

Name.....Centre & Index No.....

Signature

P530/1

BIOLOGY

Paper 1

July /August 2023

2 ½ Hours

ASSHU ANKOLE JOINT MOCK EXAMINATIONS 2023

Uganda Advanced Certificate of Education

BIOLOGY

Paper 1

2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of sections A and B.

Answer all questions in both sections.

SECTION A. write answers to this section in the boxes provided.

SECTION B. write answers to this section in the spaces provided.

FOR EXAMINERS' USE ONLY

SECTION	MARKS	EXAMINER'S SIGNATURE AND NO
A: 1 - 40		
B: 41		
42		
43		
44		
45		
46		
Total		

SECTION A (40 MARKS)

1. How can biological fitness be estimated
 - A. Document how long different individuals in a population survive.
 - B. Count the number of fertile off spring produced by different individuals in a population.
 - C. Determine which individuals are strongest
 - D. Determine which phenotype is most common in a given population
2. Which of the following would cause cells to switch from cellular respiration to fermentation?
 - A. Pyruvate is not available
 - B. NADH and FADH₂ supplies are low
 - C. The proton-motive force runs down
 - D. The final electron acceptor in the ETC is not available.
3. If only K⁺ gates open on the postsynaptic membrane, then
 - A. The postsynaptic membrane releases a neuro transmitter
 - B. An excitatory post synaptic potential (EPSP) is established
 - C. The post synaptic neuron is inhibited.
 - D. The post synaptic neuron is stimulated.
4. All the following are true about photosynthesis except;
 - A. The Calvin-Benson cycle usually occurs in the dark.
 - B. The majority of the light reactions occur on the stroma membranes in the chloroplast.
 - C. Light energy is stored in ATP.
 - D. A proton gradient drives the formation of ATP from ADP+Pi
5. If 80 from the total alleles of a population which consist of 100 diploid organisms are recessive alleles, what is the frequency of the dominant alleles?
 - A. 0.16
 - B. 0.36
 - C. 0.40
 - D. 0.60

6. What is the function of the reactions in a fermentation pathway? To
- A. Generate NADH from NAD⁺ so electrons can be donated to the ETS.
 - B. Synthesize pyruvate from lactate.
 - C. Generate NAD⁺ from NADH, so glycolysis can continue
 - D. Synthesize electron acceptors, so that cellular respiration can continue.
7. The use of electrons as a source of radiation in the electron microscope allows high resolution to be achieved because electrons.
- A. Are negatively charged.
 - B. Can be focused using electromagnets
 - C. Have a very short wave-length
 - D. Travel at a speed of light
8. A Mutation takes place in DNA triplet coding for the amino acid tyrosine.
The triplet ATA is changed to ATG
The mRNA codons for tyrosine are UAU and UAC
The mRNA codons signaling 'stop' are UAA, UAG, and UGA
What is the effect of the mutation?
- A. The mutated triplet codes for stop
 - B. The mutated triplet codes for a different amino acid.
 - C. The mutated triplet is meaningless.
 - D. The mutated triplet still codes for tyrosine
9. Which comparison of blood pressure is correct?
- A. The pressure in Vena cava is higher than in capillaries.
 - B. The pressure in small arteries is higher than in large veins
 - C. The pressure in capillaries is lower than in small veins.
 - D. The pressure in arterioles is lower than in venules
10. After an immune response, memory cells remain in blood for a long time.
What is the function of a memory cell?
- A. To secrete antibodies
 - B. To kill cells infected with viruses
 - C. To ingest invading bacteria
 - D. To divide to form plasma cells
11. The function of the acrosome in the sperm head is to
- A. Provide ATP for flagellar movements
 - B. Control DNA replication in the sperm
 - C. Enclose genetic material
 - D. Store enzymes used for penetrating the egg.

12. Two genes A and B are linked. An individual who is AaBb produces equal numbers of four gametes AB, Ab, aB, and ab. The best explanation for this would be that.

- A. The genes are on non-homologous chromosomes
- B. Non-disjunction occurred
- C. The two genes are separated by a large distance on the same chromosome.
- D. The two genes are close together on the same chromosome.

