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

P530/1
Biology
(Theory)
Paper 1
July 2024
2 ½ Hours

ACEITEKA JOINT MOCK EXAMINATIONS 2024

Uganda Advanced Certificate of Education

BIOLOGY (THEORY)

PAPER 1

TIME: 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 the 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		

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SECTION: A (40 MARKS)

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

1. The tusks of elephants are modified teeth of which type?

   A. Incisor B. Canine C. Premolar D. Molar

2. Which of the following represents the bile salts?

   A. Bilirubin and biliverdin B. Haemoglobin

   C. Sodium glycocholate and sodium taurocholate D. Chlorocruorin and haemocyanin

3. If loops of Henle were absent from mammalian nephrons which of the following will be expected?

   A. No change in the quality and quantity of urine

   B. Urine would be more concentrated

   C. Urine would be more dilute

   D. No urine would be formed

4. Sickle cell anemia occurs in an African population that exhibits balanced polymorphism for the allele. What causes this?

   A. Varied geographical range

   B. Heterozygote superiority

   C. Maintenance of variation by sympatric speciation

   D. Upset of variation by sympatric speciation

5. Which of the following sets of ions are necessary in the chemical events for nerve transmission?

   A. Na^+ and K^+ B. Ca^{2+} and Mg^{2+} C. Na^+ and Ca^{2+} D. Na^+ and Mg^2

6. In a population with two alleles for a particular locus B and b, the allele frequency of B is 0.7. What would be the frequency of heterozygotes if the population is in Hardy Weinberg equilibrium?

   A. 0.7 B. 0.41 C. 0.21 D.0.42

7. Among allopatric species of Anopheles mosquito, some live in brackish water,some in running fresh water and others in stagnant water. What type of reproductive barrier is

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most obviously separating these differentspecies?

A. Habitat isolation B. Behavioral isolation C. Temporal isolation D. Gametic isolation

8. Plant species **A** and **B** have diploid number **12** and **16** respectively. A new species **C** arises as an allopolyploid from hybridization between species **A** and **B** and has a diploid number of 28. The type of speciation described is

A. Allopatric B. Sympatric C. Natural selection D. Adaptive radiation

9. Which one of the following is not an example of polymorphism in humans?Variation in

A. Height B. Intelligence C. Sex D. Fingerprint

10. Which of the following is **not** part of an older tree's bark?

A. Cork B. Cork cambium C. Lenticels D. Secondary phloem

11. The lateral roots of a young dicot originate from the

A. Pericycle of the tap root B. Endodermis of fibrous roots

C. Meristematic cells of the protoderm D. Vascular cambium

12. According to the fluid mosaic model of the plasma membrane, the structural proteins of the membrane are

A. Spread in a continuous layer over the inner and outer surfaces of the membrane.

B. Confined to the hydrophobic core of the membrane

C. Imbedded in a lipid bilayer

D. Randomly oriented in the membrane

13. Most cells cannot harness heat in order to perform work because

A. Heat is not a form of energy

B. Cells do not have much heat they are relatively cool

C. Temperature is usually uniform throughout a cell

D. There are no mechanisms in nature that can use heat to do work.

14. Which of these correctly describes the distribution of ions on either side of an axon when it is not conducting a nerve impulse?

A. Na^+ outside and K^+ inside

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B. K^+ outside and Na^+ inside

