

## **Aga Khan University Examination Board**

### **Notes from E-Marking Centre on SSC II Biology Examination April/ May 2019**

#### **Introduction**

This document has been prepared for the teachers and candidates of Secondary School Certificate (SSC) Part II (Class X) Biology. It contains comments on candidates' responses to the 2019 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 mostly failed to understand the demand of the question; often misinterpreting the command word and the stimulus. Furthermore, understanding the 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.

- Interpretation of the pyramid of number
- Structure and function of human nephron
- Sources of variations and continuous and discontinuous variations

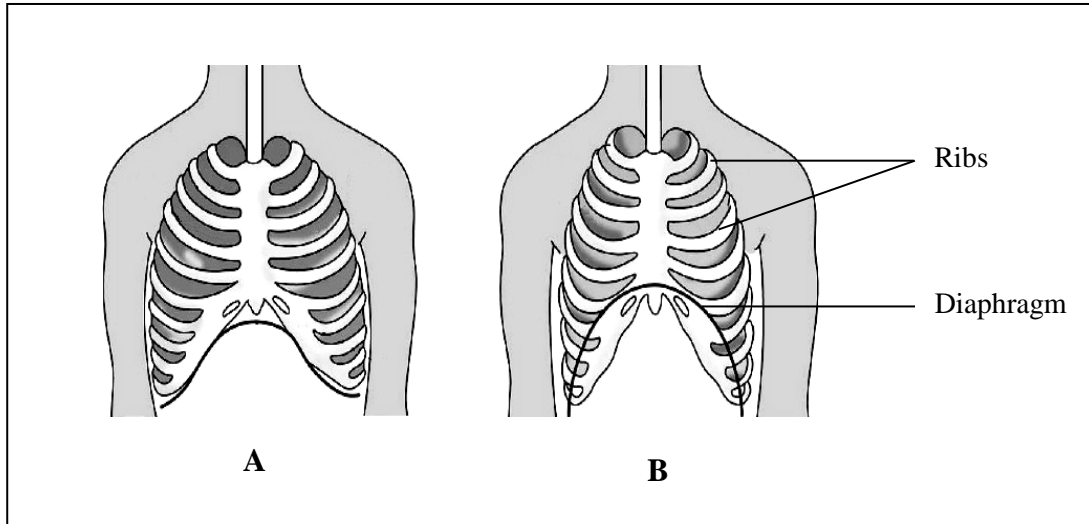
However, candidates outshined in some topics, such as, the concepts of function of adrenaline, breathing mechanism and structure of hinge joint.

**Detailed Comments:**

**Constructed Response Questions (CRQs)**

**Question 1a:**

The two steps of breathing are shown in the given diagrams.



Which of the given diagrams, A or B, shows the process of exhalation? Support your answer with a reason.

*Better responses* correctly identified the diagram and supported the identification with valid reason(s). Such responses extracted reasons from the diagram which included lower position of ribs, dome shape of diaphragm and decreased volume of thorax. Moreover, some other credits worthy reasons were relaxation of external intercostal muscles and contraction of internal intercostal muscles and upward movement of ribs.

**Example:**

diagram 'B' shows the process of exhalation because the volume of lungs and thorax decreases in 'B' and the diaphragm also become its original dome shape, ribs cage also pull inward which is only <sup>seen</sup> in exhalation.

*Weaker responses* were unable to comprehend the diagrammatic presentation of the process of exhalation; therefore, failed to identify correctly. However, some of these responses identified the process correctly but were unable to provide a valid reason. Most of these candidates showed confusion in the condition of diaphragm during exhalation. Candidates were not able to relate the shape of diaphragm with its contraction and relaxation. Similarly, few of these responses incorrectly identified the process, drafted a memorised description of process of exhalation. Candidates are highly recommended to make a habit of learning through diagrams.

**Example:**

Part A Shows the Process of exhalation Because in Part A Ribs are Opening & the Diaphragm Out ways and in Part B Ribs are Contracting & Stretching & Diaphragm is Pushing towards Inside.

**Question 1b:**

Describe the effects of cigarette smoking on the inner walls of trachea of human beings.

*Better responses* depicted a sound comprehension of the demand of the question. Such responses mentioned the effect, which is the destruction of cilia present on the inner wall of trachea. Furthermore, the mentioned effect is described as, due to the reduced number of cilia, mucus is not swept away from the air passages causing clogging of mucous in the trachea. Moreover, few responses also mentioned the production of mucous in large amount due to the irritation of the mucous secreting cells by smoke.

