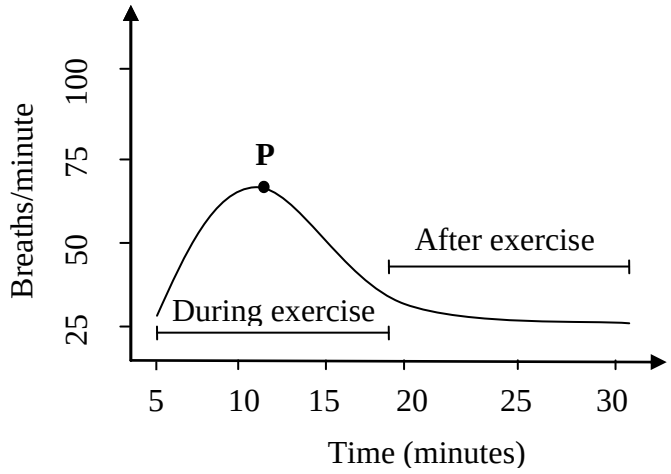
However, candidates outshined in some topics such as causes of kidney stones, skeletal system and fermenters.

**Detailed Comments:**

## Constructed Response Questions (CRQs)

**Question 1a:**

The given graph shows the breathing rate of an individual during and after exercise.

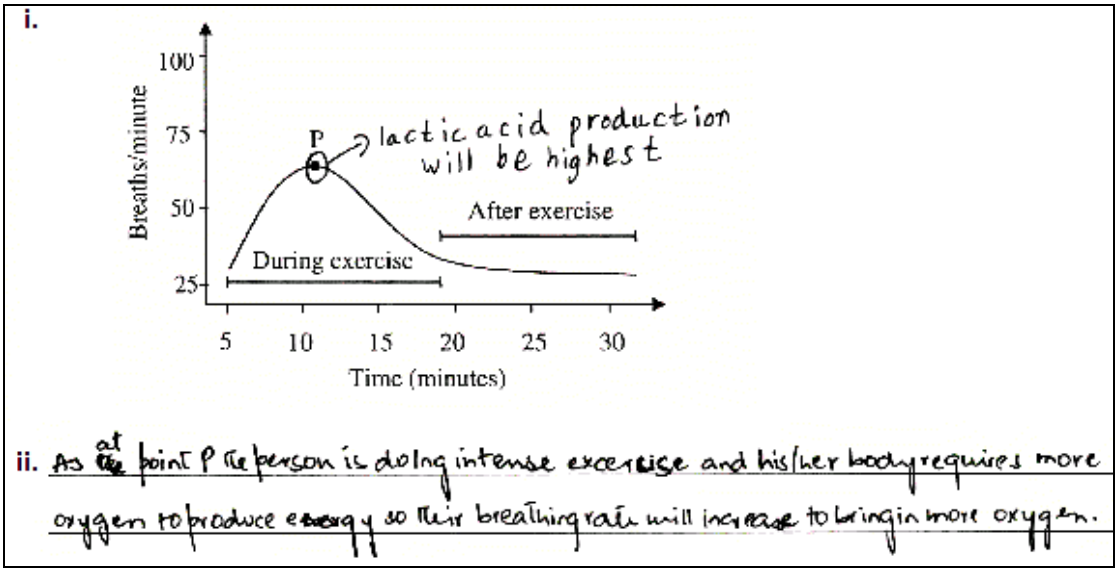



i. Locate the point on the graph where lactic acid production will be the highest?

ii. Why is the breathing rate of the individual high at point **P**?

*Better responses* revealed that candidates were able to interpret the graph in order to derive the required answer. Such responses gave reasons for higher breathing rate at point P as to supply more energy/ oxygen for the muscles to work/ to remove excess carbon dioxide produced in cells during exercise.

**Example:**

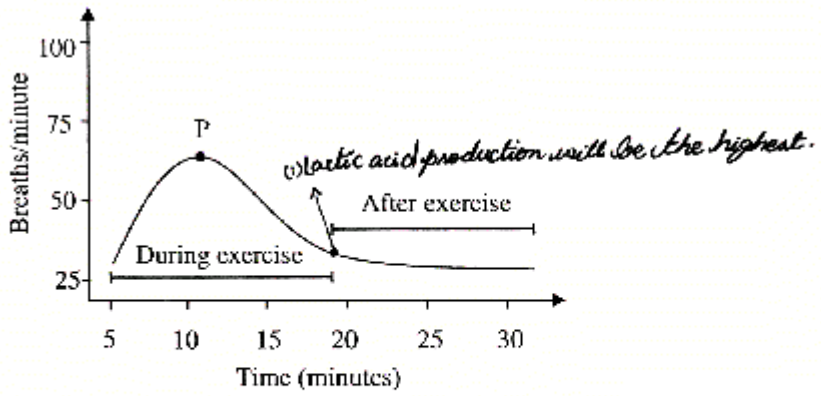



*Weaker responses* were unable to interpret the graph so such responses failed to locate the point correctly. Candidates either located the point at a random position on the graph or on one of the axes. Most of the responses gave generalised reasons such as 'because rate of respiration is high/ rate of metabolism is high'. A few responses were vague, e.g. carbon dioxide from the atmosphere moves inside the body.

Candidates are advised to use graphs for better understanding of the topic.

**Example:**

i.




b) lactic acid production will be the highest.

ii. The breathing rate of the individual is high at point P because due to hard work carbondioxide from atmosphere rushes inside. Human breathe 30-40 times during hard work per minute.

**Question 1b**

State any TWO causes of stone formation in human kidneys.

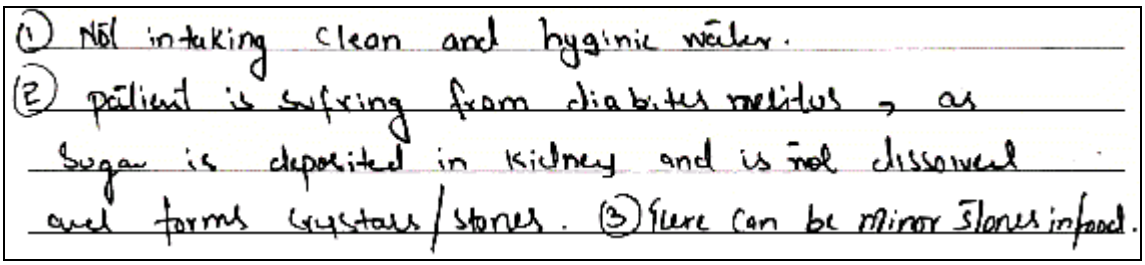
*Better responses* stated the causes of kidney stones as diet (containing more green vegetables/ salts/ vitamin C and D)/ calcium oxalate crystal formation/ uric acid accumulation/ cysteine accumulation/ recurring urinary tract infections/ alcohol consumption/ age/ less consumption of water.

**Example:**

When concentrated urine is formed, the salts crystals of many salts are formed i.e ammoniumphosphate and calciumoxalate. these crystals cannot pass and form hard deposits called kidney stones. Moreover, the kidney stone formation causes can be because using urinary tract infection, diet (having more green vegetables, vitamin C and D) and age also can be because

*Weaker responses* provided incorrect and inappropriate reasons of stone formation in human kidneys such as 'material that cannot pass through urine cause kidney stones/ when drinking water is not filtered/ hypertension/ diabetes/ use of pain killers/ accumulation of ions/ high glucose concentration in urine/ drinking tap water'.

**Example:**




**Question 2a:**

A biology student draws a diagram of the human heart while standing in the laboratory.

Complete the given table by identifying the parts of the student's brain against the functions performed during the activity.

| S. No. | Function | Part of brain |
|---|---|---|
| 1 | It coordinates the movement of the arm for drawing and helps to keep the student in a standing position. | |
| 2 | It helps to recall the structure of the heart that the student had studied earlier to complete the drawing. | |

*Better responses* correctly identified cerebellum/ hindbrain and cerebrum/ forebrain.