C. Charged protein outside, Na^+ and K^+ inside

D. Na^+ and K^+ inside and water inside

15. Animals with which of these structures are most likely to excrete a semisolid nitrogenous waste?

A. Nephridia B. Malpighian tubules C. Human kidneys D. Moist skins

16. Which of the following is incorrect about the vertebrate eye?

A. The vitreous humor regulates the amount of light entering the pupil.

B. The transparent cornea is an extension of the sclera

C. The fovea is the centre of the visual field and contains only cones

D. The retina lies just inside the choroid and contains photoreceptor cells

17. Which of these explains why in the DNA structure cytosine pairs with guanine and not adenine?

A. A cytosine adenine pair would be too wide to fit in the double helix

B. Cytosine and adenine bases are both polar

C. A cytosine adenine pair would not reach across the double helix

D. The functional groups that form hydrogen bonds are not complimentary between cytosine and adenine.

18. Receptor sites for neuro transmitters are located on the

A. Tips of axons B. Axon membranes of the nodes of Ranvier

C. Postsynaptic membrane D. Presynaptic membrane

19. Which of the process in the nephron is least selective?

A. Secretion B. Reabsorption C. Absorption D. Filtration

20. An example of antagonistic hormones controlling homeostasis is

A. Thyroxin and Parathyroid hormone in calcium balance

B. Insulin and Glucagon in glucose metabolism

C. Progesterone and Oesterogen of sexual reproduction

D. Oxytocin and prolactin in milk production

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21. Compared to the intestinal fluid that bathes active muscle cells, blood reaching muscle tissue in arteries has a

A. higher Partial pressure of O2
B. higher Pp of CO2
C. Greater bicarbonate concentration
D. lower pH

22. Compared to a human, a diving mammal of equal size has

A. Less blood
B. Larger lungs
C. A larger spleen
D. Less oxygen stored in muscles

23. Which of the following is **not** characteristic of the early stages of a localized inflammatory response?

A. Increased permeability of capillaries
B. Attack by cytotoxic T cells
C. Release of clotting protein
D. Release of histamine

24. A decrease in the pH of human blood caused by exercise would

A. Decrease breathing rate
B. Increase heart rate
C. Decrease the amount of oxygen unloaded from hemoglobin
D. Decrease cardiac output

25. If a long day plant has a critical day length of 9hours, which of the following 24 hour cycles would prevent flowering?

A. 16hrs light / 8hrs dark
B. 14hrs light / 10hrs dark
C. 15.5hrs light/ 8.5hrs dark
D. 4hrs light/ 8hrs dark / 4hrs light / 8hrs light

26. The phytochrome system helps set the biological clock by indicating to a plant that light is present when

A. Pr is rapidly converted to Pfr
B. Pfr is slowly converted to Pr
C. Pr and Pfr are equal in concentration
D. Red light is absorbed by Pfr

27. Which of these conditions is needed by almost all seeds to break dormancy?

A. Exposure to light
B. Imbibition
C. Abrasion of seed coat
D. Exposure to cold temperature

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28. Micronutrients are needed in very small amounts because

A. Most of them are motile in the plant

B. Most function as cofactors for enzymes

C. Most are supplied in large enough quantity in seeds.

D. They play only a minor role in the health of the plant.

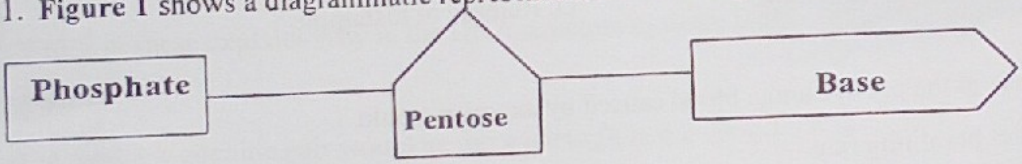
29. Most of the mass of organic material of a plant come from

A. Water B. Carbon dioxide C. Atmospheric nitrogen D. Soil mineral

30. Red green color blindness is caused by a sex linked recessive allele. A colorblind man marries a woman with normal vision whose father has color blindness. What is the probability that their first son will be color blind?

A. ½ B. ¼ C. ¾ D. 0

31. **Figure 1** shows a diagrammatic representation of a biological molecule



The molecule represented is most likely to be

A. An amino acid B. A nucleoside C. A nucleotide D. A nucleic acid

32. One common feature about C3, C4 and CAM photosynthesis is that their first stable products are all

A. Bases B. Acids C. Sugars D. Carbohydrates

33. A mixed nerve takes nerve impulses

A. To the CNS

B. Away from the CNS

C. Both to and away from the CNS

D. Only inside the CNS

34. Which of these is the first component and the last component in a spinal reflex?

A. Axon and dendrite

B. Sense organ and muscle effector

C. Ventral horn and dorsal horn

D. Motor nerve and sensory nerve

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35. Which of these gives the correct path for light rays entering the human eye?

