

P530/1
Biology
Paper 1
July/August, 2023
2 ½ hours



UGANDA MUSLIM TEACHERS' ASSOCIATION
UMTA JOINT MOCK EXAMINATIONS – 2023

NAME.....

INDEX NO.....SIGNATURE.....

UGANDA ADVANCED CERTIFICATE OF EDUCATION

Biology Paper one

2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES:

- Answer all questions in sections A and B
- Answers to section A must be written as letters in the corresponding columns.
- Answers to section B must be written in the spaces provided

FOR EXAMINERS USE ONLY

SECTIONS	MARKS
A: 1 – 40	
B: 41	
42	
43	
44	
45	
46	

SECTION A (40 MARKS)

Write the letter corresponding to the most correct answer in the box provided.

1. The different shapes and functions of different proteins are determined by
 - A. The R groups of the amino acids they contain.
 - B. The amino groups of the amino acids they contain.
 - C. The carboxyl groups of the amino acids they contain.
 - D. Whether or not they contain any amino acids.

☐
2. Facilitated diffusion is often used in the transport of....
 - A. Ions.
 - B. Water.
 - C. Large sized molecules only.
 - D. Molecules that are soluble in lipids.

☐
3. The energy that is used to establish the proton gradient across the thylakoid membrane comes from the
 - A. Synthesis of ATP.
 - B. Synthesis of NADPH.
 - C. Passage of electrons along the electron transport chain of photosystem II.
 - D. Splitting of water.

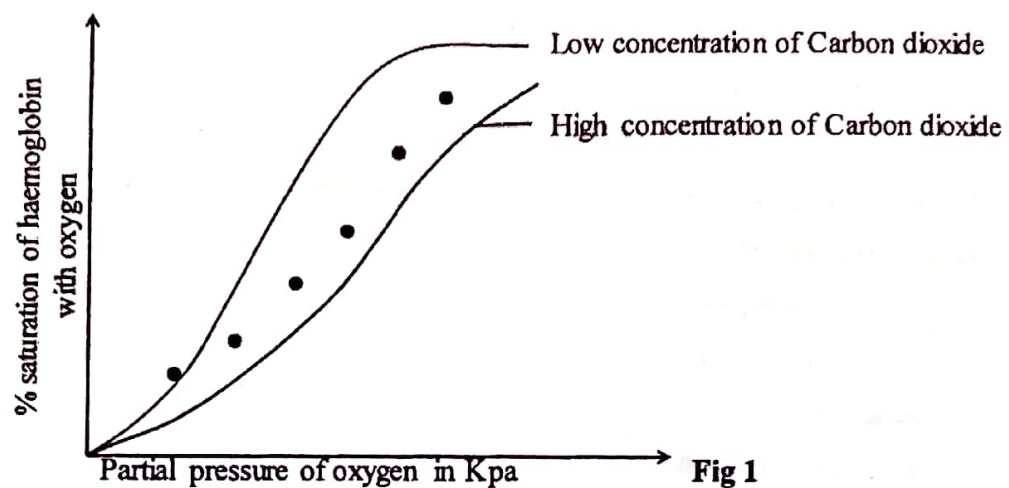
☐
4. The electron transport chain of aerobic respiration involves;
 - A. Generating oxygen from water.
 - B. Producing NADH by chemiosmosis
 - C. Pumping electrons into the mitochondrial matrix.
 - D. Pumping protons into the space between the inner and outer mitochondrial membranes.

☐
5. Which of the following is not a threat to the survival of small population?
 - A. In breeding
 - B. Breeding in captivity.
 - C. Habitat destruction.
 - D. Disease out breaks.