**Example:**

| S. No. | Function | Part of Brain |
|---|---|---|
| i | It coordinates the movement of the arm for drawing and helps to keep the student in a standing position. | Cerebellum |
| ii | It helps to recall the structure of the heart that the student had studied earlier to complete the drawing. | Cerebrum |

*Weaker responses* failed to identify the correct part of brain involved in the mentioned activity. Such responses identified thalamus, medulla, hypothalamus etc. Some of the responses

mentioned more than one part of brain including the correct response. Candidates are advised to be more specific while answering the questions.

**Example:**

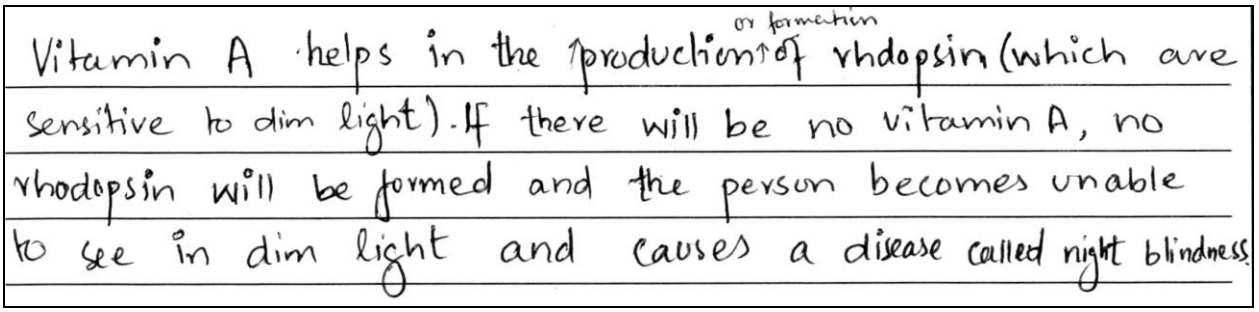
| S. No. | Function | Part of Brain |
|---|---|---|
| i | It coordinates the movement of the arm for drawing and helps to keep the student in a standing position. | Thalamus |
| ii | It helps to recall the structure of the heart that the student had studied earlier to complete the drawing. | Hypothalamus |

**Question 2b**

Describe the effect of vitamin A deficiency with reference to the pigment involved in human vision.

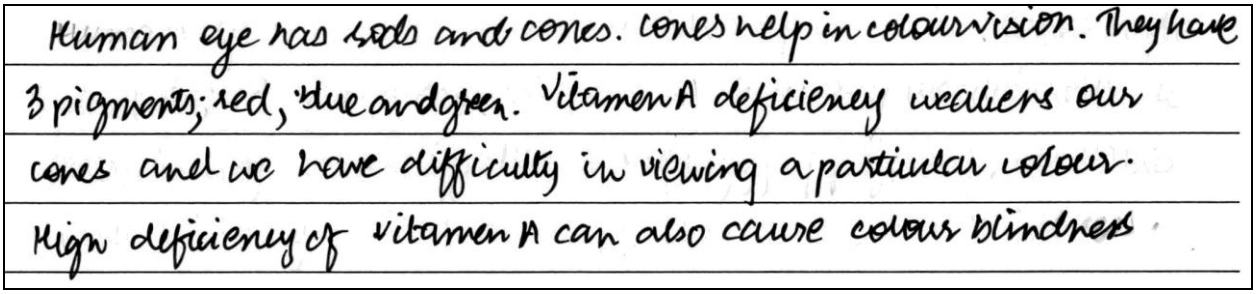
*Better responses* described that the deficiency of vitamin A causes night blindness/ poor night vision because the human body synthesises rhodopsin from Vitamin A, which is responsible for vision during night.

**Example:**




*Weaker responses* mostly swapped the concepts of rhodopsin and iodopsin. Some of the responses described the types of cones present in eye, process of reflection and refraction of light through different parts of eye, light blindness. Other responses stated irrelevant answers, e.g. deficiency causes myopia and hypermetropia/ aqueous humor and vitreous humor pass light to retina. In a few low scoring responses, candidates mentioned the effect of deficiency of vitamin A, but were unable to describe it properly. Candidates must be able to differentiate between demands of different command words, such as state and describe.

**Example:**


Human eye has rods and cones. cones help in colour vision. They have 3 pigments; red, blue and green. Vitamen A deficieney weakens our cones and we have difficulty in viewing a particular colour. High deficieney of vitamen A can also cause colour blindness

**Question 3a:**

| | | | |
|---|---|---|---|
| rib cage | skull | pectoral girdle | vertebral |

Fill in the given table by categorising the given parts of the human skeleton as axial or appendicular.

| Axial Skeleton | Appendicular Skeleton |
|---|---|
| | |
| | |
| | |

*Better responses* categorised rib cage, skull and vertebral column as parts of axial skeleton while pectoral girdle as the part of appendicular skeleton.

**Example:**

| Axial Skeleton | Appendicular Skeleton |
|---|---|
| Rib cage | Pectoral Girdle. |
| Skull | |
| Vertebral Column | |

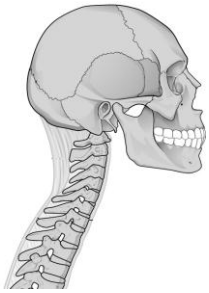
*Weaker responses* either erroneously categorised the parts of axial and appendicular skeleton or did not complete the answer.

**Example:**

| | |
|---|---|
| Skull. | Rib cage. |
| pectoral Girdle. | Vertebral column. |
| | |

**Question 3b:**

**Stimulus/ Stem:** The given diagram shows some parts of human skeleton.

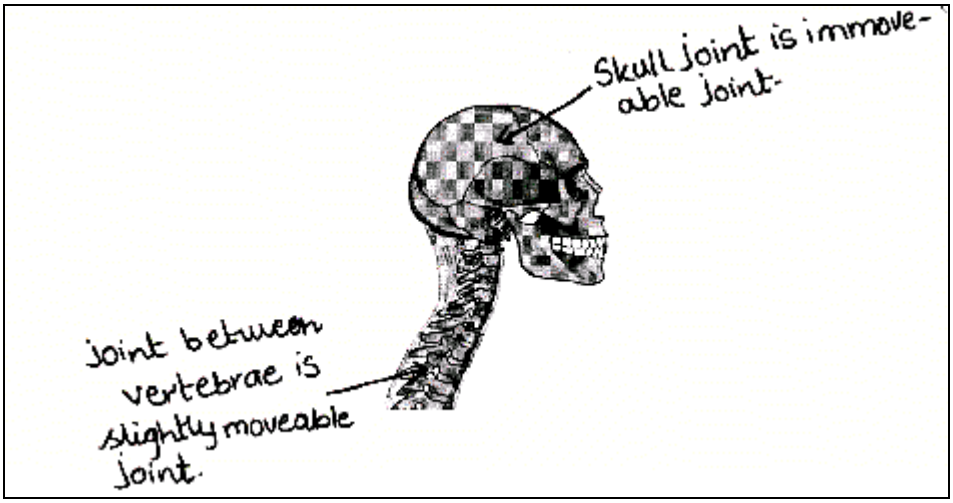


**Lead-in:**

Locate and label any ONE slightly moveable and ONE immoveable joint on the given diagram.

