P530/1
BIOLOGY
Paper 1
AUGUST, 2023
$2\frac{1}{2}$ *hours*

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – AUGUST, 2023

BIOLOGY

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

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

SECTION A:
Answers to this section must be written in the answer sheet provided at the end of this section.

SECTION B:
Answers to this section should be written in the spaces provided and not anywhere else.

No additional sheets of paper should be inserted in this booklet.

For Examiner's Use Only

SECTION		MARKS
Section A:	1 – 40	
Section B:	41	
	42	
	43	
	44	
	45	
	46	
TOTAL		

 Turn Over

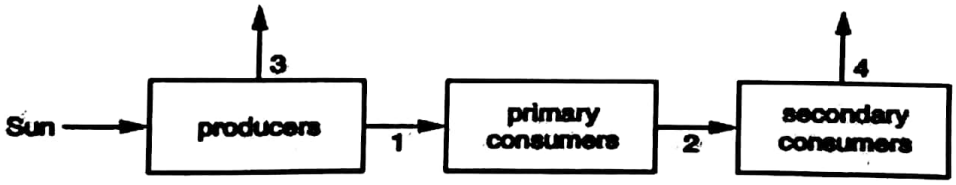
SECTION A (40MARKS)

1. Which of the following animal dormancy responses result in suspended development during unfavourable cold environmental conditions?
   A. Aestivation
   B. Hibernation
   C. Diapause
   D. Kinesis

2. Which type of molecule is the end product of translation?
   A. amino acid
   B. DNA
   C. mRNA
   D. polypeptide

3. What is the volume of blood ejected from a heart in one hour if its stroke volume is 60 cm^3 and the heart rate is 75 beats per minute?
   A. 4.5 dm^3
   B. 270 dm^3
   C. 45 dm^3
   D. 360 dm^3

4. The diagram shows the flow of energy through an ecosystem.



Which arrows represent the smallest amount of energy transferred between organisms, and the largest amount of energy lost to the ecosystem?

	Smallest energy transfer	Largest energy transfer
A	1	3
B	1	4
C	2	3
D	2	4

5. The hormone produced from the duodenal mucosa which stimulates the production of bile by the liver is called

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A. Insulin
B. Cholecystokinin
C. Gastrin
D. Secretin

6. The rapid fall of progesterone towards the end of pregnancy is due
A. Fetus pressing against cervix
B. Increase in amount oxytocin
C. Fetus producing steroid substances
D. Increase in amount of oestrogen in blood

7. Which one of the following is not true of a contracted muscle fibre?
A. M-line shortens
B. Sarcomere shortens
C. H-zone shortens
D. Light bands shorten

8. Which processes are essential in making nitrogen in dead plant material available to growing plants?

1 ammonification
2 deamination
3 nitrification
4 nitrogen fixation

A 1, 2 and 3 only
B 1, 2 and 4 only
C 2, 3 and 4 only

9. Which cell activity must occur before prophase of mitosis can begin?
A. Break down of the nuclear envelope
B. Increased production of mRNA
C. Migration of centrioles to opposite poles
D. Replication of DNA

10. Which part of a phospholipid molecule makes up most of the thickness of a cell surface membrane?
A. glycerol
B. hydrocarbon chains
C. hydrophilic head
D. phosphate group

11. Which type of tissue is present in the walls of all blood vessels?
    A. elastic
    B. endothelial
    C. fibrous
    D. smooth muscle

12. When marine fish like shark is transferred from Indian Ocean to Lake Victoria, it is unable to survive. This is due to its
    A. Excretion of trimethylamine oxide a totally non-toxic waste
    B. Glomeruli are small and few in number
    C. Chloride secretory cells in gills take up more salts from the water
    D. Excretion of urea which is less toxic

13. In poultry the cross between normal white leg horn crossed with coloured frizzle female gives the following results.

Phenotype	%
White normal	63
White frizzle	18
Coloured normal	13
Coloured frizzle	63