**Example:**

Cigarette smoking can damage the inner walls of trachea in a way that its constituents can damage the cilia present there, which can cause difficulty in performing the function of filtering the air. Furthermore carcinogens present in cigarette can also cause cancer of trachea.

*Weaker responses* overlooked the key terms of the question, thus, were unable to fulfill the demand of the question. Majority of the responses provided incomplete answers. Such responses mentioned the generalised effect like the destruction of respiratory tract and improper functioning of trachea. Furthermore, these responses failed to provide the description of the effect. Therefore, such responses were not credited full marks. Candidates are advised to read the question carefully to understand the demand of the question.

**Example:**

- It could not work properly ~~and~~ <sup>to</sup> filter the gas. ✓  
- It will develop a infection

**Question 2a:**

Mention any TWO ways through which heat is lost from the human body.

*Better responses* exhibited clear understanding of the mechanism of thermoregulation. Such responses mentioned vasodilation/ evaporation of sweat from skin/ radiation and convection from skin/ exhalation and excretion.

**Example:**

1) Heat is lost by sweating. When sweat evaporates using latent heat of vaporization it produces a cooling effect and heat is lost. 2) By vasodilation and contraction of blood vessels. When they dilate more heat is given to skin which is lost through radiation, convection, conduction.

*Weaker responses* mostly provided generalised answers such as loss of heat from the human body through metabolic activities and cellular respiration. Moreover, most of these responses provided the definition of thermoregulation rather than mentioning the mechanism of thermoregulation.

**Example:**

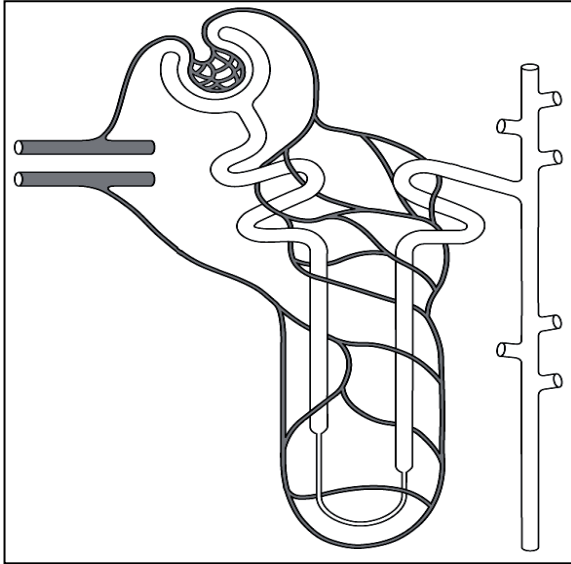
1) Heat is lost from the body when a person does metabolic activities.  
2) Heat is lost from the body through "Goosebumps" which produces a insulated blanket of warm air (heat).

**Question 2b:**

The given diagram shows the structure of a human nephron.

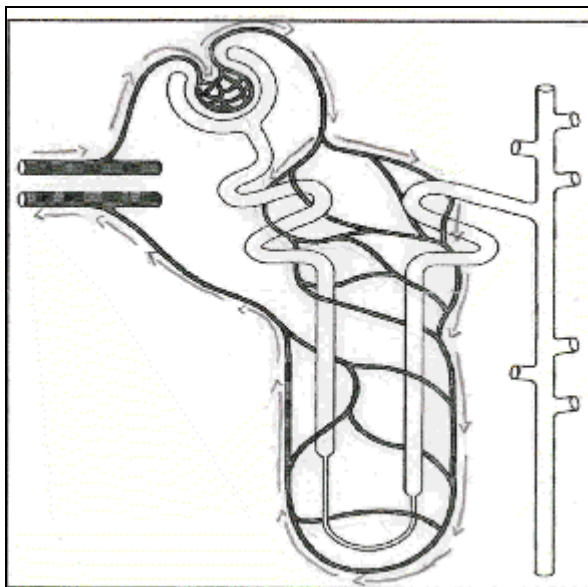
Trace the pathway of blood with the help of arrows (→) in the given diagram.

(Note: Do NOT show pathway of the filtrate.)



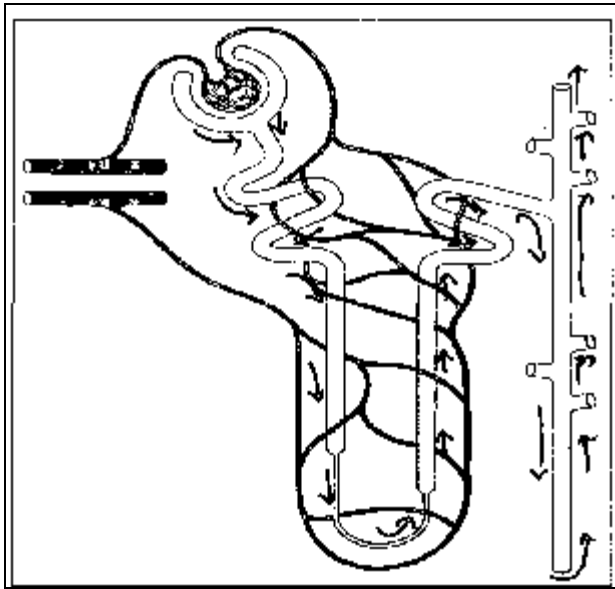
*Better responses* exhibited comprehensive understanding of direction of flow of blood in the blood vessels of nephron. Such responses traced the pathway of blood by showing the direction of blood movement from renal artery to renal vein and within blood vessels, i.e., glomerulus and peritubular capillaries. Meticulous reading of question and understanding instructions was evident from these responses.

**Example:**

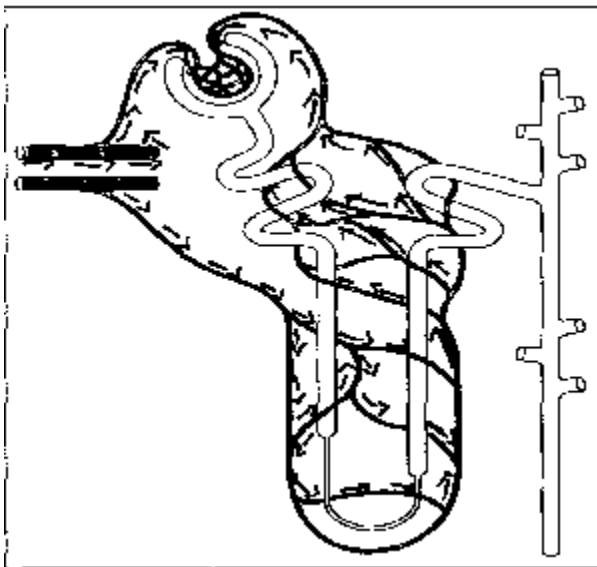


*Weaker responses* exhibited carelessness in reading instructions. Such responses showed the pathway of filtrate in the nephron. However, very few candidates who did follow the instruction were unable to trace direction of blood movement correctly. Such responses revealed a significant confusion in the difference between the flow of blood in the blood vessels and filtrate in the nephron. Moreover, candidates' weak understanding of different parts of the nephron and its associated blood capillaries was evident. In the light of these responses, candidates are advised to focus on the diagrammatic representation of concept for better understanding.

**Example 1:**

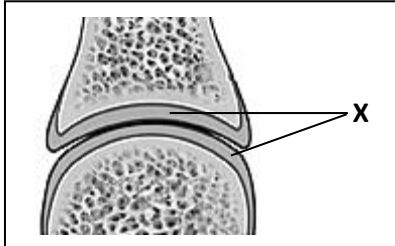


**Example 2:**



**Question 3:**

The given diagram represents a human hinge joint.



- Identify structure **X** in the given diagram.
- Name the cells that make structure **X**.
- Mention the role of structure **X** in the joint.
- Name the disease that occurs due to the degeneration of structure **X**.

*Better responses* revealed candidates' thorough knowledge and understanding of the articular cartilage of hinge joint. Such responses identified the labelled part X as cartilage and named its cells chondrocytes. Similarly, the correct function of cartilage was provided that is it provides flexibility and reduces friction in the joint. Furthermore, osteoarthritis was mentioned as the disease that occurs due to its degeneration.

**Example:**

a. Identify structure <b>X</b> in the given diagram. (1 Mark)
<u>The structure X is cartilage</u>
b. Name the cells that make structure <b>X</b> . (1 Mark)
<u>Chondrocytes are the cells which makes cartilage</u>
c. Mention the role of structure <b>X</b> in the joint. (1 Mark)
<u>It reduces friction between the bones so that joint can be move properly.</u>
d. Name the disease that occurs due to the degeneration of structure <b>X</b> . (1 Mark)
<u>The disease occurs due to degeneration of cartilage is "Osteo-Arthritis"</u>

Weaker responses mostly identified the labelled part X as ligament, therefore, provided incorrect answers to the rest of the questions. Such responses named the constituent cells as connective tissues, fibrous tissues and osteocytes. Likewise, incorrect function was given as it connects bones in the joint. Dislocation of bones and osteoporosis was mentioned.

Teachers are advised to focus on the articulation of different components of joints relating with their structure, function and composition.