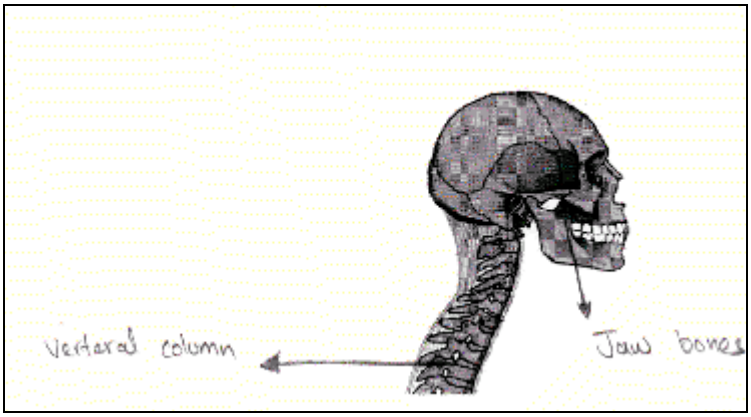
*Better responses* differentiated well between slightly moveable and immoveable joints. Such responses located and labeled slightly moveable joint in neck region or in vertebrae/ lower jaw and immoveable joint in skull.

**Example:**




*Weaker responses* located the joints but were unable to label them correctly. Some of the responses labeled slightly moveable joints instead of immoveable joints and vice versa. A few responses labeled both types of joints on a single point on the diagram.

**Example:**



**Question 4a:**

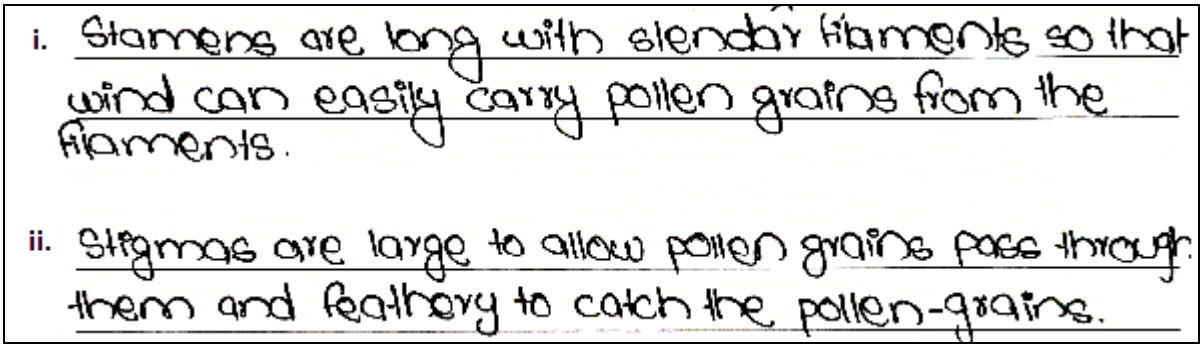
How are following adaptive features advantageous for a wind pollinated flower?

i. Stamens are long with slender filaments:

ii. Stigmas are large and feathery:

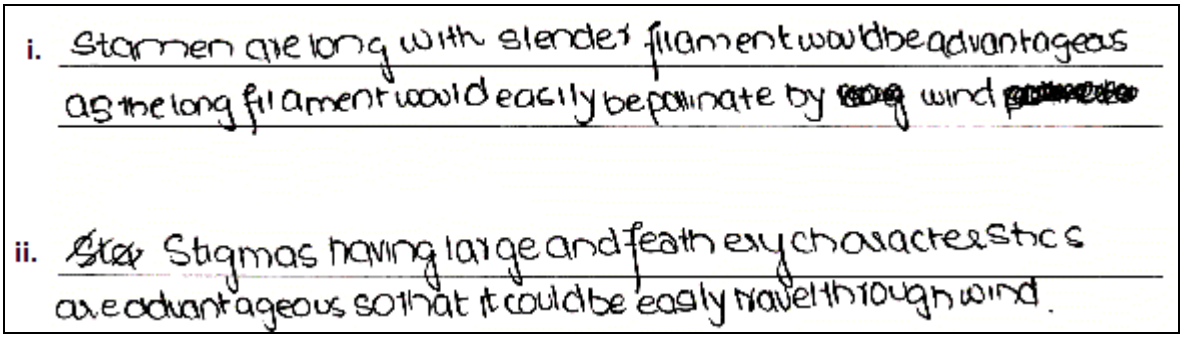
*Better responses* wrote that 'due to the presence of long stamens with slender filaments wind pollinated flowers can be easily swayed in the wind/ pollen grains can be easily shaken out from the anther. While large and feathery stigmas provide a large surface area to catch pollen/ more number of pollen grains stick to the stigma'.

**Example:**




*Weaker responses* mostly elaborated structural features of flower mentioned in the given question. Such responses overlooked the key point of the question, i.e. 'adaptive features' and thus gave irrelevant answers. Candidates are advised to focus on the demand of the question before drafting their answer.

**Example:**



**Question 4b:**

The given table represents the data collected during a field trip to a terrestrial ecosystem.

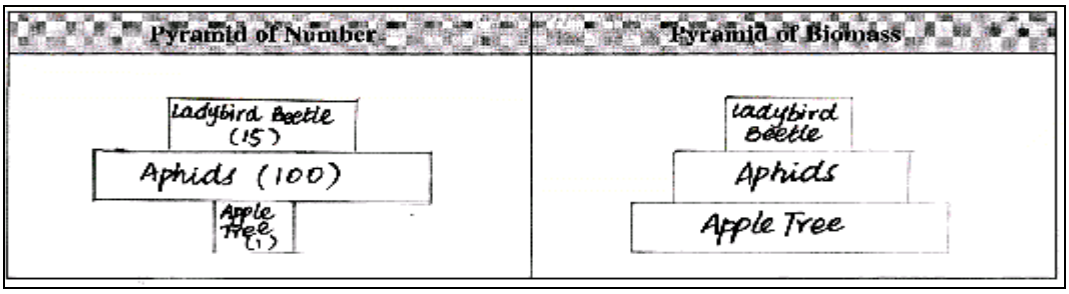
| Species | Number of Individuals |
|---|---|
| Ladybird Beetle | 15 |
| Aphids | 100 |
| Apple Tree | 1 |

**Lead-in:** Construct pyramids of number and biomass using the given information.

| Pyramid of Number | Pyramid of Biomass |
|---|---|
| | |

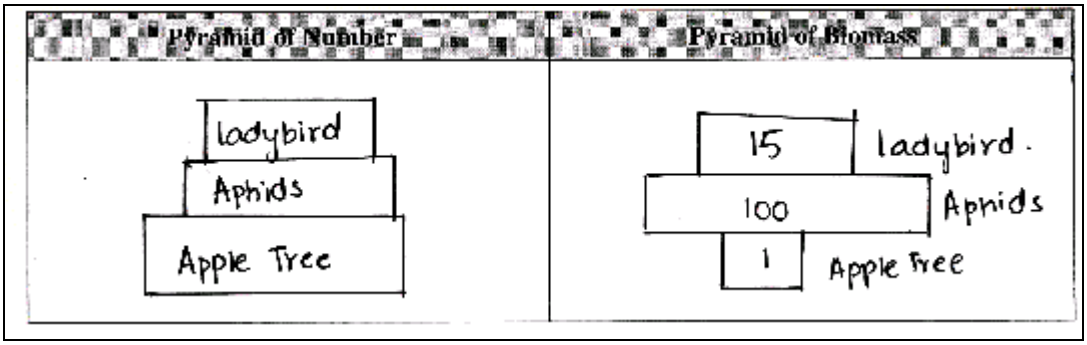
*Better responses* demonstrated candidates' ability to apply their understanding of pyramid of number and biomass in different situations.

**Example:**




*Weaker responses* were unable to construct the pyramids correctly. Such responses either swapped the pyramids or drew different shapes. Candidates are advised to practice the construction of variety of unseen food chains and food webs in order to have a command over the concept.

**Example:**




**Question 5a:**

A template strand of DNA is shown.

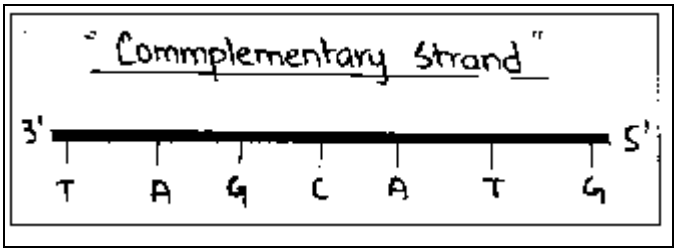
5′ 3′

A T C G T A C

Draw the complementary strand of the given template.