13. In typical cell divisions by mitosis and meiosis, all the following contribute to genetic variation EXCEPT

- A. Anaphase of Mitosis
- B. Random union of egg and sperm
- C. Crossing over
- D. Anaphase of meiosis 1

14. Part of the stem of a plant is heated to kill living vascular tissues. How will this treatment affect transport through phloem and xylem.
Key:

✓ transport continues x transport stops

	Phloem	Xylem
A	✓	
B	x	✓
C	✓	
D	x	x

15. Which of the following statements correctly describes the mobilization of nutrients during germination of a seed?

- A. The aleurone releases gibberellic acid which stimulates the embryo to synthesize amylase.
- B. The aleurone releases amylase which stimulates the embryo to synthesize gibberellic acid
- C. Gibberellic acid inhibits amylase synthesis and this ensures constant supply of starch to embryo.
- D. The embryo produces gibberellic acid which causes aleurone to secrete amylase.

16. Which of the following would normally contain blood with the least amount of oxygen?

- A. Capillaries that line the small intestine
- B. The pulmonary arteries
- C. The left atrium
- D. The pulmonary veins

17. Which of the following generates the formation of adaptations?

- A. Genetic drift
- B. Mutations
- C. Gene flow
- D. Natural selection

18. The primary function of progesterone in the menstrual cycle is to

- A. Stimulate development of the corpus luteum
- B. Trigger ovulation
- C. Stimulate development of endometrium
- D. Stimulate development of follicle

19. The transition from a tropical rain forest to a savanna is marked by fewer and fewer trees. This is most likely caused by changes in

- A. The average length of day light
- B. Carbondioxide concentration
- C. Precipitation
- D. Temperature

20. Storage and maturation of human sperm occur in the

- A. Epididymis
- B. Interstitial cells
- C. Seminiferous tubules
- D. Sertoli cells

21. In hepatocytes, detoxification takes place in the

- A. Mitochondrion
- B. Lysosome
- C. Rough endoplasmic reticulum
- D. Smooth endoplasmic reticulum

22. The population dispersion exhibited in nesting territoriality of birds is
- A. Clumped
 - B. Uniform
 - C. Random
 - D. Logistic

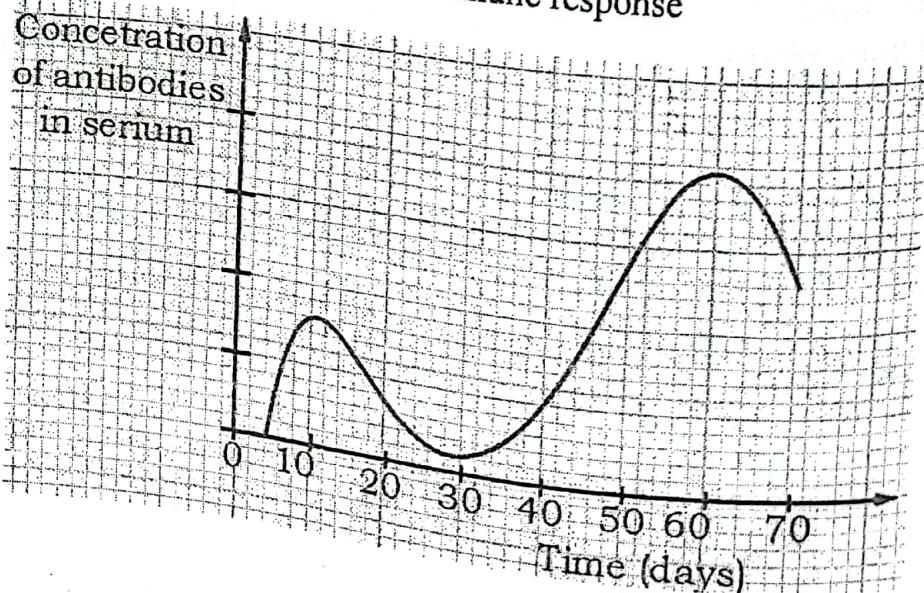
23. Which of the following statements is **not** correct?
- A. Atrial muscles are connected to ventricle muscles, except at the atrioventricular node (AVN)
 - B. Both atria contract at the same time
 - C. Both ventricles contract at the same time
 - D. Contraction of atria is complete before contraction of ventricles

24. Protein synthesis consists of all the following steps except:

- A. Transcription
- B. Translations
- C. Replication
- D. Elongation

25. Which of the following best describes the pattern of punctuated equilibrium in evolution?
- A. Geographical isolation is the predominant mechanism of speciation.
 - B. Speciation events occur relatively rapidly.
 - C. Speciation occurs when random changes accumulate over long periods of time.
 - D. Small changes that accumulate over long periods of time lead to divergence one species into two or more species.

