MATIGO EXAMINATIONS BOARD

✓ Or ; Full mark

✓ Half a mark

P530/2
BIOLOGY
MARKING GUIDE 2023
PAPER 2

Qn	Answer	marks
1(a)(i)	Figure 1 Increase in partial pressures of oxygen leads to an increase in the percentage saturation of haemoglobin with oxygen, further increase in partial pressures of oxygen leads to a constant percentage saturation of haemoglobin with oxygen	04
	Figure 2 Increase in partial pressures of oxygen results in an increase in the percentage saturation of haemoglobin with oxygen up to a point where further increase in partial pressures of oxygen leads to a constant percentage saturation of haemoglobin with oxygen.	02
(ii)	Decrease in PH, leads to a reduction/ decrease in the percentage saturation of haemoglobin with oxygen.	02
(b)(i)	Increasing partial pressure of oxygen increases percentage saturation of haemoglobin, due to more oxygen molecules available to combine with haemoglobin/haem groups, making haemoglobin molecules unstable leading to rapid unfolding of the polypeptide chains, allowing easy combination of oxygen with haem groups.	05
(ii)	Decrease in PH, decreases the saturation of haemoglobin with oxygen due to accumulation of H^+, That combine with amino acids of haemoglobin, reducing the affinity of haemoglobin for oxygen	04
(c)	**Similarities** In both, percentage saturation of haemoglobin increases with increase in partial pressure of oxygen.	

	In both percentage saturation of haemoglobin becomes/is constant with further increase in partial pressure of oxygen beyond90mmHg. **Differences** From 0 to40mmHg, the percentage saturation of haemoglobin in foetus increases rapidly while that of the mother increases gradually. The foetal haemoglobin reaches loading tension saturation point at lower partial pressure of oxygen while that of the mother reaches loading tension at higher partial pressures of oxygen. Any 3 @ 1 mark (1 similarity and 2 differences) Acc. Any other correct similarity and differences Ace table	03
(d)(i)	The percentage saturation of haemoglobin of a cat is higher than that of a rat because the cat is bigger than a rat, leading to higher energy demands hence its haemoglobin has a higher affinity for oxygen, to pick up more oxygen for maintaining high metabolic activity to supply sufficient energy.	06
(d)(ii)	Foetal haemoglobin has a higher saturation of oxygen than that of the mother because the foetus lives in the low oxygen tension areas of the womb and obtains its oxygen from material blood its haemoglobin has a higher affinity for oxygen to easily obtain oxygen from the material blood for respiration to produce energy for its growth and survival.	05
(e)(i)	Has a high affinity for oxygen to easily pick up oxygen at high attitudes where low atmospheric pressures reduce the ease with which haemoglobin loads oxygen. Difficulty in dissociation of oxyhaemoglobin to use oxygen sparingly.	03
(e)(ii)	Ignore	
(e)(iii)	To avoid miscarriage , since smoke produces carbon monoxide, that readily and permanently combine with haemoglobin to form carboxy-haemoglobin preventing the combination of haemoglobin with oxygen, decreasing oxygen supply to the growing baby.	06
2(a)	Animals produce carbon dioxide as a bi-product of respiration which is removed from the body during expiration/exhalation/breathing out. Plants gve out oxygen as a bi product of photosynthesis, which is used up in respiration, and removed during gaseous exchange. Plants give off carbon dioxide a bi product of respiration, which is used during photosynthesis.	12

	Mammals produce urea during the ornithine cycle in the liver, which is removed in form of urine. Mammals give off metabolic water during respiration which is removed in form of sweat.	
2(b)	Renal fluids flow in the descending and ascending loop of henle in opposite directions, forming a hair pin counter current multiplier system, as renal and CL- fluid flows up the ascending loop, Na + are actively transported out into the medulla making the medulla more concentrated. This causes osmosis flow of water from descending loop into medulla then into blood producing hypertonic urine.	08
3(a)	Biological control is the control of pests and weeds using other living organisms that are natural enemies/ predators or parasites to the target pests for example use of lady birds to control aphids in green houses.	03
(b)	• Exact identification of the pests • Identification of the origin, geographic distribution of the pest. • Field study of the target pest and the potential natural enemy • Prediction of success and efficiency levels by the natural enemy using ecological data. • Collection of the natural enemy using appropriate techniques. • Quarantine of the collected natural enemy to prevent escape and contamination by native species. • Propagation of collected natural enemies. • Introduction of the natural enemies in the field of pests.	07
(c)	• Has no danger of polluting environment. • Control agents may become food for other organisms unlike pesticides. • Control agents are specific to their target pests avoiding destruction of other useful organisms. • It doesn't lead to extinction of target organisms. • Provides few chances of pest resurgence. • More efficient since they control pest population in every short period of time.	06
(c)(ii)	• Expensive at the onset. • It takes a lot of time at the start. • May interrupt the natural food chain. • May not completely wipe out the pests. • May target other useful organisms like crops.	04

4(a)

Similarities

Both use nitrogenous bases

Differences

Transcription	Translation
Forms messenger RNA	Forms a polypeptide
Occurs in the nucleus	Occurs on ribosomes found in cytoplasm
No use of amino acids	Amino acids are used
No involvement of ERNA	ERNA is involved
Uses DNA template	Uses mRNA template
Involves unwinding of DNA	No unwinding of DNA
RNA polymerase is involved	No role of RNA polymerase

Any 7, 1similarity and 6 differences

07

4(b)

A gene on DNA unwinds during transcription catalysed by RNA polymerase to expose nitrogenous bases and forming two strands. As RNA polymerase moves along the Anti-sense template strand it attracts free nucleotides that complementary base pair with the template strand forming messenger. RNA. mRNA leaves through the nucleus pores to the protein synthesis machinery in cytoplasm where its base sequence determines the sequence of amino acids in forming a polypeptide in process of translation.

09

(c)

Has anti-codon for attachment of messenger RNA to allow formation of a peptide bond between adjacent amino acids.

Has a drop with bases cytosine, cytosine and adenine for attachment of amino acids to form the tRNA amino acid complex used for generating a poly peptide.

Has let hand loop for attachment of activating enzymes.

Has right hand loop for binding with ribosomes during protein synthesis.

04

5(a)(i)	Stamen is a male reproductive organ of a flower made up of the filament and anther filament are made up of vascular bundles while each anther is made up of four pollen sacs.	05
5(a)(ii)	Anthers contain pollen sacs; with diploid mother cells; which undergo meiosis; to form four; haploid pollen grains;, each pollen grain; develops a thick wall exine; inner wall intine and its nucleus divides mitotically to form the generative; nucleus divides mitotically; during fertilization to form a pair of male nuclei;	11
5(b)	Stamens of insect pollinated flowers have small and compact and firmly attached anthers to hold visiting insects while those of wind pollinated flowers have large and loosely attached anthers to swing easily for dispersal of pollen grains. Stamens of insect pollinated flowers produce small quantities of large sticky pollen grains to attach on bodies of insects while stamens of wind pollinated flowers produce large quantities of small powder pollen grains to easily be blown by wind	08
6(a)(i)	It has compact cells with tight functions to form an impervious barrier. It is made up of several layers of cells impregnated with keratin to increase strength of the body cover like in skin. Some epithelia are modified into outer exoskeleton structures like nails, scales hairs for protection.	04
(b)(ii)	Squamous epithelium lining the alveoli of lungs is thin to reduce diffusion distance of respiratory gases. Squamous epithelium lining blood vessels is thin to allow easily diffusion of food during absorption in the ileum. Columnar epithelium lining the small intestine possess microvilli which increases the surface area for food absorption.	04
(iii)	Lungs have numerous alveoli to increase the surface area of gaseous exchange. Lungs are supplied with a dense network of blood capillaries to transport away gases and maintain a high concentration gradient.	08

	Inner alveolar lining is moist to dissolve respiratory gases for easy diffusion in solution. Alveoli of lungs have a thin epithelium to provide a short diffusion distance for respiratory gases. Lungs are well ventilated by nostrils to maintain a high concentration gradients. Grills have gill filaments to increase the surface area for gaseous exchange. Grills have many blood capillaries to maintain a high concentration gradient.	

END

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