The cross over value (COV) of these gene is;

A. 19.7%
B. 16.25%
C. 13.8% D. 14.8%

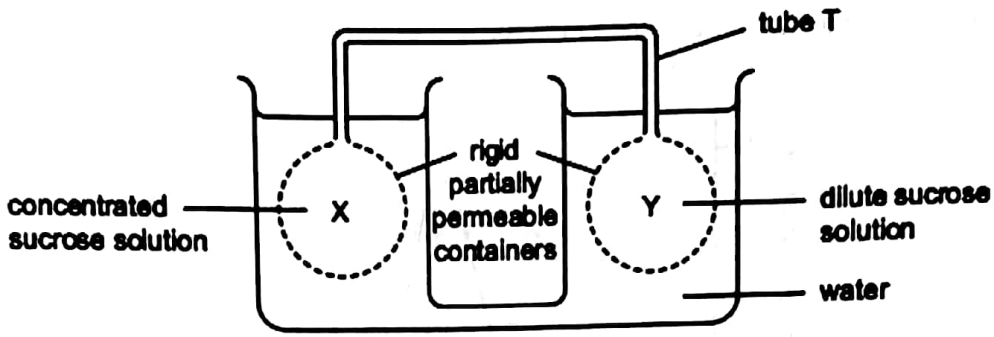
14. The blood cells which engulf and digest bacteria are;

    (i) leucocytes
    (ii) neutrophils
    (iii) basophils
    (iv) monocytes

    A. (i) and (iii)
    B. (ii) and (iv)
    C. (i), (iii) and (iv)
    D. (iii) and (iv)

15. During water stress, photosynthesis reduces in plants mainly due to shortage of
    A. water
    B. mineral salts
    C. carbon dioxide
    D. sunlight

16. The diagram shows a model which can be used to demonstrate mass flow.



X and Y are filled with sucrose solutions of different concentration, causing water to move in or out of X and Y by osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through the tube T joining X and Y.

Which description of this is correct?

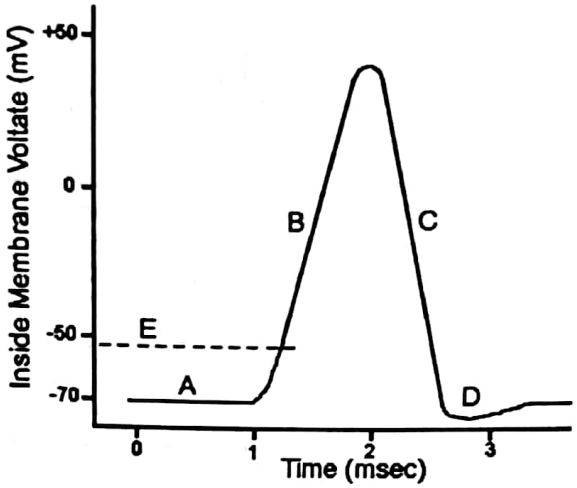
	water potential in X compared with Y	direction of movement of sucrose solution in tube T
A	higher (less negative)	from X to Y
B	higher (less negative)	from Y to X
C	lower (more negative)	from X to Y
D	lower (more negative)	from Y to X

17. Which one of the following represents the correct order of structures through which light passes before striking the retina?
    A. Conjunctiva, cornea, aqueous humour, lens, vitreous humour, retina
    B. Corna, conjunctiva, vitreous humour, lens, aqueous humour, retina
    C. Conjunctiva, cornea, vitreous humour, lens, aqueous humour, retina
    D. Conjunctiva, cornea, lens, vitreous humour, aqueous humour, retina

18. Which of the following extra embryonic membranes forms the umbilical cord in the placental mammals?
    A. Allantois
    B. Yolk sac
    C. Amnion
    D. Chorion

19. The hormone commonly used to test for pregnancy in mothers is
    A. Progesterone
    B. Oestrogen
    C. Chorionic gonadotrophin
    D. Oxytocin

20. The figure below shows the changes in electrical potential in an axon membrane when an impulse is transmitted



At which stage of the electrical potentials marked, is the axon most impermeable to sodium ions?

21. Which of the following forms of air pollution will directly affect the distribution of lichens?
    A. High carbon dioxide levels
    B. Chlorofluorocarbons in air
    C. High levels of sulphur dioxide
    D. Spraying pesticides

22. Which one of the following will not increase blood sugar in human blood?
    A. Gluconeogenesis
    B. Glycogenolysis
    C. Glycogenesis
    D. Adrenaline secretion

23. The separation of the chromatids during anaphase in mitosis is a direct result of
    A. Chromatid repulsion
    B. Centromere divisions
    C. DNA duplications
    D. Spindle fibre activity

24. In which one of the groups A to D are all the three organs not homologous?
    A. Human fore arm, bat wing and bird wing
    B. Fish pectoral fin, whale flippers and penguin wings
    C. Human fore arm, whale flippers and bird wings
    D. Bat wing, bird wing and insect wing

25. The intermittent output of blood in the mammalian heart is converted to steady blood flow in the capillaries by
    A. Elastic tissue in the vein walls
    B. Muscular tissue in the arterial wall
    C. Regular contraction of the pre-capillary sphincters
    D. Elastic tissue in the arterial walls

26. Which one of the following statements about the mammalian kidney is true?
    A. Urine has similar composition as the glomerular filtrate
    B. Glucose is not found in the proximal convulated tubules
    C. The kidney excretes carbon dioxide in the form of bicarbonate D. A low blood pressure does not affect kidney function

27. Which property of water is most important to submerged hydrophytic plants?
    A. Cohesion
    B. Oxygen solubility
    C. Surface tension
    D. Transparency

28. Which of the following mammalian organs below have both the endocrine and exocrine functions?
    A. Stomach
    B. Colon
    C. Kidney
    D. Heart

29. It is safe to transfuse group B rhesus positive blood into a recipient of
    A. Group AB rhesus positive
    B. Group A rhesus positive
    C. Group O rhesus positive
    D. Group O rhesus negative

30. Which of the following is an effect on the ventilation rate of the lungs rebreathing expired air for a period of two minutes?
    A. Ventilation rate remains constant within the two minutes
    B. Ventilation rate that is maintained constant within the two minutes
    C. Ventilation rate increases rapidly to higher rate that is maintained constant within two minutes
    D. Ventilation rate at higher rate rapidly decreases within two minutes

31. Which one of the following conversions occurs in human under the conditions of starvation?
    A. Fatty acids to carbohydrates
    B. Proteins to carbohydrates
    C. Glucose to lipids
    D. Lipids to lipo-proteins

32. Which of the following statements is true of a mature dicotyledonous seed?
    A. The testa is a layer formed from the integuments of the ovule
    B. The endosperm is formed from the fusion of a sperm nucleus and an egg nucleus
    C. The cotyledon is a food store derived from the tissues of the ovary
    D. The plumule is the part of the embryo that will enventually form the root

33. In garden peas, the pairs of alleles coding for seed shape and colour are not linked. The allele for smooth seeds (S) is dominant over the allele for wrinkled seeds(s). The allele for yellow seeds (Y) is dominant over the allele for green seeds (y).
    If a plant of genotype Ssyy is crossed with plant of genotype ssYy, which offspring are recombinants?
    A. SsYy and Ssyy
    B. SsYy and ssYy
    C. SsYy and ssyy
    D. Ssyy and ssYy

34. What is disruptive selection?
    A. Selection against the extremes of a population
    B. Change in the phenotype in one particular direction
    C. Sudden selection of desirable phenotypes in the population
    D. Selection against intermediate phenotypes in favour of the extremes