A. Sclera, retina, choroid, lens, cornea

B. Fovea centralis, pupil, aqueous humor, lens

C. Cornea, pupil, lens, vitreous humor, retina

D. Optic nerve, sclera, choroid, retina, humors

36. Which one of these correctly describes the location of the organ of Corti?

A. Between the lymphatic membrane cell and the oral window in the inner ear

B. In the utricle and saccule within the vestibule

C. Between the tectorial membrane and the basilar membrane in cochlea

D. Between the outer and inner ear with the semicircular canals

37. Which of these wouldn't one mention when tracing the path of soundvibrations?

A. Auditory canal B. Tympanic membrane

C. Semicircular canals D. Cochlea

38. Which one of the following organs in ruminants release HCl and pepsin?

A. Abomasum B. Reticulum C. Omasum D. Rumen

39. Thought of delicious food sometimes makes one's mouth watery due to

A. Hormonal response B. Neural response

C. Olfactory response D. Optic response

40. A person is wearing glasses with concave lenses for correcting vision. Whilenot using the glasses the image of a distant object in this case will be formed

A. On the blind spot B. Behind the retina

C. In front of the retina D. On the yellow spot

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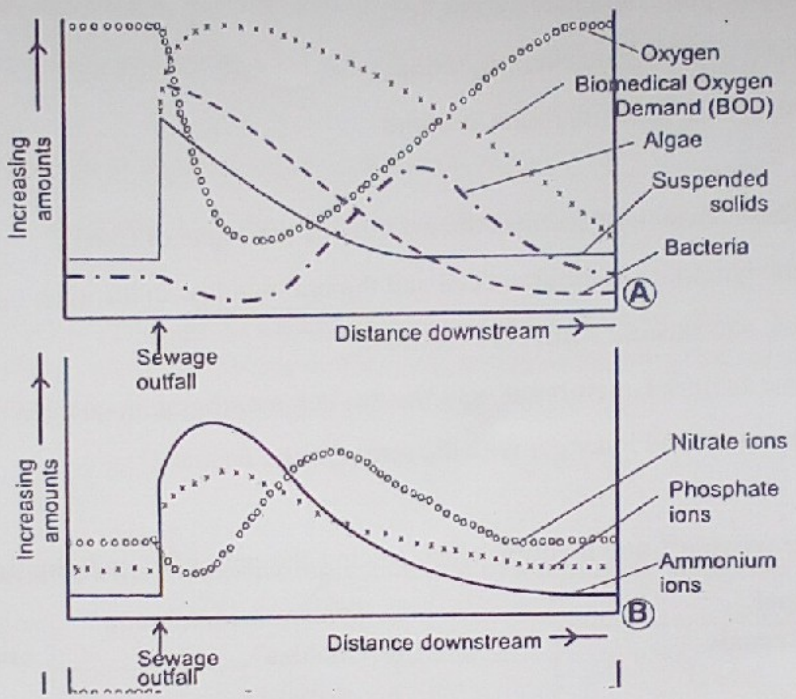
SECTION: B (60 MARKS)

41 Figure 2 below shows some of the effects of discharge of raw sewage into ariver.



Fig, 2

a) Explain the decrease in oxygen concentration downstream after the input of raw sewage.

(02marks)

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b) Explain the increase in ammonia and phosphate concentration downstream following the input of raw sewage.