### Example 1:

The structure X is ligament.	
b. Name the cells that make structure X. (1 Mark)	connective cells are used to make connective tissue which make ligament
c. Mention the role of structure X in the joint. (1 Mark)	It helps the part of body to move in (true and fro) motion. easily.
d. Name the disease that occurs due to the degeneration of structure X. (1 Mark)	displacement of bones or cracking sound.

### Example 2:

Ligament is given structure which is present between these two bones.	
b. Name the cells that make structure X. (1 Mark)	The cells that make structure X are made up of connective tissue, fibrous and elastic bands.
c. Mention the role of structure X in the joint. (1 Mark)	It prevent the dislocation of bones. It is present between two bones so it avoid contact between bones.
d. Name the disease that occurs due to the degeneration of structure X. (1 Mark)	Rheumatoid arthritis occurs due to the dislocation between these two bones.

**Question 4:**

The given table demonstrates a genetic cross between two flowers.

<b>Parents</b>	Red	×	White
<b>F1 Generation</b>	Pink		
<b>F1 x F1</b>	Pink	×	Pink
<b>F2 Generation</b>	Red	Pink	Pink

- Determine the genotype of the pink flowers produced in F1 generation.
- Identify the type of dominance in the given cross.
- Determine the phenotype and genotype of offspring flowers if two red flowers from F2 generation are crossed.

Phenotype:

Genotype:

*Better responses* exhibited effective use of the stimulus. Such responses determined the genotype of the pink flower as heterozygous/ Rr in part 'a'. In part 'b' of question, type of dominance was identified as incomplete dominance. In part 'c' of the question, phenotype and genotype was correctly mentioned as red and homozygous/ RR respectively.

**Example:**

It is heterozygous genotype because and consider letter Rr for it.

b. Identify the type of dominance in the given cross. (1 Mark)  
 The dominance is incomplete dominance in which they give a blend mixture.

c. Determine the phenotype and genotype of offspring flowers if two red flowers from F2 generation are crossed. (2 Marks)

Phenotype: all are red. RR

Genotype: Homozygous red. all. RR

Weaker responses failed to comprehend the stimulus and relate it to the question asked. Misunderstanding of the biological vocabulary, i.e. phenotype and genotype was evident. Moreover, candidates' misconception of co-dominance and incomplete dominance was apparent. In parts 'a' and 'c' of the question, most of the candidates either incorrectly determined the genotype or swapped the genotype and phenotype. Similarly, part 'b' of the question was poorly attempted. Majority of the candidates identified the type of dominance as co-dominance.

Teachers are advised to provide multiple examples of genetic diagrams so that candidates may get exposure to diverse conditions to solve.

### Example 1:

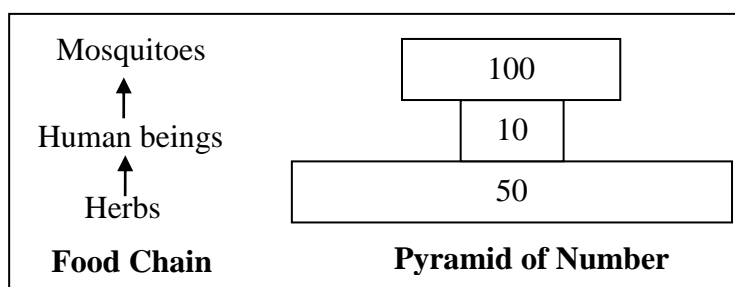
a.	Determine the genotype of the pink flowers produced in F1 generation.	(1 Mark)
The genotype of the pink flowers produced in F1 generation is dominant and recessive.		
b.	Identify the type of dominance in the given cross.	(1 Mark)
The type of dominance in the given cross is co-dominance.		
c.	Determine the phenotype and genotype of offspring flowers if two red flowers from F2 generation are crossed.	(2 Marks)
Phenotype: In the genotype the gene is combined into dominant & recessive		
Genotype: In the genotype the gene only form recessive.		

### Example 2:

a.	Determine the genotype of the pink flowers produced in F1 generation.	(1 Mark)
The genotype in f1 generation is that all the flower <del>is</del> will have pink homozygous pink colour.		
b.	Identify the type of dominance in the given cross.	(1 Mark)
the type of dominance is in the given cross is co-dominance.		
c.	Determine the phenotype and genotype of offspring flowers if two red flowers from F2 generation are crossed.	(2 Marks)
Phenotype: 50% pink colour, 25% red color & 25% white color		
Genotype: 50% homozygous pink & 50% heterozygous pink		

### Question 5a

The given diagram represents a food chain and the pyramid of number of the same food chain.