26. The figure below is a graph of an immune response



If the immune responses at day 5 and day 30 are reactions to the same substance, the likely source of antibodies at day 30 are

- A. Cytotoxic T- cells
- B. T-helper cells
- C. Macrophages
- D. Memory cells

27. All the following are effective in lowering body temperature in mammals

EXCEPT

- A. Large ears
- B. Sweating
- C. Decreased muscular activity
- D. Decreased blood flow to extremities

28. Which of the following correctly describes plasmids?

- A. They are DNA segments in the chromosome of bacteria
- B. They are DNA cores of viruses
- C. They can be transferred between bacteria during conjugation
- D. They are composed of RNA and protein.

29. A function of the allantois is to

- A. Fuse with the endometrium and form placenta
- B. Store food for use by the developing embryo.
- C. Store or dispose of wastes from the developing embryo
- D. Form the amniotic cavity.

30. Four genes A, B, C and D occur on the same chromosome. Use the following crossover frequencies to determine the order of the genes of the chromosome

Genes	Cross over frequency
A and D	5%
B and C	15%
A and C	30%
C and D	35%
B and D	50%

- A. BCAD
- B. CBDA
- C. BACD
- D. CDAB

31. The table below shows four hormones and their physiological effects

Hormone	Physiological effect			
	I	II	III	IV
i) Aldosterone	(a) To control the metabolic rate			
ii) Insulin		(b) To maintain the balance of Na^+ and K^+ ions		
iii) Thyroxine		(c) To decrease the glucose level in blood		
iv) Glucagon		(d) To increase the glucose level in blood		

Which of the following is correct for the hormones and their physiological effects

- A. (a) (d) (c) (b)
B. (b) (c) (a) (d)
C. (c) (d) (b) (a)
D. (d) (c) (a) (b)

32. All of the following are examples of counter current exchange EXCEPT

- A. Movement of blood through the legs of a wading birds.
B. Movement of blood through the fins and tails of marine mammals.
C. The loop of Henle in the nephron
D. Gas exchange in elasmobranch fish

33. In a survey carried out in a school with 800 students (equal number of males and females) 20 male students are found to be colour blind. Red-green colour blindness is controlled by a x-linked recessive allele. What is the number of heterozygous, females who have normal colour vision?

- A. 38
B. 76
C. 361
D. 391

34. Where does each stage of aerobic respiration occur in a eukaryotic cell?

	Link reaction	Krebs cycle	Oxidative phosphorylation
A	Cytoplasm	Mitochondrial matrix	Mitochondrial cristae
B	Mitochondrial cristae	Cytoplasm	Mitochondrial matrix
C	Cytoplasm	Mitochondrial cristae	Mitochondrial matrix
D	Mitochondrial matrix	Mitochondrial matrix	Mitochondrial cristae

35. Oogenesis in humans begins

- A. Monthly during the menstrual cycle
- B. At puberty
- C. During embryonic development
- D. During the last days of the third trimester

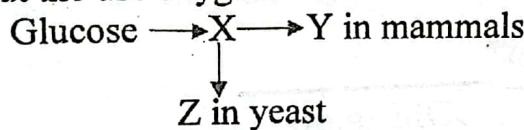
36. Which of the following is not an example of genetic drift?

- A. Evolution of organisms on island distant from the mainland.
- B. The migration or mating of individuals among populations.
- C. The loss of genetic variability of the cheetah.
- D. A new population of self-pollinating plants which originate from dispersal of a single seed.

37. In response to dehydration, ADH is secreted by the posterior pituitary gland one of its effects is to stimulate.

- A. A reduction in the glomerular filtration rate
- B. An increase in the number of aquaporins in the cell membranes of collecting duct cells.
- C. An increase in the uptake of water by cells in the proximal convoluted tubules of nephrons.
- D. An increase in the volume of urine produced by the kidneys.

38. The diagram summarizes how glucose can be used to produce ATP, without the use oxygen.



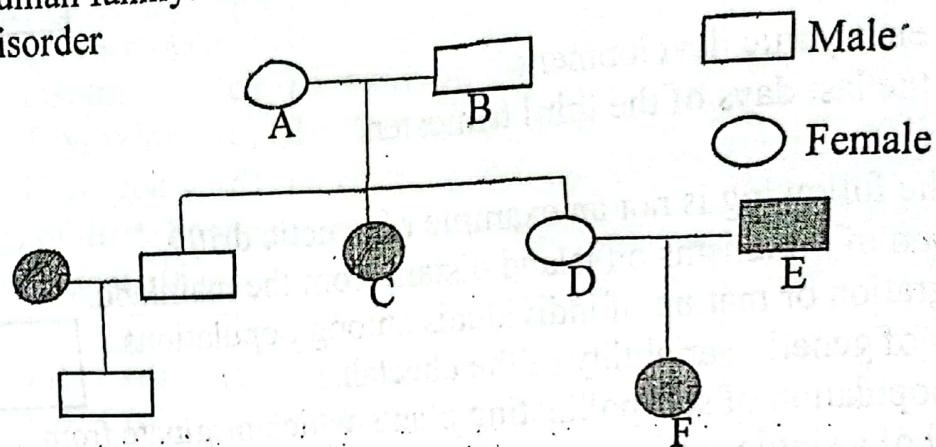
Which compounds are represented by letters X, Y and Z?

	X	Y	Z
A	Ethanol	Pyruvate	Lactate
B	Lactate	Ethanol	Pyruvate
C	Pyruvate	Ethanol	Lactate
D	Pyruvate	Lactate	Ethanol

39. A plant cell is magnified x 2000 and the length of the chloroplast (M) in the diagram is 16mm. What is the actual length of the chloroplast (M) in μm ?

- A. $125 \mu m$
- B. $1.25 \mu m$
- C. $8 \mu m$
- D. $60 \mu m$

40. The diagram below shows the inheritance of a biochemical disorder in a human family. Filled boxes or filled circles indicate a biochemical disorder

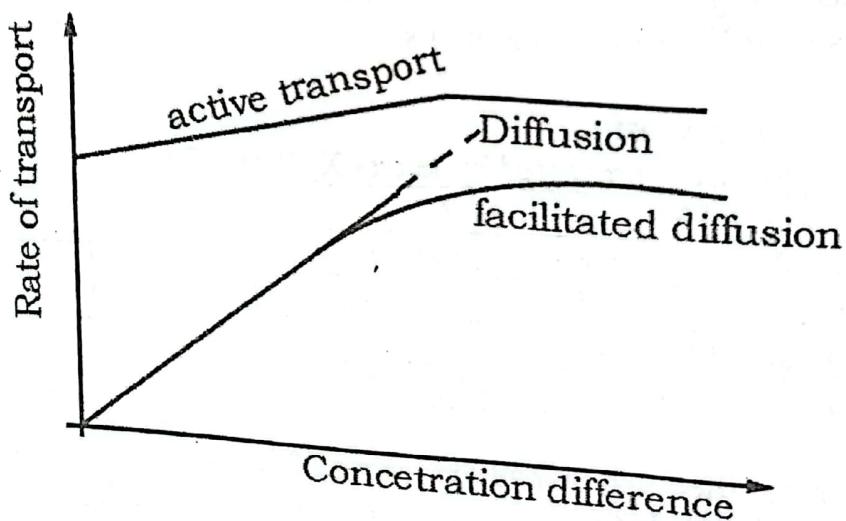


The disorder illustrated in the pedigree is probably inherited as

- A. An autosomal dominant allele
- B. An autosomal recessive allele
- C. An X-linked dominant allele
- D. A Y-linked dominant allele

SECTION B (60 MARKS)

41. The graph below shows the effect of concentration difference of a substance on three transport processes



- (a) With reference to the graphs, state what the three transport processes have in common.
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(b) Explain the rates of transport observed when the concentration difference is zero. | (3 marks)

(3 marks)