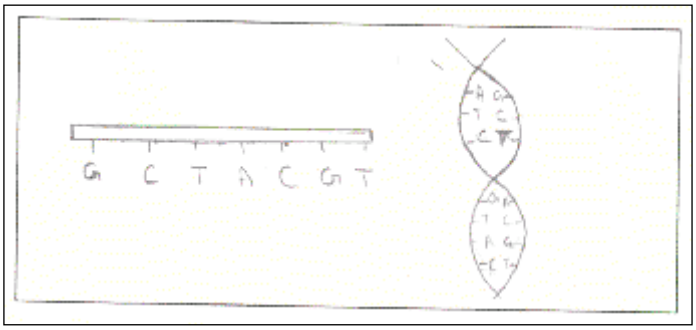
*Better responses* drew the antiparallel complementary strand with correct pairing of nitrogenous bases and labeled ends.

**Example:**



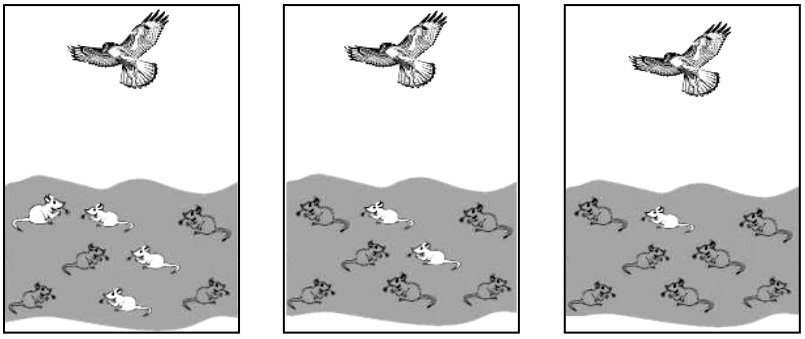

*Weaker responses* depicted candidates' lack of understanding of the structure of DNA. Such responses drew the correct nucleotides of the complementary DNA, but failed to label the ends correctly. Some other responses exhibited rote-learned concept of structure of DNA as they drew a complete new strand of DNA.

**Example:**



**Question 5b:**

The given diagrams show the comparative population of mice of two different colours over three generations with their predator.

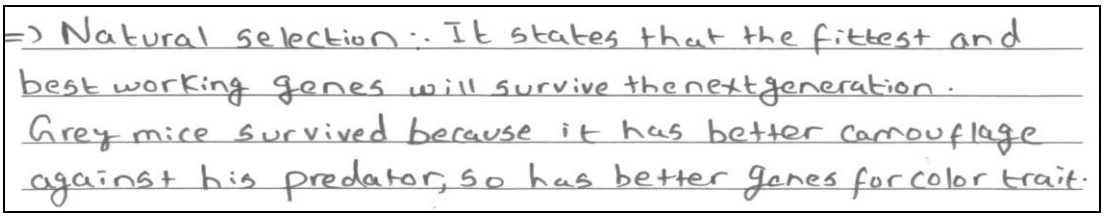


**Generation I** **Generation II** **Generation III**

Describe the phenomenon responsible for the survival of grey mice.

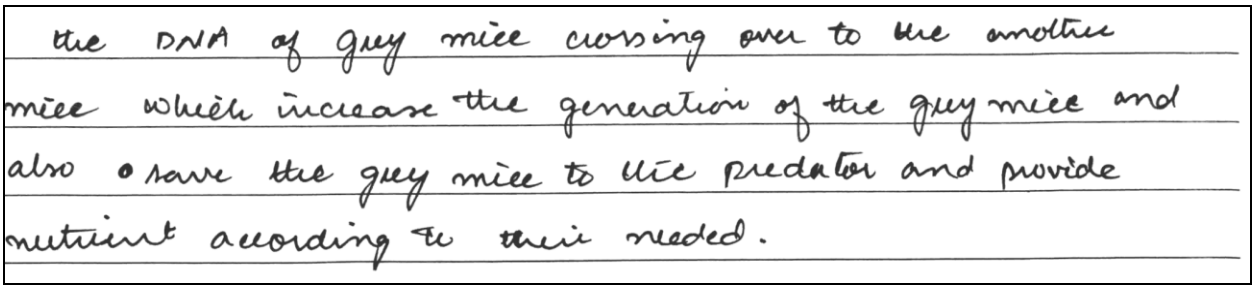
*Better responses* revealed the candidates' understanding of the concept of natural selection. Such responses first identified the phenomenon as natural selection/ survival of the fittest/ adaption with the environment, then described the identified phenomenon precisely.

**Example:**




*Weaker responses* failed to understand the given stimulus. Some responses identified the phenomenon correctly but were unable to describe and relate it with linked concepts. Other responses gave incomplete or irrelevant descriptions, e.g. because of mutualism, grey mice will survive/ predator attacks on white mice/ predator checks the population of prey.

**Example:**

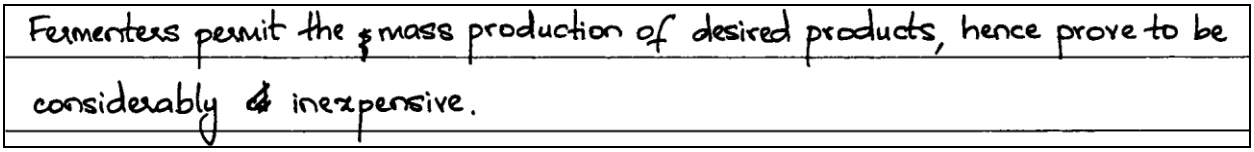



**Question 6a:**

Mention an advantage of using fermenters in industries.

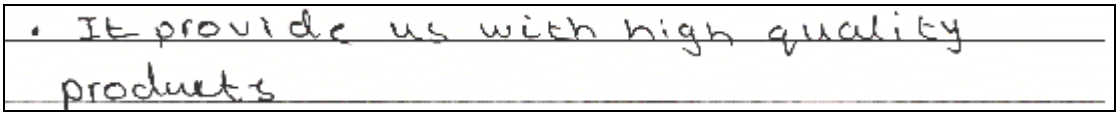
*Better responses* focused on the demand of the question. Such responses mentioned the advantages of fermenters as fermenter provides controlled and monitored environment for any biotechnological process/ optimises the growth of the organisms by controlling nutrients, oxygen, pH and temperature/ fermenter may hold several thousand litres of the growth medium/ allow the production of material in bulk quantities/ large amounts of dairy products/ hormones are produced/ the use of fermenters makes the process inexpensive/ the process is profitable.

**Example:**




*Weaker responses* were unable to differentiate between functions of fermenters and their advantages. Such responses drafted that fermentation produces many useful products such as bread and yogurt/ provides high quality products/ used in leather tanning, making of plastic and rubber/ fermenters ferment yeast and bacteria/ makes food delicious and nutritious.

**Example:**

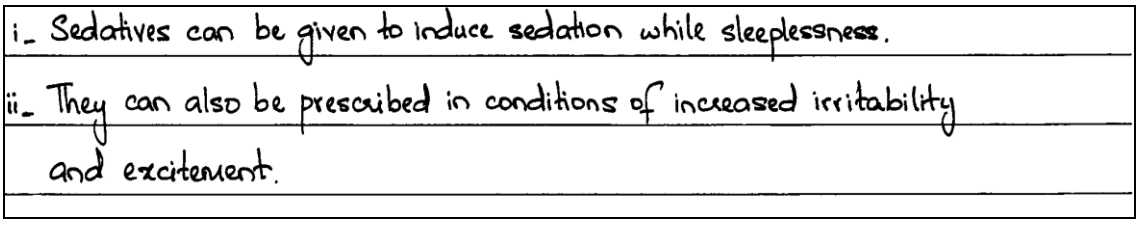



**Question 6b:**

State any TWO conditions for which sedatives are prescribed by a doctor.