Interpret the given pyramid of number.

*Better responses* showed comprehensive understanding of the command word; therefore, they were able to apply the understanding of the concept of pyramid of number. Such responses provided appropriate comparison, elaboration and deduction of explicit and implicit points in their interpretation. For example, 10 human beings are feeding on 50 herbs/ the number of producers is more as compared to the number of primary consumers.

100 mosquitos are feeding on 10 human beings/ more mosquitos can feed on less number of human being/ number of mosquitos feeding on human being is more as compared to the number of human beings feeding on herbs.

#### Example:

A larger number of herbs is consumed by a small amount of human beings. The humans are hosts to <sup>many</sup> mosquitoes. Herbs are producers, humans are primary consumers (herbivores) and mosquitoes are secondary consumers.

*Weaker responses* struggled to understand the meaning of the command word. Moreover, candidates' misconception of pyramid of number, biomass and energy was noteworthy. Majority of the candidates described the pyramid of energy. Few other responses were unable to identify the trophic level correctly. Some candidates redrew the pyramid and restated the given information in their own words.

#### Example 1:

Pyramidal of number shows that Herbs are 50 human beings are 10 and mosquitoes are 100

**Example 2:**

Ans: Herbs are <sup>shown</sup> greater in number and human beings are <sup>shown</sup> less in number, while mosquitos are shown medium in number, not greater nor lesser in the given pyramid of number.

**Example 3:**

The given pyramid of number is representing the food chain. The pyramid of number of herbs is the primary consumer, mosquitos is the secondary consumer while the human beings are the tertiary consumers.

**Question 5b:**

Describe the effect of competition on the population of living organisms in an ecosystem.

*Better responses* correctly described the effect of competition on the population of living organisms in an ecosystem. Such as in an ecosystem, living organisms compete among each other for the utilisation of resources/ space/ food/ mate. As a result, stronger species would survive whereas, weaker ones would disappear/ become extinct. Moreover, some responses mentioned the effect of competition in keeping the biodiversity in a balanced way.

**Example 1:**

The competition among the same species and between different species maintain the balance in the ecosystem in this way that the organism or species that is fittest and best for environment will avail the resources and the species that have unfavourable condition will not avail resources and will extinct and this causes the maintenance of population of living organism and ecosystem and our environment have the best species that can survive.

**Example 2:**

Competition allows balance of ecosystem and will stop any <sup>living organisms</sup> species from getting to a very high or low number. lion feeds on zebra, if this doesn't happen, zebra will increase and lions will decrease by dying.

Weaker responses displayed candidates' poor understanding of the concept of competition in the ecosystem. In this case, such responses failed to apply their knowledge of competition in terms of ecology. However, majority of the candidates mentioned the negative impact of competition, but were unable to describe the effect. Therefore, such responses were not credited full marks. Such responses drafted generalised answers such as due to competition human population will decrease and scarcity of food will occur.

**Example:**

(2 Marks)  
The effect of competition on the population of living organisms is that if there is more competition so day by day there is population is growing it causes overpopulation more concentrations of CO<sub>2</sub> occurs and food shortage occur.

**Question 6a:**

List any THREE steps of genetic engineering.

Better responses mostly listed first three steps of genetic engineering such as isolation of genes, selection of vector and insertion of gene. Furthermore, few responses listed other steps of genetic engineering such as transfer of rDNA into host cell, growth of GMOs and expression of clone genes.

**Example:**

- 1 Isolation of the gene of interest from the <sup>total</sup> culture medium.
- 2 Transfer of gene of interest into the selected vector. (Recombinant DNA)
- 3 Transfer of Recombinant DNA into the host organism.

*Weaker responses* mostly ignored the command word used in the question. Such responses focused on general applications and objectives of genetic engineering. In such cases, candidates described the application of genetic engineering such as genetic engineering helps in making insecticides, medicines and chemical fertilisers. Breeding different plants and gene therapy was also highlighted. A general trend of vague responses was apparent such as addition of DNA, removal of DNA and synthesis of DNA.

**Example:**

1. genetic engineering ~~give~~ <sup>modify</sup> the genes.
2. genetic engineering give resistance to Insect, plant etc)
3. genetic engineering Increase the variation.

**Question 6b:**

State the primary usage of the following drugs.

- i. Tetracycline
- ii. Small pox vaccine

*Better responses* correctly stated the primary usage of tetracycline as it is used to kill bacteria/ inhibit/ prevent bacterial growth/ treat bacterial infections. Furthermore, these responses also mentioned the bacteriostatic action and inhibition of bacterial cell wall protein formation. The primary usage of small pox vaccine was stated as to prevent small pox or to develop immunity against small pox.

**Example:**

- i. Tetracycline  
Tetracycline is used to kill the bacteria, it is also prescribed by doctors during urinary tract infections.
- ii. Small pox vaccine  
It makes antibodies against the pathogens for future protection. protection and kill the antigens of pathogen

*Weaker responses* ignored the key term of the question, i.e. primary usage; hence, provided generalised and vague responses. Such responses stated the usage of tetracycline in treating all types of infections and vaccines as killing agents, to recover the body cells and defend immune system.

**Example:**

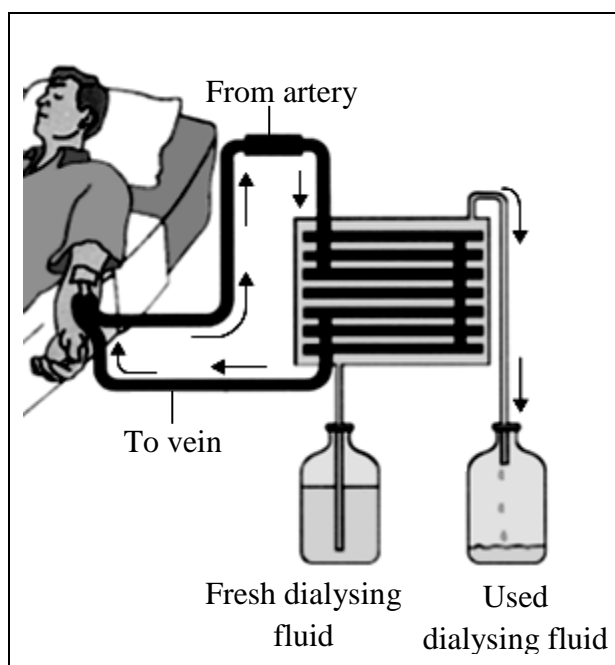
i. Tetracycline
Tetracycline helps to cure <del>agents</del> against the viruses, bacteria.
ii. Small pox vaccine
Small pox vaccine helps to defends against pathogens.

### 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 the 'process of haemodialysis and structural and functional relationship of process of dialysis with nephron. On the contrary, in question 8, almost equal number of candidates attempted each part.'

#### Question 7a:



- i. Name the type of dialysis shown in the given diagram.
- ii. Dialysis machine is considered to be an artificial kidney. Describe any THREE features of a dialysis machine on the basis of which it can substitute the functions of different parts of the nephron.

*Better responses* displayed clear understanding of the diagram in the first part of the question; hence, diagram was identified as haemodialysis. In the second part of the question, candidates were able to relate the structure and function of dialysis machine with the nephron. In such a case, candidates clearly described the structural feature such as the walls of the tubing are partially permeable like the wall of tubules/ dialysis machine tubing is long like loop of Henle and the composition of dialyser is similar to the filtrate composition in the kidney.

**Example:**

- (i) Dialysis shown in diagram is Haemodialysis in which patient's blood is pumped through an apparatus called dialyzer. This machine filters the blood by diffusing waste material from blood into dialysis fluid and cleaned blood is returned back to the body.
- ii) Dialysis machine filters extra salts, water, waste material (urea, uric acid, creatinine) from blood, these same functions are performed by nephron that's why dialysis machine is considered as artificial kidney.
- Dialysis machine contains long coiled tube which increases surface area to volume ratio hence speeds up the ~~process~~<sup>diffusion</sup> such as coiled proximal and distal convoluted tubules in Nephrons.
  - Tubes of dialysis are made up of semi permeable membrane and have small pores therefore only small particles (glucose, water, salts, urea) can diffuse into fluid, large molecules (RBC's, proteins) cannot be diffused. Filtration in Bowman's capsule of nephron occurs in same manner <sup>on machine</sup>, glucose is reabsorbed in blood again due to semi-permeable membrane, such as reabsorption occurs in loop of henle.
  - Dialysis fluid contains essential minerals and salts in correct proportion so that these cannot be diffused from blood into fluid.

Weaker responses displayed confusion between the peritoneal and haemodialysis in the first part of the question.

In the second part of the question, candidates were unable to comprehend the demand of the question, thus, explained the process of urine formation in the nephron. Such responses described the filtration, reabsorption and secretion. Moreover, these responses also described importance and process of dialysis as shown in the diagram. However, a few responses were able to describe the function of different components of dialysis machine but failed to relate it with different parts of nephron. Therefore, such responses were not credited full marks.

### Example:

- i. The dialysis shown in the given diagram is hemodialysis.
- ii. Dialysis machine is considered to be an artificial kidney because of the following features:
  1. There is a dialyzer in which the blood of body moves for a short time period. The blood is mixed with dialysis fluid and the fresh blood comes back to the body.
  - It filtrates the blood with the help of dialysis fluid, the salts, urea and other waste materials or excretory materials remains in the dialyzer and filtrate blood comes back to the body.
  - It transfers the blood from arteries to the veins as same as the parts of renal medulla. The unfiltered blood comes from arteries is filtered by the dialysis machine and the filtrate blood transfers to the veins by the means of dialysis machine.

### Question 7b:

- i. Mention any FOUR physiological changes that would take place in the human body as a result of increased adrenaline level.
- ii. Describe the importance of any THREE physiological changes mentioned in part (i) for exercise or emergency situation.

*Better responses* correctly described the physiological changes that occur due to increased concentration of adrenaline in human body. Such responses, in the first part, mentioned increase in blood glucose level/ metabolic rate/ heart beat rate/ breathing rate, vasoconstriction and pupil dilation.

In the second part, candidates correctly provided the description related to the importance of each physiological effect. Such responses described that the increase in blood glucose level/ metabolic rate/ heart beat rate/ breathing rate is to increase cellular respiration, oxidation of food for more energy release, rapid transfer of oxygen and glucose to the muscles.

**Example:**

It is released when a person is facing bear, getting angry or feeling anxiety. all these promote the production of this hormone. The physiological changes that take place when this is released are: 1) There is an increase in heart rate 2) The breathing rate is increased and goose pimple appears. 3) There is dilation of pupil. 4) Skin color change i.e person become pallor.

① Importance of increase in heart rate: due to this, the blood flows fastly and is pumped to all parts so that the person continues his/her exercise.

② Importance of increase in breathing rate: body metabolism is high so the  $\text{CO}_2$  produced is removed fastly from body and oxygen is also gained, excess heat is also removed.

③ Importance of dilation of pupils: the pupils dilate so that the person can see clearly.

④ Importance of vasoconstriction: This ensures that blood is supplied to important organs, blood flow toward skin is low.

*Weaker responses* mentioned the location of adrenaline formation and secretion. However, few of the candidates were able to gauge the demand of the question but were unable to draft a correct answer. These responses mentioned decrease in heart rate, breathing rate and metabolic rate.

In the second part of the question, candidates described the examples of 'fight or flight' situations. Moreover, candidates also discussed the importance of exercise.

### Example:

Physiological changes that would take place in the human body as a result of increased adrenaline level :-

- Decrease in heart beat.
- Decrease in blood pressure.
- Decrease in sugar concentration of blood.
- Decrease in stress level of body.
- Constriction of pupil of eye.

Importance of physiological changes :-

- As dilation of pupil causes digestion problems so adrenaline will make the pupil constrict.
- Adrenaline is secreted in the body at the time of emergency situations (fight/flight) so it will decrease the stress level which will help us to not panic and make the decision efficiently.
- During stress situations sugar level rises so adrenaline will decrease it and sugar concentration in the blood will be maintained.
- During such situations heart beat and blood pressure which may lead to heart diseases so adrenaline normalizes it.

### Question 8a:

- i. Mention any ONE adaptation each of stigma and pollen grain for pollination in an insect pollinated plant.
- ii. Describe the process of sexual reproduction in plants from pollination to fruit formation.

Better responses mentioned the adaptation of stigma and pollen grain as follows:

Stigma are pinhead shaped with no branches whereas, pollen grains are heavy/ sticky/ less pollen are produced, as pollen transfer is more precise and less wastage of pollen.

In the second part of the question, each step of sexual reproduction from pollination to fruit formation was clearly stated in a sequence. Such responses described the construction of pollen tube, entrance of pollen tube into style and ovule, release of sperms, formation of diploid zygote, formation of endosperm nucleus, development of zygote into embryo, development of endosperm tissue and formation of fruit.

### Example:

i) • The pollen grains for insect pollinated plant should be heavy & sticky so that they can be easily ~~transer~~ attached to the insect.  
• They should have pinheaded stigma for easy pollination.

ii) Sexual Reproduction In Plant :-  
when pollen grains become mature they are transfer to stigma this is called pollination. On reaching stigma pollen grain construct a pollen tube which travel from stigma to style and from style to the basal ovary. This pollen tube consists 2 sperms. On reaching basal ovary it enters in ovule and here they are bursts. As a result sperm <sup>fuses</sup> with the egg and formed diploid zygote, on other hand the other sperm fuses with diploid fusion nucleus and form's triplord endosperm nucleus. Hence in this process there <sup>are</sup> 2 fertilization so it is known as Double fertilization.  
After fertilization ~~xy~~ diploid zygote (2N) turns into Embryo, the triplord endosperm nucleus is turns into endosperm tissue which contains food for embryo. Then the ovule turns into seed and ovary turns into a fruit.

Weaker responses exhibited careless reading of the first part of the question. Such responses mentioned the adaptive features of pollen grain and stigma of wind pollinated flowers, such as, pollens are light with smooth surface and produced in large number; similarly, stigma are feathery branched.

In the second part of the question, most of the candidates provided generalised and brief description of sexual reproduction. Moreover, candidates described the alternation of generation with the production of haploid spores and diploid sporophyte.

**Example:**

a) when an insects e.g (bee) sit on a flower after a while when it fly out of there some pollen grains stick to his feet when he sit on another plant the pollen grain falls into the stigma and the the plant gets pollinated.

b) when the male reproductive part (pollen grains) fall into the female reproductive part (stigma) the flower becomes pollinated. in this case the sperm goes into the stigma where ovary, ovule, and style is present. It burst in their and after some time the ovule become fruit.

**Question 8b:**

- i. State any TWO sources of variations in sexually reproducing organisms.
- ii. Describe continuous and discontinuous variations. Give an example of human beings in each case to support your answer.

Better responses correctly stated the sources of variations in the first part of the question. The most frequently written sources of variations were mutation and crossing over. However, in these responses, candidates also mentioned random fertilisation and random assortment of homologous chromosomes.

In the second part of the question, candidates have correctly described the continuous and discontinuous in terms of their properties, representation and factors affecting these variations. Moreover, some responses, also provided related examples to support their description.

Example:

<p>b. i. SOURCES OF VARIATIONS IN SEXUALLY REPRODUCING ORGANISM.</p> <p>→ During meiosis Prophase I <del>of</del> of meiosis I, the homologous chromosomes undergoes the process of crossing over, which results in exchange of chromosomal segments.</p> <p>→ During Metaphase I, independent assortment occurs.</p> <p>The homologous chromosomes align along the equator of cell. Difference in the alignment patterns results in the formation of gametes with different genetic code.</p> <p>→ Mutation during meiosis is also a source of variation.</p>
<p>ii. CONTINUOUS VARIATIONS shows phenotype over wide range of measurements from one extreme to another. continuous variations are controlled by many genes and they are affected from the environmental changes &amp; factors. For example, Weight, Height and Intelligence are the phenotypes which have large scale <sup>of measurement</sup> and are not same in all individuals of species.</p> <p>DISCONTINUOUS VARIATION shows distinct phenotype. They are controlled by alleles of single gene pairs. They are less likely or almost unaffected by environment. For example: ABO Blood system and attached <sup>of ear</sup> or free lobes.</p> <p>In humans whether an individual will have Blood group A or B or O or AB. There is no other option <sup>these are the groups</sup> rather than these groups.</p>

*Weaker responses* displayed misunderstanding of the key part of the question, i.e. sources of variation; hence, majority of the candidates mentioned DNA, genes and nucleus as source of variation. Few other frequently appearing responses also included formation of gametes and sexual reproduction.

In the second part of the question, weaker responses either provided incorrect description and examples of continuous and discontinuous variations or swapped the description and examples. Most of the responses incorrectly differentiated continuous and discontinuous variation irrespective of the demand of the question. Majority of the candidates described both types of variations in terms of inheritance. In this case, such responses mentioned that in continuous variation traits are inherited to offspring continuously and in discontinuous variations traits get inherited spontaneously. Such responses revealed a significant misunderstanding of the terms.

Teachers are recommended to teach this topic through exploration of examples that candidates may be able to associate the concept with daily life examples.

Example:

### i SOURCES OF VARIATION:-

→ The genetic recombination during the Sexual Reproduction also lead to variation.

→ The distribution of DNA from parent to its offspring is also a source of variation. → The fusion of male and female gametes also lead to offspring with variation.

### ii Continuous Variations:-

It is a type of variation in which there are uncontrolled traits. The characteristics in this variation cannot be controlled by the human activities and the environment have very less or no effect on it. Example:- The Blood groups in humans like A, B, O, AB are the continuous variation which continues throughout the life and cannot be changed.

Discontinuous Variations:- It is a type of variation in which there are the controlled traits. The characteristics in these variation can be controlled by the human activities, and the environment have more effect on it. Example:- The Variations in human's body weight can be changed. The human weight can be disturbed easily. The human Skin Colour can be changed with various human activities like exposure to Sun light.