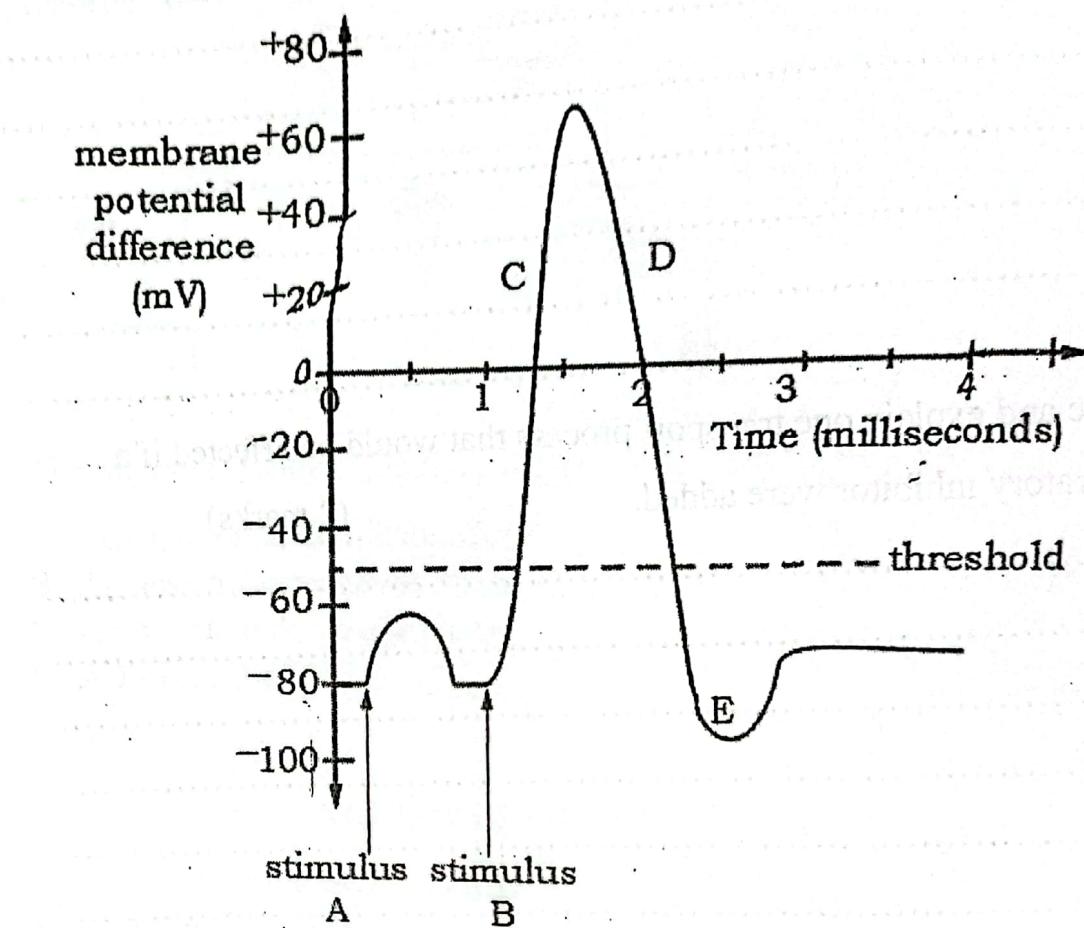
(c) Name and explain one transport process that would be affected if a respiratory inhibitor were added. (2 marks)

(2 marks)

(d) Explain the difference between the graphs for diffusion and facilitated diffusion. (4 marks)

(4 marks)

42. The graph below shows the change in potential difference at point A and B in a neuron during propagation of nerve impulse



(a) From the graph, give the value of;

- (i) Resting potential of the neuron (½ mark)

(ii) The maximum change which occurs in the potential difference across the membrane.

(b) Suggest why stimulus A did not result in action potential being produced where as stimulus B did

(c) Explain in terms of ion movements, the change in potential difference that takes place at

(i) C.....

(ii) D.....

(iii) E.....

(d) Describe two factors which can affect the rate of conduction of action potentials along the axon. (2 marks)

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43.(a) What is meant by double fertilization in flowering plants?

(2 marks)

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(b) Why is outbreeding an advantage to flowering plants. (2 marks)

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(c) How do the following favour outbreeding in flowering plants

(i) relative positions of fertile anther and stigma

(2 marks)

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(ii) Self sterility/incompatibility.