(02 marks)

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c) Explain why the maximum concentration of nitrate downstream is above of maximum concentration of ammonia. *(02 marks)*

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d) Explain the increase in number of algae shown in the graph. *(02 marks)*

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e) Suggest reasons for the decrease in numbers of bacteria, downstream of part of the river where there is the maximum number of bacteria. *(02 marks)*

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42. a) Explain why it is necessary for fresh water animals to have osmoregulatory mechanisms. *(02 marks)*

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b) Explain the general principles illustrated by each of the following examples.

i) Tilapia a fresh water fish dies when placed in sea water *(03 marks)*

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ii) Maia the spider crab dies if placed in fresh water *(03 marks)*

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c) Fluid from the end sac of a freshwater cray fish is isotonic with its blood but hypotonic urine is produced *(02 marks)*

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43. In mice the allele for black coat color **B** is dominant to that for white coat. At a different locus a dominant allele (A) produces a band of yellow just below the tip of each hair in mice with black fur. This gives a frosted appearance known as **agouti.** Expression of the recessive allele (a) results in a solid coat color. If mice that are heterozygous at both loci are crossed, what will be the expected phenotypic ratio of their offspring? *(10 marks)*

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44. a) State **two** main types of **orientation responses.** *(02marks)*

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b) State two ways in which an orientation response differs from a reflex action. *(02 marks)*

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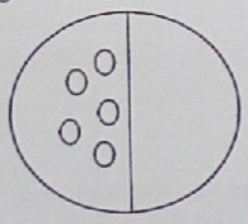
c) **Figure 3** shows a choice chamber indicating the position of wood lice which have been placed in the dry side of the chamber

fig.3



i) In the space below draw a similar diagram to show the likely position of the wood lice 5 minutes later *(01 mark)*

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ii) Name the type of orientation behavior exhibited by the wood lice in this investigation

(02 marks)

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iii) State **three** characteristics of non-learned behaviors *(03marks)*

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45. a) Distinguish between **differentiation** and **development** as used in plant growth

(01 mark)

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b) **Table 1** shows dry weight of germinating potato tubers and their sprouts

Week	1	2	3	4	5	6	7
Total dry wt (g)	54.0	48.0	44.0	34.8	36.4	46.4	71.2
Stalks dry wt (g)	0.0	0.0	0.0	1.6	2.8	10.0	23.2
Leaves dry wt (g)	0.0	0.0	0.8	2.8	12.4	26.8	0.0

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Explain the changes in **total dry weight**

i) Between weeks **1** and **3** ***(03 marks)***

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ii) Between weeks **3** and **4** ***(03 marks)***

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iii) Between weeks **4** and **5** ***(03 marks)***

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46. **Figure 4** shows changes in membrane potential in neurons when an impulse arrives at a synapse.

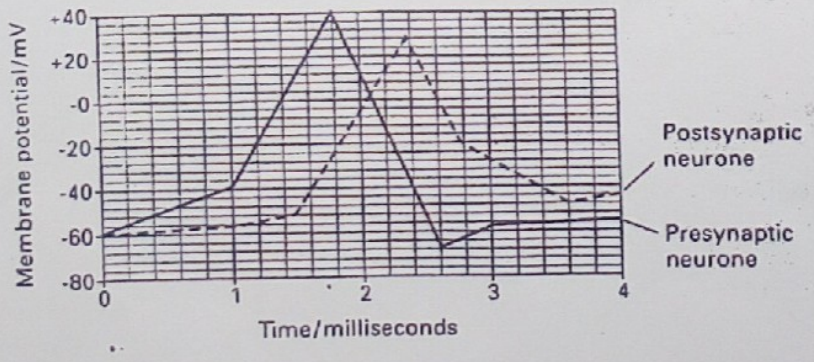

fig.4

a) Indicate on the graph the period of **depolarization** and **repolarization** ***(02marks)***

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b) Explain the change in polarity at 1.8ms? *(03marks)*

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c) Explain the time delay between depolarization of the presynaptic and postsynoptic membranes *(03 marks)*

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d) How does a drug like caffeine affect synaptic transmission? *(02 marks)*

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END

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