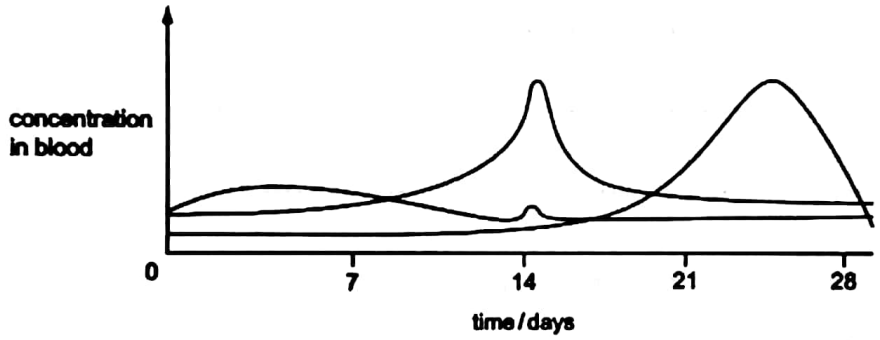
35. Which one of the following reactions would yield the least ATP?
    A. Conversion of hexose sugar to triose phosphate
    B. Oxidation of triose phosphate to pyruvic acid
    C. Anaerobic breakdown of glucose into ethanol or lactic acid
    D. Oxidation of pyruvic acid in the krebs cycle

36. Which one of the following is not caused by deforestation?
    A. Global atmospheric warming due to greenhouse effect
    B. Disappearance of water catchment areas
    C. Improved germination of positively photoblastic seeds
    D. Decrease in plant diversity

37. Which of the following represent the sporophyte stage in flowering plants?
    A. Embryo or seed
    B. Pollen grain or mature embryo sac
    C. Seed and ovum
    D. Pollen grains and ovum

38. Which statement most accurately describes a nerve impulse?
    A nerve impulse is
    A. The sudden depolarization of the nerve cell membrane
    B. The spread of a wave of electrons down the axon
    C. A self-propagating change in polarity across the membrane
    D. The active removal of sodium ions across a membrane

39. The graph shows the concentration in the blood of three of the four hormones FSH, LH, oestrogen and progesterone.



Which hormone is not shown?

    A. FSH
    B. LH
    C. oestrogen
    D. progesterone

40. The bond between a glycerol molecule and a fatty acid molecule is:
    A. glycosidic bond
    B. peptide bond
    C. phosphodiester bond
    D. ester bond

SECTION B (60 MARKS)

41. (a) Briefly describe four ways how the skeletal muscle is adapted to its function. *(04 marks)*

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(b) Explain the role of the following in muscular contraction. *(06 marks)*

(i) Calcium ions

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(ii) ATP molecules

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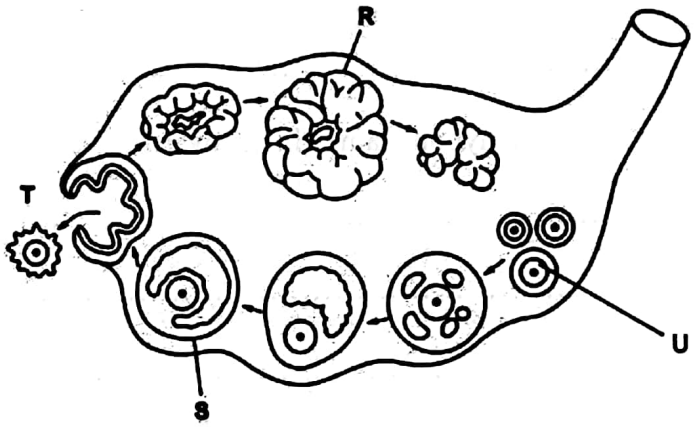
42. The diagram below shows the sequence of events that take place during ovarian human female



(a) Identify structures labeled *(02 marks)*

R.....

S.....

T.....

U.....

(b) State the main hormone secreted by structure labelled R, clearly giving its role during the cycle. *(02 marks)*

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(c) Briefly describe what would happen if fertilization does not occur *(03 marks)*

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(d) Explain the role of the hypothalamus in the ovarian cycle. *(03 marks)*

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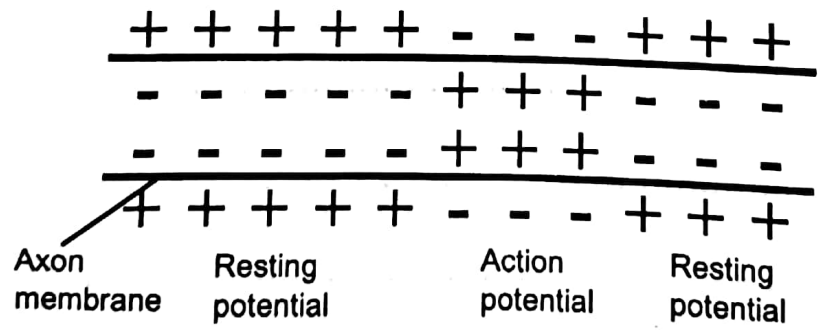
43. Figure below shows the changes in the charge across the surface membrane of a non-myelinated axon when an action potential is produced.



(a) (i) Describe how the change shown in the figure occurs when an action potential is produced *(02 marks)*

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(ii) Explain what causes the conduction of impulses along a non-myelinated axon to be slower than a myelinated axon. *(03 marks)*

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(b) Describe two ways in which hormonal control differs from nervous control *(02 marks)*

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(c) Give three differences between rods and cones in a retina *(03 marks)*

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44. (a) What is meant by the following terms? *(03 marks)*

(i) Integrated pest management (IPM)

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(ii) Indicator species

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(b) Suggest why all the insecticides related to DDT have gone out of use? *(03 marks)*

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(c) Suggest two advantages and disadvantages of using biological control method in pest control. *(04 marks)*

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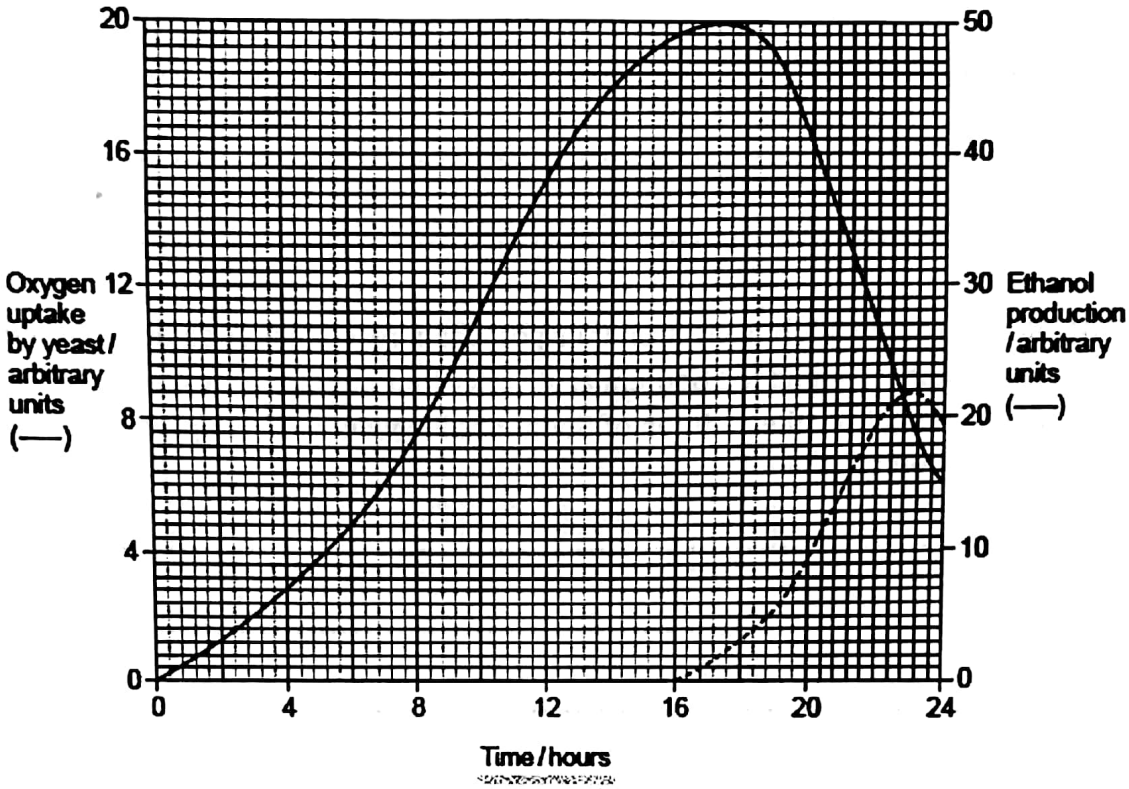
45. Yeast is a single celled organism. A student investigated respiration in a population of yeast growing in a sealed container. His results are shown in the graph below.



a) Calculate the rate of oxygen uptake between 2 and 9 hours *(02 marks)*

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b) Explain the changes in oxygen uptake during this investigation *(03 marks)*

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c) Explain the changes in production of ethanol during this investigation *(02 marks)*

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d) Sodium azide inhibits electron transport chain reactions. A student repeated the investigation but added Sodium azide after four hours. Suggest and explain how the addition of Sodium azide would affect uptake of oxygen and production of ethanol. *(03 marks)*

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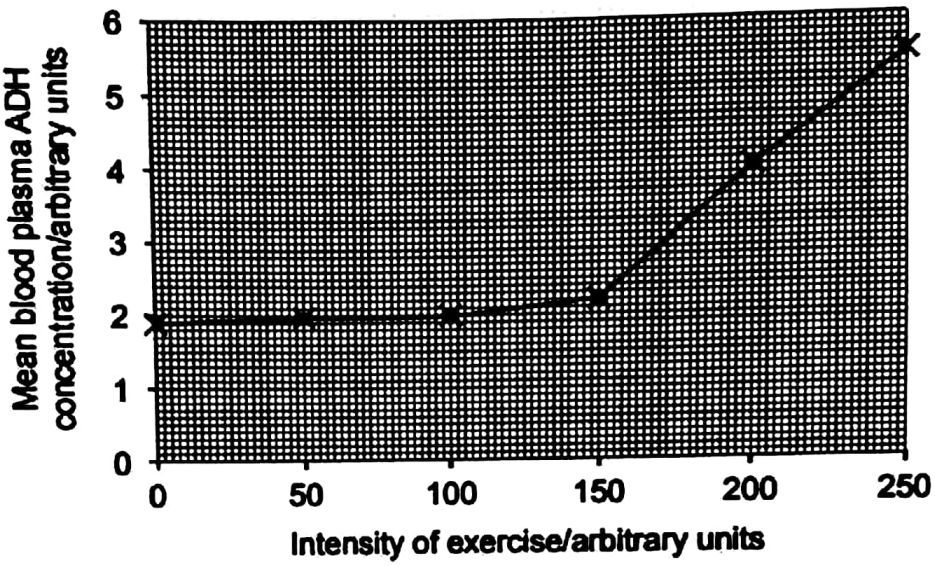
46. The effect of intensity of exercise on the concentration of ADH in blood plasma was investigated in a group of students. They carried out exercises of different intensities for the same length of time, and the ADH concentration in each student was measured one hour after the exercise. The results of the investigation are summarised in the graph below.



a) Identify one other controlled variable appropriate for this investigation.

(01 mark)

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b) Name the organs in the body that secretes and stores ADH.

(02 marks)

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c) Describe and explain the trend shown and the consequence of this on kidney function. (04 marks)

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d) Suggest what would happen to some students whose ADH blood concentration failed to change and remained at 2a.u during the intensive exercise throughout the whole time of investigation. (03 marks)

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 End