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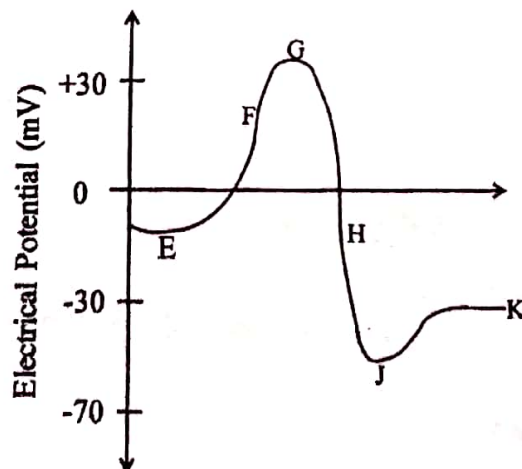
6. A gene is expressed when it is
- Present in the genome of an individual.
 - Transcribed into mRNA and that mRNA is translated into protein.
 - Duplicated during the replication of DNA.
 - Prevented from interacting with RNA polymerase.
7. Starlings produce an average of five eggs in each clutch. If there are more than five, the parents cannot adequately feed the young. If there are fewer than five, predators may destroy the entire clutch, this is an example of
- Disruptive selection
 - Directional selection.
 - Sexual selection
 - Stabilizing selection.
8. The main difference between chemosynthetic autotrophs and photosynthetic autotrophs is that only
- Chemosynthetic autotrophs obtain energy from inorganic molecules.
 - Photosynthetic autotrophs use carbon dioxide as a carbon source.
 - Chemosynthetic autotrophs use carbon dioxide as a carbon source.
 - Photosynthetic autotrophs synthesize organic compounds.
9. Which of the following organelles doesn't contain a partially permeable membrane?
- Ribosome
 - Mitochondrion.
 - Lysosome
 - Golgi apparatus.
10. During a primary immune response, the following events take place
- Some B – lymphocytes form plasma cells.
 - B – lymphocytes with the specific cell surface receptors divide repeatedly by mitosis.
 - Specific antibody is produced.
 - T – helper cells secrete cytokines.
 - T – helper cells identify a specific antigen.
- In which sequence will the events take place?
- 2 → 1 → 4 → 3 → 5
 - 2 → 4 → 3 → 1 → 5
 - 5 → 4 → 2 → 1 → 3
 - 5 → 4 → 3 → 1 → 2

11. Figure 1 below shows the percentage saturation of haemoglobin with oxygen at different partial pressures of oxygen and two different concentration of carbon dioxide.



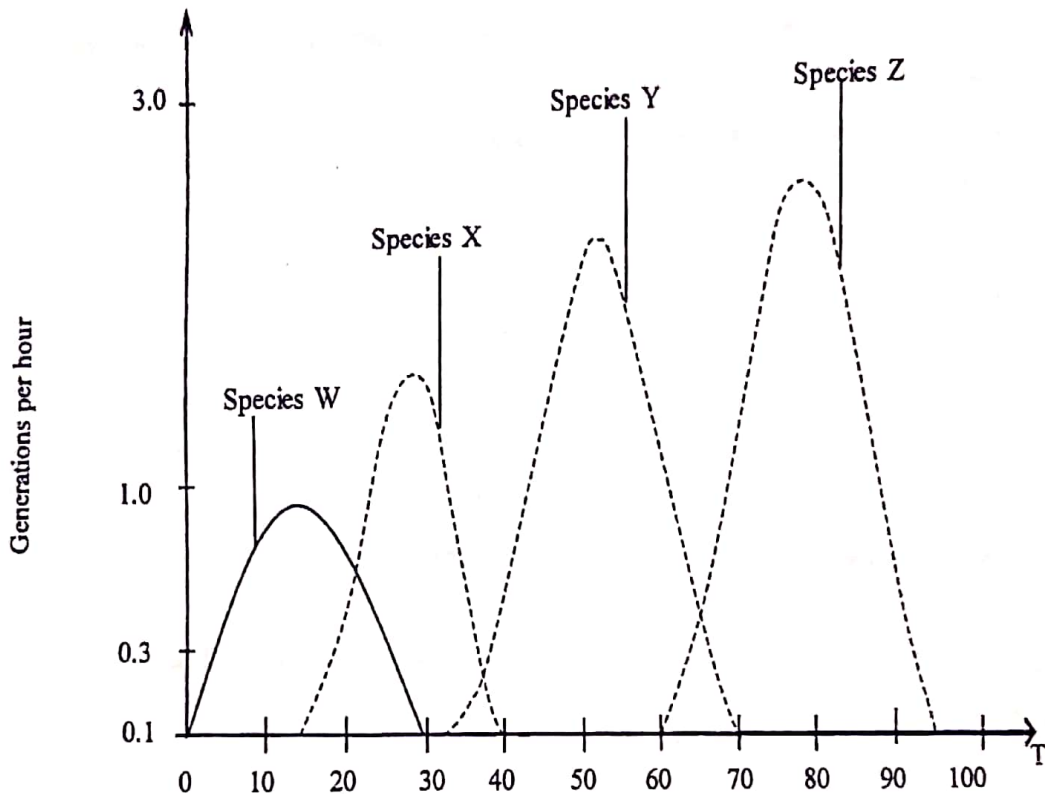
What is the effect of increasing the concentration of carbon dioxide?

- A. It increases the affinity of haemoglobin for oxygen at respiring tissue.
 - B. It increases the dissociation of oxygen from haemoglobin at respiring tissues. ☐
 - C. It increases the dissociation of haemoglobinic acid inside red blood cells.
 - D. It increases the inhibition of carbonic anhydrase enzyme in red blood cells.
12. Figure 2 below shows the pattern traced by placing electrodes at a point on the axon of a nerve cell, as it is stimulated.



- A. The lowest potential **J**, represents the resting potential of the nerve.
- B. During phase **F**, fewer sodium ions are leaving the cell than entering it. ☐
- C. During phase **K**, the membrane will fail to respond to further stimulation.
- D. The stimulus applied only has an effect when the membrane potential is positive.
13. A unique characteristic of Bryophytes when compared to other green plants is that they;
- A. Lack roots
- B. Have the sporophyte attached to gametophyte.
- C. Have xylem ☐
- D. Produce spores.
14. Protons accumulate in the thylakoid space during electron transport between photosystem I and II. The excess protons in the thylakoid space
- A. Enter the respiratory pathway. ☐
- B. Convert NADP to NADPH and generate ATP.
- C. Raise the **pH** of the space until the process stops.
- D. Are small enough to diffuse back into the stroma.
15. Which part of Hardy – Weinberg equation represents persons who have at least one allele for sickle cell anaemia?
- A. $p^2 + 2pq$
- B. $2pq + q^2$ ☐
- C. $2pq$
- D. $p^2 + q^2$
16. Birds reared by a foster mother of another species later attempt to mate with birds of the foster mother's species. This is as a result of:
- A. Conditional reflex
- B. Simple reflex ☐
- C. Imprinting
- D. Trial and error

17. Figure 3 below shows information about four species of bacteria and their reproductive rates at different temperatures.



What conclusion can you be drawn from the figure above?

- A. All bacterial species can adapt to a broad range of temperature ☐
- B. Individual species can reproduce in a broad range of temperature. ☐
- C. All bacterial species are limited to range of temperature between 0°C and 100°C . ☐
- D. Individual species reproduce in relatively narrow range of temperature. ☐
18. Which one of the following does not determine the position of an animal within a pecking order? ☐
- A. Aggressiveness ☐
- B. Size of the animals ☐
- C. Genetic vigour of the animal ☐
- D. Fitness of the animal ☐
19. Which of the following would directly lead to stomatal opening? ☐
- A. Water being absorbed by osmosis into guard cells. ☐
- B. K^{+} actively pumped into guard cells. ☐
- C. K^{+} activity pumped out of guard cells ☐
- D. Water being absorbed by diffusion. ☐

20. To move forward terrestrial animals must overcome the forces that act to keep them stationary. These forces are known as;

- A. Drag
- B. Gravitational forces
- C. Aerodynamic forces
- D. Drug

☐

21. Impulses transmitted by optic fibres in the retina are generated by;

- A. Rods and cones
- B. Bipolar neurons
- C. Amacrine cells
- D. Ganglion cells

☐

22. The following are phytochrome controlled physiological responses in plants EXCEPT

- A. Seed germination
- B. Onset of senescence
- C. Root branching
- D. Flowering

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23. Preparation of the uterine wall for implantation is coordinated by

- A. Cerebellum, pituitary and ovaries
- B. Hypothalamus, pituitary and ovaries
- C. Uterus, ovaries and amnion
- D. Pituitary, amnion and ovaries

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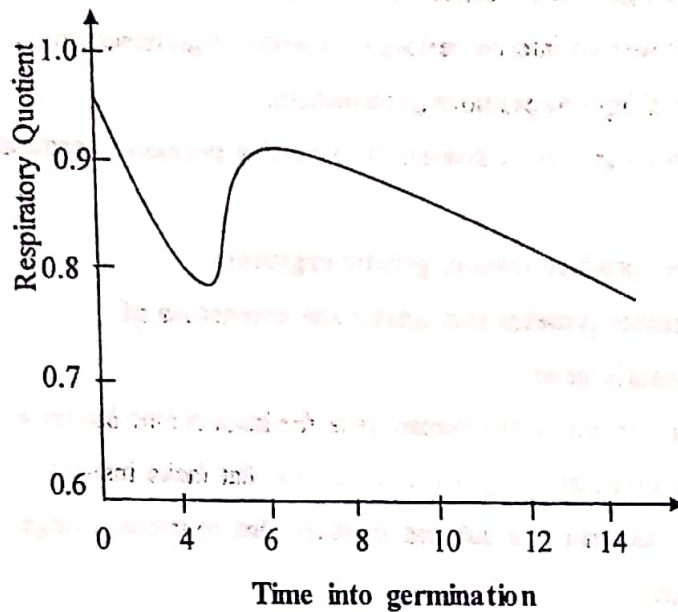
24. Which one of the following may NOT lead to natural selection?

- A. Incidence of a lethal disease
- B. Competition for resources
- C. Unchanging environment
- D. Prevalence of predators

☐

25. The following are typical features of hydrophytes EXCEPT;
- A. Elongated petioles ☐
 - B. large floating leaves
 - C. Aerial flowers
 - D. Well-developed xylem
26. The presence of an extra X chromosome in males causes
- A. Down's syndrome
 - B. Turner's syndrome ☐
 - C. Klinefelter's syndrome
 - D. Huntington's disease
27. During excretion and osmoregulation in terrestrial insect, which of the following enter the Malpighian tubules passively?
- A. Carbon dioxide and water ☐
 - B. K^+ and Na^+
 - C. Salts and water
 - D. Uric acid and ammonia
28. During secondary growth in plants, the following events occur EXCEPT.
- A. Cells of the fascicular cambium divide tangentially to give rise to the secondary parenchyma on the inside and outside. ☐
 - B. Cells of the inner fascicular cambium divide tangentially to give rise to the secondary xylem on the inside and secondary phloem on the outside.
 - C. Cells of cork cambium divide tangentially to form secondary cortex and phloem.
 - D. Cells of the fascicular cambium divide tangentially to give rise to secondary xylem on the inside and secondary phloem on the outside.
29. The changes that take place in the circulatory system of a mammalian foetus at birth include;
- A. Foramen ovale closes, ductus arteriosus closes
 - B. Foramen ovale opens, ductus arteriosus closes ☐
 - C. Foramen ovale closes, ductus arteriosus opens
 - D. Ductus arteriosus opens as well as foramen ovale.

30. Figure 4 below shows the RQ of germinating wheat grains. Study it and use it to answer the question below.



Which of the following conclusions is true according to the graph?

- A. Before germination metabolism of carbohydrates occurs anaerobically.
- B. After 12 days the respiratory substrate is mainly protein.
- C. Fats, lipids and protein are all used at every stage of germination.
- D. Fats are mainly used at early stages of germination.

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31. When myosin binds with actin forming a cross bridge

- A. Acetylcholine is released
- B. Ca^{2+} stimulates processes that lead to exposure of active sites.
- C. Filaments slide past each other and muscle fibres shorten
- D. ADP and P are released and cross bridge flexes.

☐

32. Which of these lung volumes is greatest?

- A. Tidal volume
- B. Inspiratory reserve volume
- C. Expiratory reserve volume
- D. Residual volume

☐

33. When seeds are exposed to red light they can germinate because ☐
- A. Pr absorbs red light and is converted to Pfr that promotes germination
 - B. