

Aga Khan University Examination Board

Notes from E-Marking Centre on SSC I Biology Examination May 2015

Introduction

This document has been produced for the teachers and candidates of SSC Part I (Class IX) Biology. It contains comments on candidates' responses to the 2015 Secondary School Certificate (SSC-I) 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 Student Learning Outcomes 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.

Question 1b

State any THREE salient features of the animal shown in the diagram below.



Better responses stated the characteristics of sea star (star fish) such as, it is a marine animal or is found in sea water/ body is star-shaped or it has five arms/ there are many tube feet on the ventral side of each arm/ body is covered with spines or spicules/ they have a water vascular system and dermal gills/ radial symmetry/ capable of regeneration.

Example:

It has rough and spiny skin.
It has a central disk in centre from which five oral arms are emitted. → It belongs to Phylum echinodermata and it has a unique water vascular system.

Weaker responses wrote irrelevant features. The variety of such features includes it eats all small organisms in water/ provides safer environment for the organisms/ lives on land as well as in water/ invertebrate/ multicellular/ eukaryote/ heterotroph/ has jelly like appearance/ contains scales (mixed up with spines)/ has jointed legs/ bilaterally symmetrical/ has segmented body.

Example:

It eats all the microscopic small organisms that can cause harm to the water.
It provides a safer environment for the organisms under water.
It can live on land as well as in water.

Question 2

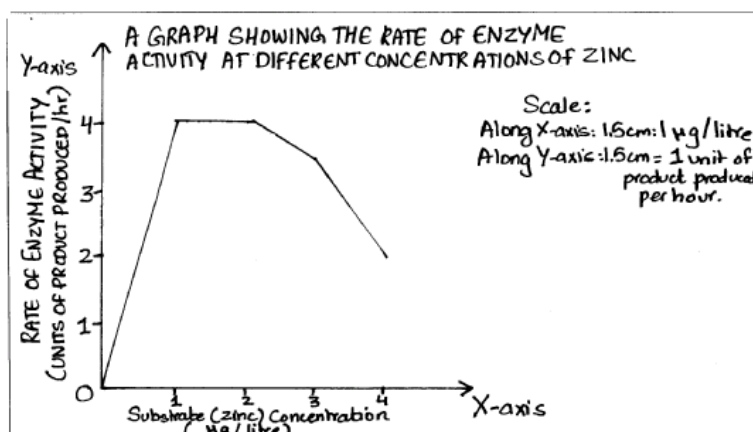
The data below shows the effect of different concentrations of zinc on the activity of an enzyme.

S. No.	Zinc Concentration ($\mu\text{g}/\text{litre}$)	Rate of Enzyme Activity (Units of product produced per hour)
1	1	4
2	2	4
3	3	3.5
4	4	2

Present the given information in the form of a graph with labelled x-axis and y-axis.

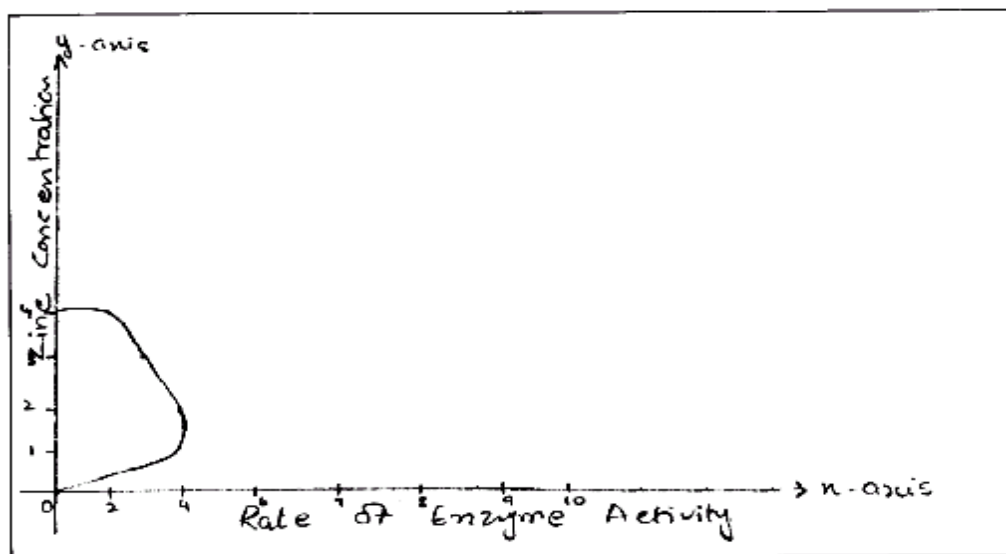
Better responses displayed sound understanding of the SLO (2.1.1.e *organize data appropriately using techniques such as tables and graphs*);. These responses took independent quantity (zinc concentration) on x-axis whereas dependent quantity (rate of enzyme activity) on y-axis. Moreover, these responses drew curve of the graph by correct placements of the given values. Some responses presented the given information using bar chart or histogram which was equally acceptable.

Example:



Weaker responses interchanged x-axis with y-axis or obtained a straight line or a bell shaped curve. The mistakes in the shape of the curve were mainly due to wrong scaling. Instead taking the values in serial, candidates jotted down the values provided in the data only. Another apparent reason was that the candidates failed to read the data correctly and simply reproduced a straight line or a bell curve from memory.

Example:



Question 3

State any THREE differences between mitosis and meiosis.

Better responses gave distinguishing features of both the processes such as:

Mitosis	Meiosis
Two daughter cells are formed.	Four daughter cells are formed.
Daughter cells are identical to the parent cell.	Daughter cells with different genetic makeup are formed/ crossing over takes place.
Number of chromosomes remains same in the daughter cells/ diploid cells are formed.	Number of chromosomes is reduced to half/ haploid cells are formed).
Takes place in somatic cells.	Takes place in germ/ sex cells.
Helps in the growth and repair of the body.	Plays role in sexual reproduction.

Example:

S.No.	Mitosis	Meiosis
1	Mitosis takes place in somatic cells.	meiosis takes place in sex cells or germ line cells
2	Mitosis produces two daughter cells	Meiosis produces four daughter cells.
3	daughter cells have equal number of chromosomes than the parent cell.	daughter cells have half the number of chromosomes present in parent cell.

Weaker responses wrote vague differences such as:








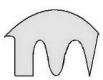

Mitosis	Meiosis
Cell division takes place.	Cell division does not take place.
Spindle fibre move to two poles.	Spindle fibre does not occur.
Mitosis has interphase.	Meiosis has telophase.
There are many steps.	There are fewer steps in meiosis.
Male and female cell can divide	Both male and female cells are required to start meiosis.
It consists of one stage.	It consists of four stages.
Infertile mule is an example of mitosis.	Healing of leg wounds is an example of meiosis.
Error in mitosis can cause cancer.	Error in meiosis can cause tumour.

Example:

S.No.	Mitosis	Meiosis
1	mitosis is a short period of time.	meiosis is the long period time
2	The cell prepare it cell for division	In this homologous chromosome break the haploid ^{one} pair into diploid ^{two} daughter cell
3	In this only four phases do occur.	In this more than three one phases and each one have two phase i.e Phase I, Phase II

Question 4

For each substrate in column II, identify and state the enzyme from column I that would act on it.

Column I		Column II	
Enzyme		Substrate	
1		_____	
2		_____	
3		_____	
4		_____	
5		_____	










Better responses focused on the shape of the active site of the enzyme and correctly matched it with the shape of the substrate.

Example:

	Column I Enzyme	Column II Substrate
1		 4
2		 5
3		 1
4		 2
5		

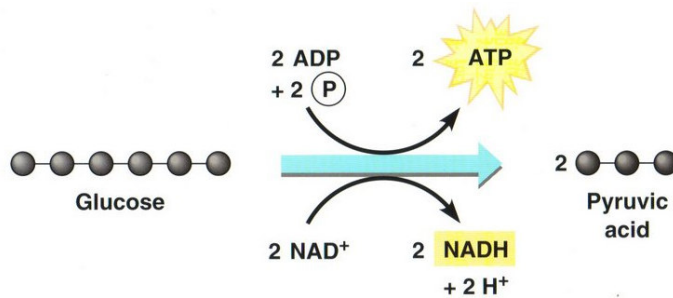
Weaker responses displayed confusion between the shape of enzyme 3 and 5. A few responses failed to match any enzyme with the correct substrate. Many weak responses indicated that the candidates were unable to understand and fulfil the demand of the question. Some labelled the substrate in column II as not specific substrate/ inhibitor/ activator/ cofactor/ active energy/ prosthetic group/ coenzyme. Others wrote description against each substrate that it would not act on the given enzyme because it has no specific shape. One of the responses wrote yes or no in each case. Another wrote amylase/ lipid/ lipase. Some of the responses drew a substrate in the last box assuming that the shape has been missed in the exam paper. Following the best practices of question making, an extra option was given in matching questions to minimise guessing.

Example:

	Column I Enzyme	Column II Substrate
1		 <i>not specific substrate.</i>
2		 <i>Inhibitor</i>
3		 <i>activator</i>
4		 <i>co-factor</i>
5		

Question 5a

The equation below shows part of a biochemical process.



Identify the process.

Better responses correctly identified the process, i.e. glycolysis.

Example:

The process is glycolysis.

Weaker responses identified the shown process as reduction/ light reaction/ aerobic respiration/ Krebs cycle/ pyruvic fermentation/ photosynthesis/ formation of ATP/ distribution of chemicals/ digestion.

Example:

Krebs Cycle also known as 'dark reaction'.

Question 5b

In which part of the cell does this process take place? Give ONE reason why it would take place in this particular part of the cell.

Better responses stated the correct location of the process, i.e. cytoplasm and supported it with the reason that all the necessary enzymes required for this process are found in the cytoplasm.

Example:

This process will occur in cytoplasm of the cell. The process will occur in this particular part because this part of cell contain the enzyme which help in the above process of glycolysis.

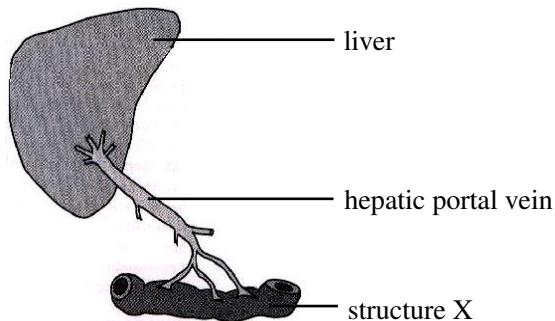
Most of the weaker responses wrote mitochondria as the location of the reaction with a reason that it is the power house of the cell. Other weaker responses stated lungs because NAD gets H so it becomes NADH^+ . Some responses mentioned chloroplast because it needs light. Few of the responses identified the location of the process as skin cell/ liver/ heart/ skeletal muscles/ nucleus of the cell as it helps maintaining nucleus.

Example:

The process takes place in thylakoids. This is because chloroplasts have have all the photosynthetic processes in it and dark reactions take place in thylakoid only.

Question 6

The digested food in structure X is absorbed by the blood and taken away by the hepatic portal vein to the liver.



Identify structure X in the given diagram. Also describe what happens to excess amino acids in the liver before the blood is distributed around the body.

Better responses identified structure X as small intestine or ileum. They wrote that excess amino acids are brought to the liver where their amino groups are removed (deamination) and converted to urea.

Example:

Structure X is small intestine. Excess amino acids are taken to the liver where deamination of amino acids takes place and it converted to urea, the less toxic form and then urea is excreted from our body.

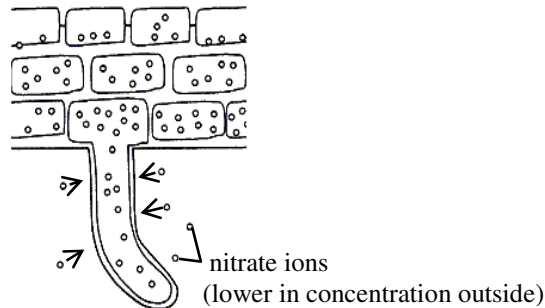
Weaker responses identified structure X as kidneys/ large intestine/ pulmonary vein carrying deoxygenated blood/ pancreas/ lymph/ capillary tube/ stomach/ gall bladder/ inferior part of aorta/ ventricle/ dorsal aorta/ spleen. They wrote that excess amino acids move on with the blood by dissolving with blood/ are filtered by liver and broken down/ are broken down in liver into polypeptides/ are converted into pepsin/ are used in the liver to make enzymes/ are converted into less toxic form due to this the blood clotting prevent and it destroy all the old red blood cell. Other such responses incorrectly wrote that amino acids can be stored as proteins for future use or excess amino acids in the liver turn into glycogen.

Example:

X is a ^{capillary} capillary tube. That the amino acid is converted into less toxic form due to this the blood clotting prevent & it destroy all the old red blood cell & after it all the protein converted into fibronogen. Due to excessive ammet amino acid the carbohydrates & lipid are convert into protein to make chloestrol.

Question 7a

The diagram below shows a root hair cell and its adjacent cells. Identify and describe the process through which plants take up the given ions from the soil.



Better responses identified the process as active transport. These responses described the process in terms of movement of nitrate ions from lower concentration (outside the cell) to higher concentration (inside the root hair cell) using energy or against the concentration gradient at the expense of energy.

Example:

The nitrate ions will ^{be taken} ~~move in~~ by the root hair by the process of active transport. This is because in the soil, nitrate ions are lower in concentration^{ion} and therefore the movement will ^{be} against the concentration gradient (lower concentration to higher). This process will require energy in the form of ATP (energy-carrying molecule) as energy will have to be spent when ^{forcing} molecules to move against concentration gradient.

Most of the *weaker responses* identified the process as osmosis or diffusion. A few identified it as pressure flow transpiration. Such responses wrote about the movement of molecules from lower concentration to higher concentration/ movement of ions from dilute to concentrated concentration via membrane/ ions of water are carried through xylem. Some of the responses wrote about transpirational pull. Moreover, despite the fact that the question asked about nitrate ions, candidates wrote about the movement of sodium-potassium ions. A number of responses rephrased the information given in the question. One incorrect response even wrote about the increased surface area of root hair cells.

Example:

Diffusion :- Root hairs are in direct contact with soil ^{and water} root hairs have higher concentration of salt than soil. So the nitrate ions moves easily and entered the roots hairs. And they entered the roots hairs by the process of diffusion.

Question 7b

The pictures below show two factors contributing to famine (shortage of food). Describe any ONE of them.



Picture 1



Picture 2

Better responses identified the factor in picture 1 as drought. They described how shortage of water can contribute to famine by highlighting the role of water for the growth of plants and for the health of domestic animals. They further wrote that upsets in rainfall pattern and droughts make less water available. This can dramatically reduce crop yield. Similarly, better responses identified the factor in picture 2 as flood. They described that unexpected heavy rainfalls can reduce crop/ livestock yield severely as plants are damaged due to water logging and fertile soil is washed away.

Example:

The floods cause famine. The floods destroy the crops which results in a shortage of food and it also results in a death of humans and life stock due to shortage of food.

Picture 1: droughts.

droughts occur when rainfall is very low or no rainfall. In this all food crops become dried and are wasted. Animals die in search of food and water and thus lead to famine.

Weaker responses ignored the description of the stimulus (factors contributing to famine) and described the pictures. E.g. in picture 1, the land is dry and cracked because there is water problem. In picture 2, people are moving from one place to another. Others wrote that the picture shows lack of awareness about the upcoming natural disaster and the solution is to make people familiar about it or the diagrams show unequal distribution of food. Few of the responses wrote that people living in rural areas have less food as compared to people living in urban areas. According to one response, picture 1 showed 'shortage of food, home, poverty, education, job and people losing their homes'. One of the responses wrote about picture 2 that 'people were take strictly, and fight their right to tell minister to solve problem of shortage of thing'.

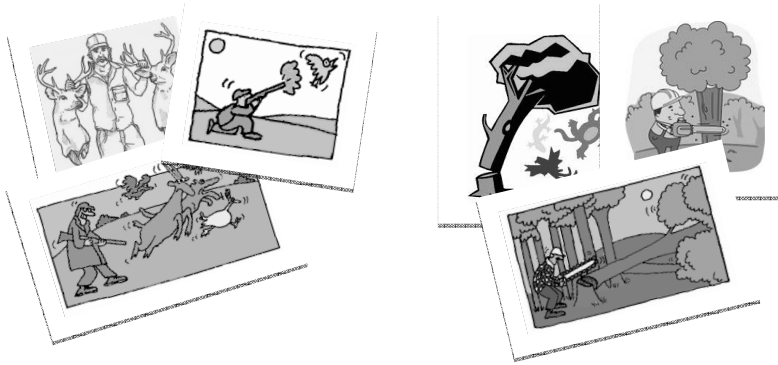
Example:

Unequal distribution of food: Food is unequally distributive in world. People living in rural areas have less food as compare to people living in urban areas. Some ~~to~~ food are too much and some their is no food.

Extended Response Questions (ERQs)

Question 8a

Describe the following human activities and their impact in bringing imbalance in nature with reference to biodiversity.



Better responses defined over-hunting, wrote reasons for over hunting and described the impact of over hunting with reference to imbalance in biodiversity. Such responses wrote about either extinction of species or endangerment of species or both. Similarly, they defined deforestation, wrote reasons for deforestation and described the impact of deforestation i.e. loss of habitat which ultimately leads to extinction or endangerment of species.

Example:

There are numerous reasons as to which different species of animals experience a constant threat to their life. Some of them might be natural, but majority of them are due to human activities. There are different ways in which the humans may be responsible in bringing about an imbalance in nature. These activities ~~include~~ mentioned include overhunting which eventually results in loss of habitat, and deforestation and its impact might also be the same. When humans hunt in order to meet the requirement of their food, they are actually causing loss of habitat, as some of the species of animal completely extinct due to this. Same goes ~~is~~ with deforestation. When we cut down trees in order to meet the materialistic requirements by the wooden product, we actually contribute our help towards loss of habitat. Forests serve a great deal to different animals in different ways i.e. shelter, food, cool atmosphere etc. So when we cut them down it greatly affects the biodiversity. It is causing a rapid decline in biodiversity. It is an increasing concern. Biodiversity is very essential for sustaining life on Earth. According to Islamic point of view, cutting trees or killing animals is strictly prohibited. Biodiversity is basically naming and distinction among ~~to~~ different species of animal present on Earth's Core. Moreover by cutting down trees, we are also cutting down a supply of free oxygen that is pure. Many birds take refuge at a tree, we are also demolishing their shelter. Their life is endangered from hunters. Pollution also disturbs their lives.

Weaker responses misunderstood the pictures and/ or the description and described the types of pollution such as air and water pollution. Some of the responses wrote about the uses of forests and animal husbandry. For instance, trees provide oxygen and shelter/ animals like birds, deer are involved in the beauty of our environment, tourists from other countries want to see the animals/ oxygen is necessary for human health/ animal husbandry provide milk and leather for people/ waste product of animals is used as fertilizer for plant to grow their length. Some responses described the given pictures without relating it to the issue asked in the question, e.g. 'on the left side three diagrams show that man is killing the animals and birds/ in this picture very poor people are present, cutting down trees'. Few of the responses wrote suggestions such as 'we have to do planting in our country so that over environment become clean'.

Example:

1) Air pollution: The harmful gases which are coming out through vehicles, By Burning Garbage and the harmful gases by industrial wastes. The impact of these harmful gases can cause pollution in the air and from this pollution Acid rain occur.

2) By cutting down the trees means deforestation which is harmful for herbivorous animals.

3) Water pollution: if the water is not clean so this may cause the death of sea animals and nature will be destructed.

4) If the environment is not clean it will directly affect the nature so our environment/ surroundings should be clean.

Question 8b

Describe the structure of endoplasmic reticulum. Also describe the structures and functions of its two types.

Better responses described the structure of endoplasmic reticulum that it is a network of interconnected channels and an extension from cell membrane to the nuclear envelope. Then the responses named and described the structure and functions of rough and smooth endoplasmic reticulum. Such responses wrote about presence or absence of ribosomes and protein synthesis, lipid metabolism and detoxification of harmful substances in the body.

Example:

Endoplasmic reticulum is a network of interconnected channels extended from cell membrane to the nuclear envelope. There are two types of endoplasmic reticulum:
Rough endoplasmic reticulum
Smooth endoplasmic reticulum.

Smooth endoplasmic Reticulum:- (SER)

* Structure: Smooth endoplasmic reticulum lack ribosomes in it and is smooth.

* Function: smooth endoplasmic is involved in lipid metabolism. It also transports materials from one part of the cell to another part. It also detoxifies the harmful chemical that have entered the cell.

~~Smooth~~ Rough Endoplasmic Reticulum:- (RER)

Structure: Rough endoplasmic reticulum is so named, due to its rough appearance and because of a large number of ribosomes are present in it.

Function: Ribosomes are the site for protein synthesis. As rough endoplasmic reticulum is bounded to the ribosomes, it helps in protein synthesis also.

Weaker responses named the two types of endoplasmic reticulum only. They mentioned that smooth endoplasmic reticulum give strength, power and support to protein synthesis so they can enter the body. As far as location is concerned, such responses wrote that it is located outside the plasma membrane and is a strong component. Other responses mentioned that endoplasmic reticulum has irregular shape/ soft surface/ it does absorption, packaging and transportation/ is a unicellular organism. One of the responses coined a new type of endoplasmic reticulum, i.e. exoplasmic reticulum (might be confused with axoplasmic reticulum) and described it as 'a small type of endoplasmic reticulum'. Other weaker responses wrote that rough endoplasmic reticulum has proteins attached to its surface/ are the inter-cellular spaces starting from the nuclear envelope to the cell wall/ smooth endoplasmic reticulum are involved in denaturing of some substances. One of the responses wrote about stomata and guard cells.

Example:

Endoplasmic reticulum ~~has~~^{have} two types ~~one sm~~
① smooth ② Rough. Endoplasmic reticulum is a double bonded membrane. It is the sites of protein synthesis.

Smooth endoplasmic reticulum: Function = It give strength, power and support to protein synthesis so they can enter the body.

Structure = It is located outside the plasma membrane. It is an strong component.

Rough endoplasmic reticulum = RER is the have Rough surface area. it's function is to make the blood enter the body.

Structure = It is used a ~~down~~ and pump type apparatus. to help blood to enter.

Question 9a

Describe in detail FOUR protective and FOUR transport functions of blood in our body.

Better responses wrote about the protective functions of blood in terms of the role of phagocytes (ingestion and destruction of foreign particles) and lymphocytes (neutralising effect and memory function of antibodies). Moreover, they wrote how clotting of blood protects the body.

With reference to transport functions of blood, better responses wrote about the transport of digested food substances (nutrients), excretory products, hormones, heat produced in respiring body tissues and oxygen from the lungs to all parts of the body.

Example:

a) PROTECTIVE FUNCTIONS OF BLOOD:

- Blood contains ^(leukocytes) white blood cells. These WBC's fight against the invading microbes of our body and thus support the body's immunity system.
- The Platelets (thrombocytes) are fragments of bone marrow cells. They heal the wounds by forming a temporary seal known as blood clot on the wound site, ^{and preventing} excess loss of blood.
- Blood contains antibodies. These antibodies also help in the functioning of supporting immune system.
- It supplies oxygen to body parts when needed and thus prevents it from respiring anaerobically.

• TRANSPORT FUNCTIONS OF BLOOD:

- The Red Blood Cells (RBCs) have haemoglobin. It functions to transport oxygen to body parts.
- The blood transports carbon dioxide to the heart through the inferior vena cava which is pumped to the lungs for purification.
- Blood absorbs minerals and digested food and transports it to several body parts.
- Blood contains glucose which is converted to glycogen in the liver. But when the energy level of the body is low, it is again converted to glucose and transported to body parts through blood.

Weaker responses displayed confusion about the words 'protective functions' and 'transport functions' used in the question. Some of the responses narrated the circulation of blood across the body or within the heart. Such responses included entry of deoxygenated blood in the heart and oxygenation of blood in lungs/ pulmonary and systemic circulation. In one of the responses, the function of red blood cell was stated to provide colour to the blood. Few responses wrote about the structure and functions of arteries, veins and capillaries instead of the blood while others described the structure of heart; presence of chambers/ valves. One of the responses described the ABO blood grouping system. Examples of vague responses included: blood protects to move our body/ helps to do work/ gives us energy/ the transport of blood through veins to all parts of the body is an example of transport function of blood/ quantity of blood in our body is 5 litres/ blood is verified at many stages; all the people do not have same blood/ thousands of blood cells die in every second/ doctors say we should have to donate blood every year.

Example:

four protective functions of blood.

- blood protects to move our body.
- It can help to do work.
- It gives us energy.
- red blood cell have main ability to protects of blood in our body.

Four transport function of blood:

- We can donate or transport blood to some body, or a person how need it.
- many transport function of blood in our body for example heart transport through vein to all part of the body.
- deoxygenated blood transport through ~~opte~~ Superior vena cava.
- transport functions of blood in our body is one vein to another vein their is a transport blood system.

Question 9b

A IX grade student in a 100 metre race experiences vigorous muscular contractions. Explain the biochemical process which enables him to reach the finish line. What subsequent changes will take place in his body when he takes rest after the race?

Better responses explained anaerobic respiration with reference to conditions for anaerobic respiration (less oxygen or more carbon dioxide)/ increased heart rate/ breathing rate, end product i.e. lactic acid and amount of energy. Such responses also mentioned the removal of lactic acid from muscles and its transportation to liver. Some candidates, instead of writing about muscle fatigue, wrote that during rest, the heart rate/ breathing rate will decrease or come to normal; marks were awarded to such responses.

Example:

During extreme muscular contractions aerobic respiration is insufficient for us. Although ~~we~~ breathe fast and heart beat also become fast. But oxygen didnot reach many cells sufficiently. ~~we~~ ^{he} need more energy, so to meet the energy need ~~we~~ ^{his} body respire anerobically which do not need oxygen supply. The first step of anerobic respiration glocolysis occurs same as in aerobic respiration. But after glycolosis on the same place in cytoplasm pyruvic acid produced in glycolosis is ~~pre~~ broken down ~~in~~ in lactic acid and energy is released as a result of it his body will produce 2 ATP which would meet with the ~~ATPs~~ of 36 ATP of aerobic respiration and give would give energy to his body. This bio chemical process enables him to reach the finish line. But after the rest when he is at rest the lactic acid from parts of the body is transported to liver where liver would detoxify it. After detoxifying liver would convert it in glucose and store it in the form of glycogen. Which would be further used ~~use~~ use in body. If this processe would not occur the lactic acid would remain in his legs or anyother place and would cause pain, as it is acid it harmful for body.

Equation

$$\text{Pyruvic acid} \rightarrow \text{lactic acid} + \text{Energy.}$$

Weaker responses described the function of antagonistic muscles. Some of the responses described the difference between lactic acid and alcoholic fermentation or described the structure, use and energy value of ATP in the body. Examples of vague responses included: 'when race will start take them water, when they drank water they cannot be run fast because they feel weighty' / 'when he is running his molecules get kinetic energy and he starts to running fast' / 'to reach the finish line he needs more proteins and minerals and nutrients'. One of the weaker responses wrote the definitions of aerobic respiration, anaerobic respiration, glycolysis, Krebs cycle and electron transport chain. This answer failed to score any marks because even though the candidate showed some knowledge, it was not relevant to the question which demanded understanding of it to a particular case.

Example:

As the student runs its muscles contracts and relax. These muscles help him in running. These muscles are known as antagonistic muscles and the phenomenon is known as antagonism. Muscles help us in walking and running. As we walk the muscles of our legs first contracts and then relax. Another example of it is our arm as we bend ~~or~~ our arm or pull something or take some load our muscles present in helps in the bending or pulling. The process of contraction and relaxation of muscles is called antagonism. This process of contraction and relaxation helped the student to reach the finish line. As the student runs his rate of heart beat becomes faster and sweat will come from his body. The heart beat becomes faster because the student is in continuous motion. The blood will also circulate faster in its body. but as he will take rest after the race some changes will occur in his body. These changes are that heart beat and pulse rate will become normal and the more sweat will not come from his body. He will feel cooling effect on his body because sweat will evaporate so evaporation ~~with~~ produces cooling effect.