Name: ……Index No. …….. Signature:…..……

P530/1
Biology
(Theory)
Paper 1
July/August 2023
2 ½Hours

ACEITEKA MOCK EXAMINATIONS 2023

Uganda Advanced Certificate of Education

BIOLOGY (THEORY)

Paper 1

2 hours 30 minutes

Instructions to Candidates:

Answer **all** questions in both sections **A** and **B.**

Answers to Section **A** should be written in the boxes provided

Answers to Section **B** should be written in spaces provided.

No additional answer sheets should be attached to this booklet.

For Examiner's use only		
Section	**Mark**	**Examiner's signature and No.**
A: 1-40		
B: 41		
42		
43		
44		
45		
46		
Total		

SECTION: A (40 MARKS)

*Write the letter to the correct answer in the corresponding box. Each question in this section carries **one** mark*

1. Which of the following protein structure is not established using disulphide bridges?

A. Primary B. Secondary C. Tertiary D. Quaternary

2. Water is an excellent solvent for solutes that are

A. Polar B. Ionized C. Acidic D. All the three

3. Which of the following would happen If water had a lower specific heat capacity?

A. Seasonal climatic changes would be greater
B. Heavier insects would walk on water
C. Water molecules would be more polar
D. It would not move from roots to the leaves of plants

4. Which level of three dimensional structure of a linear polypeptide results primarily from strong internal bonds between R groups?

A. Primary linear structure
B. Helical secondary structure
C. Beta pleated sheath
D. Tertiary structure

5. Both peptide and glycosidic linkages are formed from

A. Covalent bonds between carbon atoms
B. Linear polymers only
C. Condensation reactions
D. Linkage of carbonyl and acid groups

6. Carbon monoxide binds to the active site of haemoglobin by displacing its oxygen resulting in poisoning, however this can be revered by supplying patients with more oxygen immediately. This suggests that carbon monoxide is

A. A competitive inhibitor B. An irreversible inhibitor

C. An Allosteric effector D. A Co enzyme

7. At equilibrium a system that includes an enzyme plus equal concentration of its normal substrate and a competitive inhibitor will have

A. All enzyme molecules bound to the substrate
B. All enzyme molecules bound to the inhibitor
C. Half the enzyme bound to substrate and half to the inhibitor
D. Some enzymes bound to neither substrate nor inhibitor

8. Table **1** shows the effect of environmental temperature on bacterial growth and their enzymes.

Species	**Maximum growth temperature(º C)**	**Enzyme denaturation temperature(º C)**		
		Indophenol oxidase	**catalase**	**Succinic dehydrogenase**
Bacillus mycoides	40	41	41	41
Bacillus megatherium	48	48	50	47
Bacillus alvei	46	51	50	53
Bacillus vulgatus	55	56	56	50

A valid conclusion from the data is that

A. Different species of bacteria can survive in different temperature
B. The same enzymes in different species of bacteria have similar denaturation temperatures
C. The temperatures at which similar species of bacteria live are closely related with the temperature at which their enzymes are denatured
D. The temperatures at which different species of bacteria live are closely related with the temperature at which their enzymes are denatured

9. In compounds such as ATP that have high phosphoryl group transfer potentials the chemical bond holding the terminal phosphoryl group is best described as

A. Stable and strong
B. Unstable and easily broken
C. Resistant to hydrolysis
D. A reducing agent

10. Which of the following has the least effect on the rate of diffusion of a solvent through a permeable membrane?

A. Temperature of the system
B. Size of the solvent molecule
C. PH of the solvent
D. Steepness of the concentration gradient

11. The difference between cofactors and coenzymes is that coenzymes

A. are proteins while cofactors are not.
B. are not proteins while cofactors are.
C. are organic molecules cofactors are generally inorganic
D. activate enzymes while cofactors activate coenzymes

12. The term **aneuploi**d refers to a cell with

A. One or a few extra or missing chromosomes
B. More than two sets of homologous chromosomes
C. A single haploid set of chromosomes
D. Two sets of homologous chromosomes

13. Meiotic and mitotic cell cycles differ in

A. The stage when DNA is synthesized
B. The number of chromatids per chromosome
C. Whether or not synapsis takes place
D. The number of times DNA replicates per cycle

14. Which of the following phenotypic ratios would you expect in a mating of a female carrier of haemophilia and a normal male?

A. All normal daughters all normal sons
B. All normal daughters all sons with haemophilia
C. All daughters with haemophilia all normal sons
D. All normal daughters half normal sons

15. Which of the following does **not** occur during cyclic photophosphorylation?

A. Oxidation of chlorophyll B. Production of NADH

C. Production of ATP D. Electron transport

16. The survival rate of babies of 3 – 3.5kg at birth has always been higher than that for heavier or lighter newborns. If birth weight is under some degree of genetic control this is an example of

A. Disruptive selection B. Directional selection

C. Stabilizing selection D. Destabilizing selection

17. Starting from a parental stock ,adaptive radiation to a variety of habitats results from which type of selection

A. Stabilizing B. Directional

C. Disruptive D. Both stabilizing and directional

18. In the long term all species are most likely to undergo

A. Extinction B. Disruptive selection

C. Stabilizing selection D. Further speciation

19. If two genes are on the same pair of homologous chromosomes and show recombination, a cross of two individuals heterozygous for both genes will result in how many phenotypes?

A. One B. Two C. Three D. Four

20. Structures in organisms of different species are homologous if they

A. Have a similar appearance
B. Are found in many species within the same community

C. Perform the similar functions
D. Develop from the same embryonic structure and occupy comparable positions

21. Vestigial organs are considered evidence for evolution because of the following except
A. Their structure may show similarities to functional organs in other species
B. They arise from the same embryological source as functional organs in other species
C. They arise from different embryological source as functional organs in other species
D. Their presence fits into the history of the organ as seen in the fossil record

22. In the process of natural selection the role of the environment is to
A. Enable the population to evolve towards a predetermined goal
B. Crease particular adaptations needed at the time
C. Increase the reproductive rate of some members of a population
D. Increase the rate of reproduction of all members of a population

23. Viruses are **not** considered real organisms because they
A. Lack usable genetic information
B. Are not capable of sexual reproduction
C. Do not have their own mechanisms for exchanging matter and energy with the environment
D. Are not capable of evolution

24. In the natural environment gene flow occurs freely between members of
A. Different genera
B. Different species
C. Same species
D. Members of isolated population

25. Which of the following constitutes a post mating reproductive isolating mechanism?
A. Males are isolated from females by geography
B. Courtship behavior of males does not attract proper response from females
C. External genitals of females and males prevents mating
D. An interspecific embryo is unable to develop to term

26. Which of the following would increase the rate of photosynthesis of a plant in where light was the limiting factors
A. Increase the carbon dioxide concentration
B. Increase the temperature
C. Reducing the distance between the plant and light source
D. Increasing the distance between the plant and light source

27. Which of the following classes of muscles is /are voluntary?
A. Skeletal
B. Cardiac

C. Smooth
D. Visceral

28. Learning in which an animal association two phenomena that it experiences at approximately the same time is called

A. Imprinting
B. Operant conditioning
C. Classical conditioning
D. Insight learning

29. Which signal type would provide the fastest communication between bats flying in a dark forest?

A. Chemical
B. Sound
C. Visual
D. Electrical

30. Which of the following is **not** an advantage of breathing air over breathing water?

A. Air is less dense than water so it takes less energy to move during ventilation
B. Oxygen diffuses faster through air than it does through water
C. The oxygen content of air is greater than that of an equal volume of water
D. Air breathing leads to high evaporation rates from the respiratory surface

31. Table **2** shows the osmolality of the haemoglobin of a water mussel and that of its surrounding

Water osmolality	**Haemolymph osmolality**
250	261
500	503
750	746
1000	992

The results show that mussels are

A. Osmoregulators
B. Osmoconformers
C. Isotonic to their environment
D. Hypotonic to their environment

32. Children suffering from severe oral dehydration are given oral rehydration salts in order to

A. Decrease urine output
B. Increase water absorption
C. Kill intestinal bacteria
D. Induce thirst

33. In muscles cells myosin molecules continue moving along actin molecules as long as

A. ATP is present and troponin is not bound to Ca^{2+}
B. ADP is present and tropomyosin is released from intracellular stores

C. ADP is present and intracellular acetylcholine is high
D. ATP is present and intracellular Ca^{2+} is high.

34. The molecular formula of glucose is $C_6H_{12}0_6$. What would be the molecular formula for a polymer made by linking ten glucose molecules together by condensation reactions?

A. $C_{60}H_{120}O_{60}$ B. $C_6H_{12}O_6$ C. C. $C_{60}H_{102}O_{51}$ D. $C_{60}H_{100}O_{50}$

35. The results shows that both cortisol and ACTH bring about

A. A cascade effect
B. Negative feedback
C. Positive feedback
D. Antagonism

36. If the gross primary productivity (GPP) of a grassland is 5000kcal/m^2 per year and 55% is used up by cellular respiration what is the net primary productivity(NPP) in Kcal/m^2/yr.?