*Better responses* stated that sedatives are prescribed by a doctor when a person is suffering with severe pain/ to relieve pain/ when a person is experiencing high level of anxiety/ to decrease anxiety/ when a person is suffering with insomnia/ to promote sleep/ when a person is experiencing fits or convulsions/ suffering from epilepsy/ when a person is experiencing irritability/ excitement.

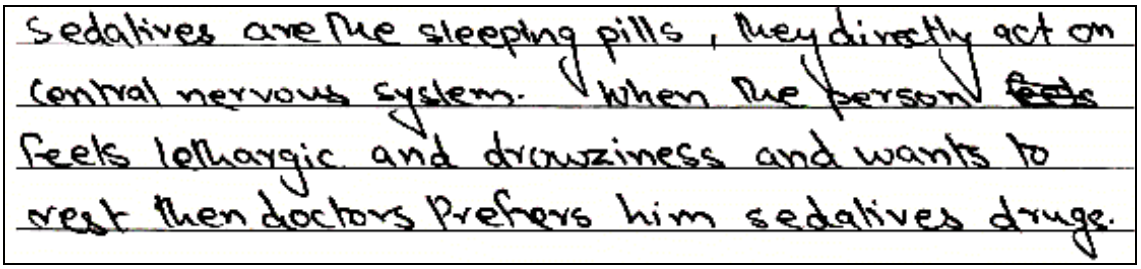
**Example:**




*Weaker responses* mostly stated the side effects of sedatives such as sedatives slow down brain functioning, cause lethargy, make the person dull and inactive, cause dizziness and unconsciousness.

Other responses were completely irrelevant; e. g. sedatives are given if a person is addicted to drugs, if a person consumes more alcohol, causes inflammation in urinary tract and respiratory tract.

**Example:**


Sedatives are the sleeping pills, they directly act on central nervous system. When the person feels lethargic and drowziness and wants to rest then doctors prefers him sedatives druge.

**Question 6c:**

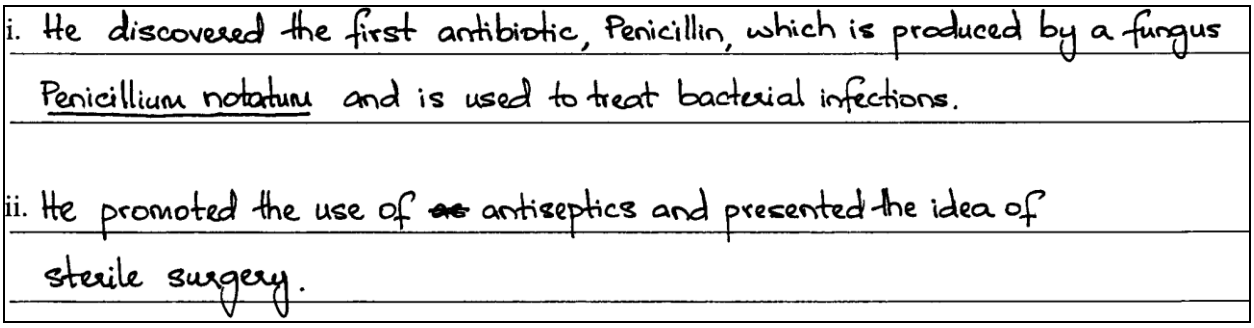
State the contribution of the following scientists in the field of pharmacology.

i. Alexander Fleming
ii. Joseph Lister

*Better responses* presented well-articuated contributions of Alexander Fleming and Joseph Lister.

Such responses stated the contribution of Alexander Fleming as the discovery of antibiotic penicillin and the contribution of Joseph Lister as the promotion of the idea of sterile surgery for the first time/ he introduced carbolic acid/ antiseptics to sterilise surgical instruments and to clean wounds.

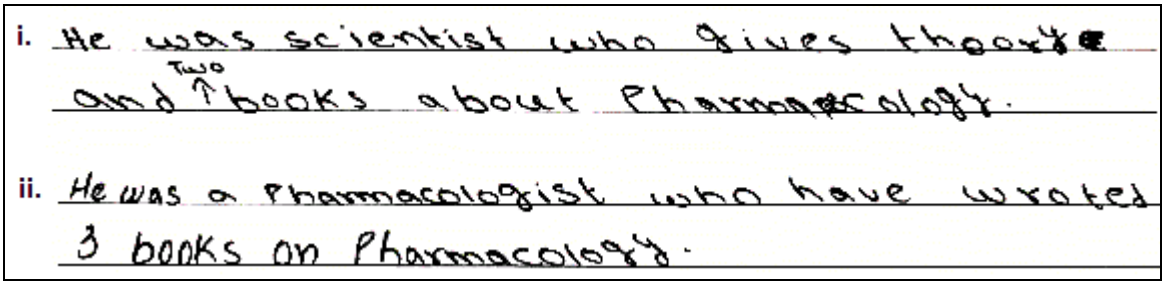
**Example:**


i. He discovered the first antibiotic, Penicillin, which is produced by a fungus Penicillium notatum and is used to treat bacterial infections.

ii. He promoted the use of ~~as~~ antiseptics and presented the idea of sterile surgery.

*Weaker responses* wrote incorrect statements such as Alexander Fleming wrote a book on medicinal drugs/ introduced the concept of vaccination/ discovered vaccine while Joseph Lister wrote a book on antibiotics/ introduced pharmaceutical drugs/ discovered antibiotics.
A few responses rephrased the question in their answers without much added value; such as, Alexander Fleming and Joseph Lister contributed in pharmacology.

**Example:**



## Extended Response Questions (ERQs)

The following questions (7 and 8) offered a choice between part **a** and **b**.

In question 7 most candidates chose to attempt part 'a'. This shows their interest and strong understanding of 'respiratory system of human beings.' On the contrary, in question 8, almost equal number of candidates attempted each part.

**Question 7a:**

i. Mention any ONE function of hair present in the nasal cavity.

ii. Describe the structure and function of the following parts of the human respiratory system.

I. Larynx
II. Trachea
III. Alveoli

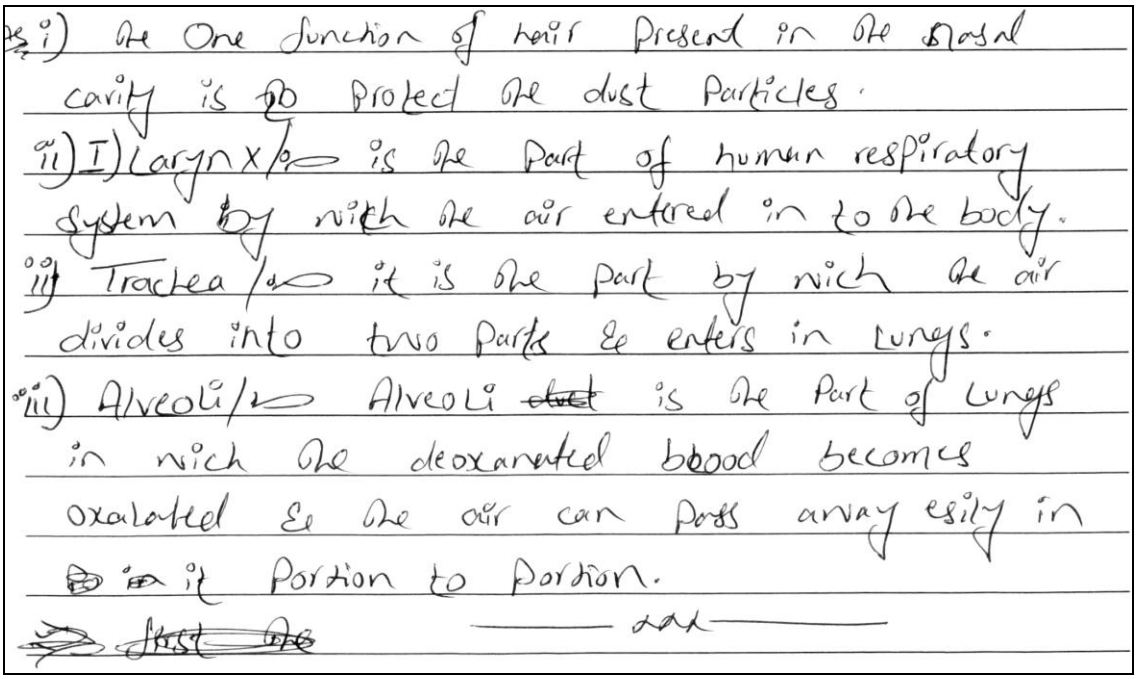
*Better responses* described the structure and function of each of the given part of respiratory tract of human beings along with the function of hair present in the nasal cavity.