(2 marks)

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(e) More than half of known flowering plants are polyploid species. State

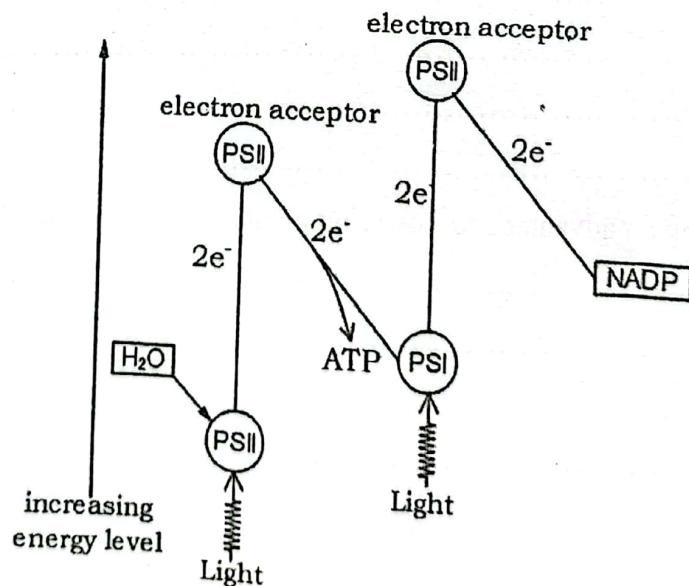
two reasons why polyploidy is common in plants

(2 marks)

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44. The diagram shows the Z-scheme, extract the main steps for cyclic photophosphorylation

(2 marks)



(a) From the Z-scheme, extract the main steps for cyclic photophosphorylation

(3 marks)

(b) Write appropriate equations to show

(i) The photolysis of water

(1 mark)

(ii) The formation of reduced NADP.

(1 mark)

(c) (i) Explain how, as a result of photactivation of chlorophyll ATP and reduced NADP are formed in the chloroplast. (2 marks)

(ii) State the role played by reduced NADP in the light independent reaction (1 mark)

(d) Describe two ways how C₄ and CAM photosynthesis improve upon C₃ photosynthesis.

45. In an investigation, the air temperature and body temperature of the lizard were measured at intervals during one morning. The results are shown in the table below.

Time of day (24 hour clock)	Air temperature °C	Body temperature of lizard °C
07:10	-3.0	2.5
07:20	-1.0	10.0
07:30	-2.0	19.0
08:00	1.0	31.0
08:20	1.5	33.0
08:45	5.0	34.0
10:00	9.0	35.0
11:00	13.0	36.0

(a) Describe the changes in air temperature and body temperature during the following time intervals.

(i) 07:10 to 08:00

(2 marks)

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(ii) 08:00 to 11:00

(2 marks)

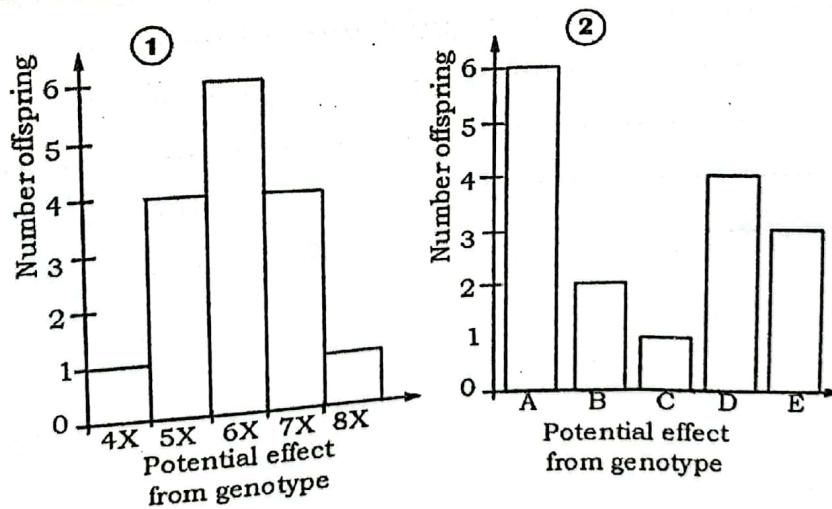
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(b) Suggest how the lizard increases its body temperature during the early morning hours. (2 marks)

(c) Suggest how the lizard controls its body temperature between the hours of 08:45 and 11:00 (2 marks)

(d) Explain why it may be an advantage for this lizard to be able to control its body temperature. (2 marks)

46. Graph 1 and Graph 2 below are the distribution of two characteristics and their variations among the individuals of a species



(a) (i) Give one example of each case in graph 1 and graph -2 (1 mark)

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(ii) State the differences in variation among the individuals for the distribution of two characteristics (4 marks)

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(b) Explain the genetic basis of the results of graph-1 and graph -2.

(2 marks)

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(c) State the importance of variations shown by members of a species.

(3 marks)

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END