A. 2250
B. 2750
C. 5000
D. 7500

37. Which of the following is normally the longest lived reservoir for carbon?

A. Atmospheric carbon dioxide
B. Marine plankton
C. Petroleum
D. Wood

38. Which of the following would cause a cell to switch from cellular respiration to fermentation?

A. The final electron acceptor in the electron transport chain is not available
B. The proton motive force runs down
C. NADH and FADH2 supplies are low
D. Pyruvate is not available

39. All the following can result in polymorphism except

A. Complete metamorphosis
B. Incomplete metamorphosis
C. Multiple alleles
D. Pleiotropy

40. Table **3** shows how many individuals were recorded for each of five species in five separate communities

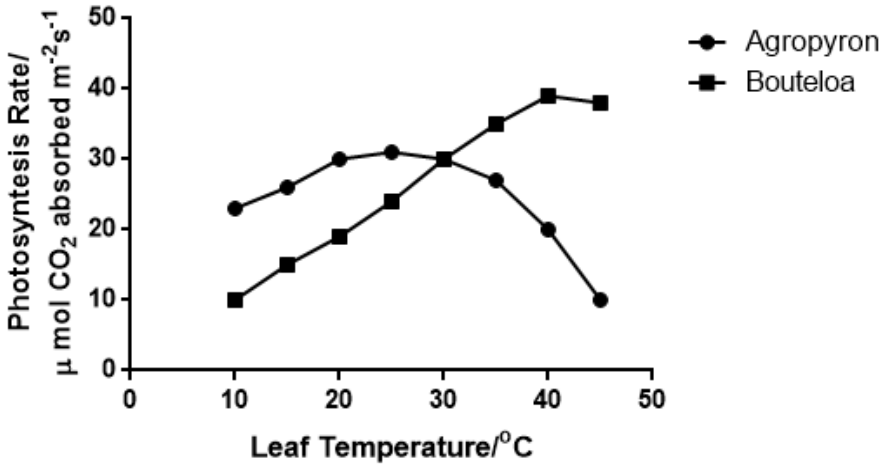
Which community has the highest species diversity?

Community	**Species**				
	1	**2**	**3**	**4**	**5**

A	90	10	0	0	0
B	80	10	10	0	0
C	25	25	25	25	25
D	20	20	20	20	20

SECTION: B (60 MARKS)

41. Figure 1 below is a graph showing the effect of temperature on the rate of photosynthesis in two grasses: Agropyron and Bouteloa



a) State how different the effect of leaf temperature is on the rate of photosynthesis in both grasses (03 marks)

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b) Giving a reason in each case, suggest which of the two grasses is likely to grow faster in a

i) Temperate climate (02 marks)

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ii) Tropical climate (02 marks)

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c) Explain the effect of temperature on the rate of photosynthesis in *Agropyron*

(03 marks)

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42. a) What is meant by the term **pest resurgence**? (02 marks)

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b) Explain the effect of using a broad spectrum pesticide in controlling populations of pests (03 marks)

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d) State **two** ways pesticides can affect non pest organisms in the environment

(02 marks)

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e) Under what circumstances can pest resurgence arise in biological pest control (03 marks)

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43. a) What is meant by the term **variation**? (02 marks)

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b) Explain why certain traits among individuals in a population are

i) continuously distributed (02 marks)

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ii) discontinuously distributed (02 marks)

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c) Describe **one** way in which the environment can affect phenotypic variation (04 marks)

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44. Table **4** shows the results of an experiment that measured the number of mistakes made by maze bright and maze dull rats raised in different environments

	Number of mistakes made in		
Phenotype	**Normal environment**	**Restricted environment**	**Enriched environment**
Maze bright	115	170	112
Maze dull	165	170	122

a) Compare the behavior of the rats in the three environments. (04 marks)

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b) State what is being investigated in this experiment. (01 mark)

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c) What general conclusions can you make from the results of this experiment?

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d) Suggest **two** characteristic of the type of learning investigated (03 marks)

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45. a) State the parameters listed in **Fick's law** of diffusion (03 marks)

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b) Explain how each parameter in **Fick's law** of diffusion is reflected in the structure of the mammalian lung (03 marks)

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c) Explain the changes in oxygen delivery to the tissues that occur as a person proceeds from a resting state to intense exercise (04 marks)

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46. Table 5 shows the results of an investigation in which two plant seedlings **X** and **Y** of different species had their **respiratory quotients (RQs)** measured during their early development.

Number of days from start of germination	**X**	**Y**
1	0.61	0.65
5	0.41	0.91
9	0.71	0.99
13	0.70	1.02

a) State what is meant by the term **respiratory quotient** (02 marks)

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b) State with a reason in each case the possible nature of the respiratory substrates being used by seedlings **X** and **Y** on **days 1** and **13** of the experiment (08 marks)

Seedling X

day1.....

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day13.....

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Seedling Y

day1.....

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day13.....

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