**Example:**

i. In human and other higher animal, gaseous exchange occur through respiratory system. It is divide into two part. the air passageway and the lung. The Nose ~~are~~ enclose the nasal cavity. It open to outside through the opening called nostril. The nasal cavity is divided in to two portion. Each portion is line by Fine hair and mucus. "The ~~hair~~ trap dust particle and mucus moisten the air." ii. **Larynx**: Larynx is a box made of Cartilage. It is present between pharynx and trachea. It is also called voice box. Two pair of fibrous band called vocal cord are stretched across the Larynx. the vocal cord vibrate, when air pass through them. This vibration produce Sound. **Trachea**: Larynx continue to trachea which is also called wind pipe. It is about 12 cm long tube, which lies infront of Oesophagus. The wall of trachea have Cartilanegeous ring. It Keep the trachea from collapsing even if there is no air. The trachea and bronchi consist of Ciliated and glandular cell. The glandular Secrete mucus which trap dust particle and moisten air. The Cilia beat an upward motion so that all the dust and mucus could caught out or Swallow. on entring the chest cavity, the trachea divided in to two fine tube called bronchi. The bronchioles continously loose cartilage as they become narrow and end as fine tube called alveolar duct. The alveoli duct open into cluster of poches called **alveoli**. Alveoli form respiratory Surface in body. It is Single-cell thick, richly Supplied by blood Capillaries for quick transportation. The wall of alveoli ~~are~~ is covered by layer of water to dissolve gas. Million of alveoli provide large Surface area for gaseous exchange.

*Weaker responses* mostly drafted irrelevant description of structure and function of the given parts of the respiratory tract such as larynx is a part of respiratory system/ it starts from nose and ends in lungs/ it protects esophagus/ it helps to respire/ it contracts and relaxes during inhalation and exhalation. Trachea is the pipe like structure that passes food/ flap of connective tissue which produces sound. Alveoli are made up of cartilage that contains vocal cords/ alveoli protect lungs from damage/ maintain blood in lungs.

**Example:**


i) The One function of hair present in the nasal cavity is to protect the dust particles.
ii) I) Larynx/ is the part of human respiratory system by with the air entered in to the body.
iii) Trachea/ it is the part by with the air divides into two parts & enters in Lungs.
iii) Alveoli/ Alveoli ~~duct~~ is the part of Lungs in with the deoxanated blood becomes oxalated & the air can pass away esily in it portion to portion.

**Question 7b**

Pancreas acts both as endocrine and exocrine gland.

With reference to the endocrine nature of pancreas mention

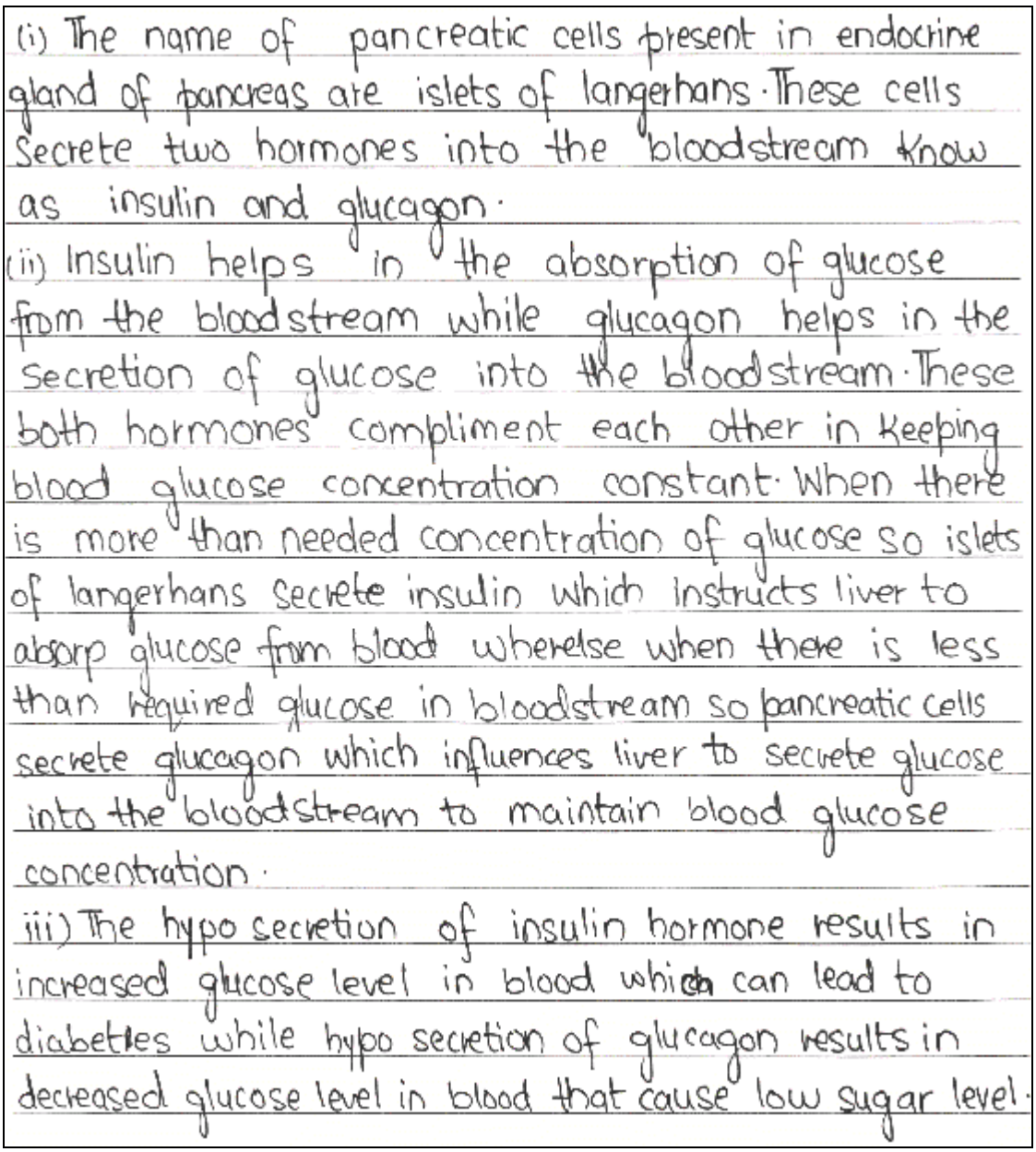
i. the names of pancreatic cells and the hormones they produce.

ii. any ONE way in which each of these hormones maintains the blood glucose concentration.

iii. any ONE effect of hypo secretion of each hormone on the body.

*Better responses* displayed a clear understanding of the functions of insulin and glucagon. Such responses named the pancreatic cells as islets of Langerhans/ alpha cells and beta cells, mentioned the way of action and effect of hypo secretion of each hormone and their effect of hypo secretion on the body in a comprehensive way.

**Example:**



(i) The name of pancreatic cells present in endocrine gland of pancreas are islets of langerhans. These cells secrete two hormones into the bloodstream know as insulin and glucagon.

(ii) Insulin helps in the absorption of glucose from the bloodstream while glucagon helps in the secretion of glucose into the bloodstream. These both hormones compliment each other in keeping blood glucose concentration constant. When there is more than needed concentration of glucose so islets of langerhans secrete insulin which instructs liver to absorp glucose from blood wherelse when there is less than required glucose in bloodstream so pancreatic cells secrete glucagon which influences liver to secrete glucose into the bloodstream to maintain blood glucose concentration.

iii) The hypo secretion of insulin hormone results in increased glucose level in blood which can lead to diabetes while hypo secretion of glucagon results in decreased glucose level in blood that cause low sugar level.

*Weaker responses* mostly gave generalised answers, e.g. insulin decreases blood sugar level and glucagon increases blood sugar level/ insulin releases when blood sugar level increases, and glucagon releases when sugar level decreases. Some of the responses described the structure and function of other glands such as hypothalamus/ pituitary gland. Other responses strived hard to describe the function of pancreas relating with negative feedback mechanism but failed to meet the demand of the question. While mentioning the effect of hypo secretion of hormones, a few responses revealed candidates' confusion about the concepts of diabetes mellitus and diabetes insipidus.

Teachers are advised to use flowcharts for teaching this topic and link the function of pancreas with feedback mechanism for better understanding of the topic. This will enable students to develop conceptual linkage/ between/ among different SLOs.

**Example:**

b)(i) The cells are Les De Mangelis and they produce the harmones 'Glygocen' and 'Insulin'. Both of these harmones help in the maintenance of the Glucose concentration in blood.

(ii) When there is a low concentration of Glucose in the Blood, harmone Glycogen is secreted from the pancreatic cells directly into the Blood stream. (Because no Cappillaries are present). In this way the concentration of Glucose is maintained in the blood. When there is high concentration of Glucose in the Blood, pancreas Secrete insulin in the blood. When insulin is secreted the concentration of glucose is normalized. In this way, high level glucose is maintained to normal.

(iii) If excessive amount of Glycogen is secreted, the amount of glucose rises and cause diabetis mellitus. ~~In~~ This causes shivering in the body due to high energy and sugar level. If excessive amount of Insulin is secreted, the concentration of the sugar (glucose) goes down. This ~~may~~ causes drowsiness and weakness in a human body due to less energy.

**Question 8a:**

Two types of reproduction are shown in the given diagrams.

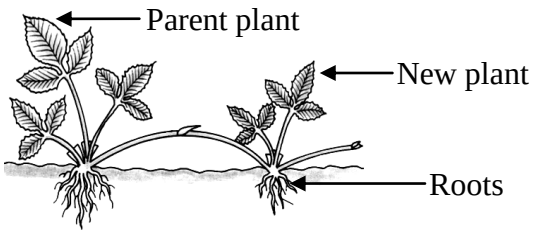



**Diagram I**

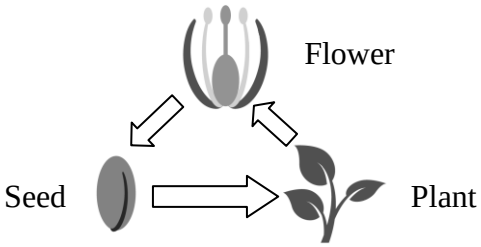



**Diagram II**

i. Name both types of reproduction.

ii. Describe any FOUR advantages and TWO disadvantages of the type of reproduction shown in **Diagram I**.

*Better responses* reflected a sound understanding of the types of reproduction. Such responses correctly identified both types of reproduction. Moreover, they described the advantages and disadvantages of asexual reproduction.

**Example:**

i: Diagram I: Asexual reproduction (vegetative propagation)
Diagram II: Sexual reproduction

ii: Advantages of asexual reproduction (veg. prop.)

1: Off-springs are the exact copies of their parents without any variation, so beneficial characteristics can be passed as such.

2: No mechanism for pollination is needed, hence dependence on wind, water, insects is low.

3: No fusion of male and female gametes (fertilization) occurs. This leads to low chance of genetic mutations.

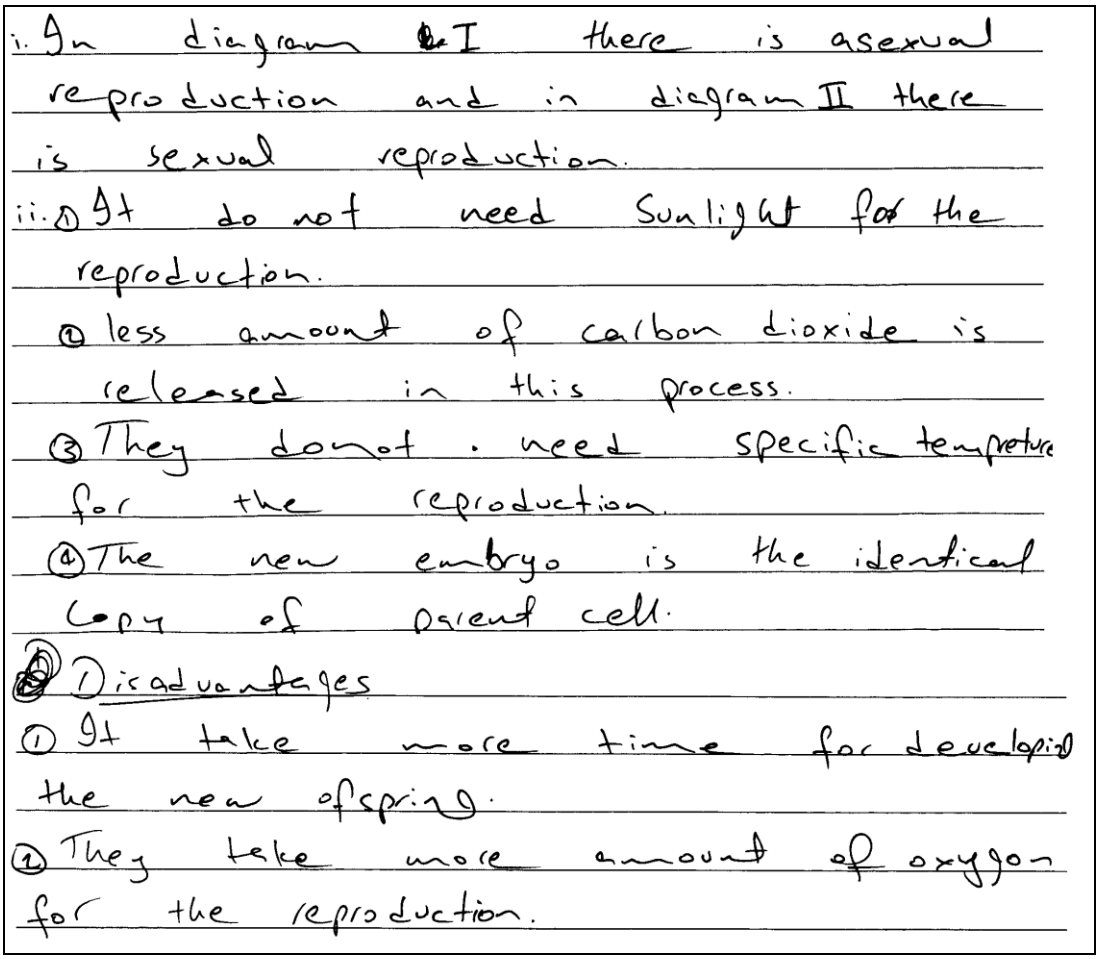
4: A large number of similar plants can be grown in a short span of time which is not possible in sexual reproduction.

Disadvantages of asexual reproduction (veg. prop.):

1: As no variation takes place so any disease in parent plant would be passed as such in all offsprings and will affect all of them. 2: If any environmental hazard such a virus attacks, the whole crop would be damaged and not even a single plant would have resistance. 3: As all plants are identical and have same requirements so this causes overcrowding and not all plants are satisfi

*Weaker responses* demonstrated candidates' lack of understanding of the topic of reproduction and its types. Such responses either described sexual and asexual reproduction or swapped both the concepts. The types of reproduction shown in diagram I and II were incorrectly identified as double fertilisation/ self-pollination and wind pollination/ germination of seeds/ cross-pollination respectively. Such responses described the processes of asexual and sexual reproduction instead of their advantages and disadvantages. Some other responses drafted irrelevant points in advantages such as new plant is healthy and strong/ new pant give us more oxygen/ species are preserved/ easily take water because of their long roots and disadvantages as new plant get nutrients of parent plant/ new plant is small.

**Example:**


i. In diagram I there is asexual reproduction and in diagram II there is sexual reproduction.

ii. ① It do not need Sunlight for the reproduction.

② less amount of carbon dioxide is released in this process.

③ They donot need specific temprature for the reproduction.

④ The new embryo is the identical Copy of parent cell.

① disadvantages

① It take more time for developing the new ofspring.

② They take more amount of oxygen for the reproduction.

**Question 8b:**

A man with blood group A marries a woman with blood group B. Two of their children have blood group O, one has blood group B and one has blood group AB.

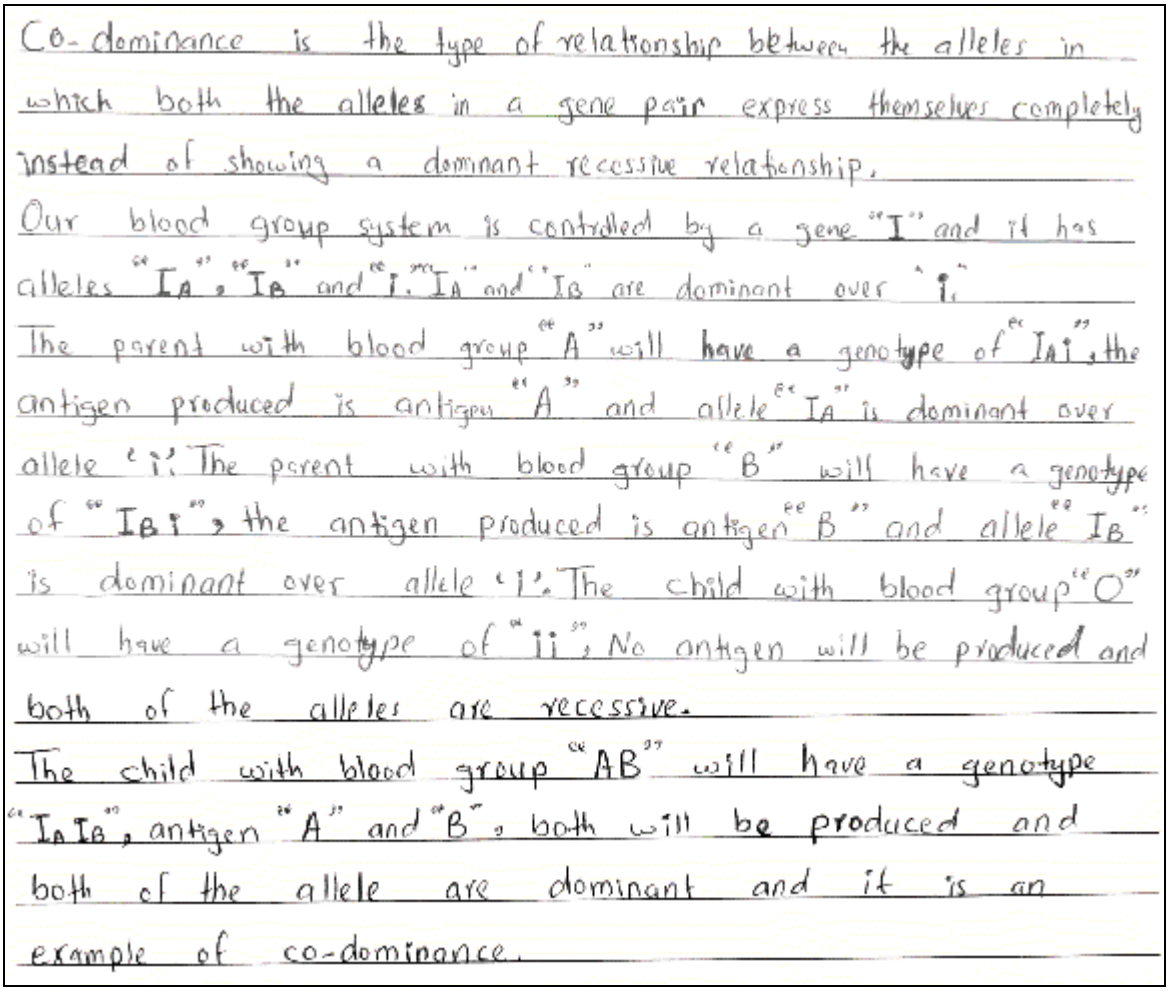
i. Define co-dominance.

ii. Referring to the given statement, describe the genotype, antigen produced and the relationship between alleles.

*Better responses* defined co-dominance as a situation where two different alleles of a gene pair express themselves completely, instead of showing a dominant recessive relationship.

Moreover, such responses provided a complete description of the question including genotype, antigen produced and the relationship between alleles, which reflected grasp over the concept of dominance and its types.

**Example:**


Co-dominance is the type of relationship between the alleles in which both the alleles in a gene pair express themselves completely instead of showing a dominant recessive relationship.
Our blood group system is controlled by a gene "I" and it has alleles "$I_A$", "$I_B$" and "i". "$I_A$" and "$I_B$" are dominant over "i".
The parent with blood group "A" will have a genotype of "$I_A i$", the antigen produced is antigen "A" and allele "$I_A$" is dominant over allele 'i'. The parent with blood group "B" will have a genotype of "$I_B i$", the antigen produced is antigen "B" and allele "$I_B$" is dominant over allele 'i'. The child with blood group "O" will have a genotype of "ii", No antigen will be produced and both of the alleles are recessive.
The child with blood group "AB" will have a genotype "$I_A I_B$", antigen "A" and "B", both will be produced and both of the allele are dominant and it is an example of co-dominance.

*Weaker responses* described the compatibility of blood transfusion, e.g. an individual with blood group A can receive blood from an individual with blood group O/ an individual with blood group B cannot donate blood to an individual with blood group O/ an individual with blood group B can receive blood from all types of blood groups. Other responses described the terms homozygous and heterozygous/ dominant and recessive.

Some of the responses were unable to relate the given stimulus with the question in order to get the correct answer. Such responses described the terms present in the question, i.e. antigens are substances that stimulate the immune system to produce antibodies/ genotype is the genetic makeup of the cell.

Some other responses determined the genotypes of offspring using the phenotypes mentioned in the stimulus. Such as 25% offspring have blood group B, 25% have blood group AB and 50% have blood group O. A few showed the given cross in the form of a Punnet square.

**Example:**

Co-dominance means transfer of combination of mother's and father's blood group to offspring

The two childrens with blood group O are different from parent. The children with blood group AB is the example of co-dominance. 50% chances are that child can blood can be co-dominant. The children with blood B is reccessive. 25% chances are that child blood group can be reccessive and 25% chances are of dominant.

In blood group O there is only antigen O and in blood group B there is antigen B, O and in blood group AB there is antigen A, B, O. The child having blood group B have reccessive Allele. The child having blood group AB have co-dominant Allele. The child having blood group O have dominant Allele ~~[illegible]~~ if any parent have 3 childs so the 4 child blood group can be estimated by the help of Allele.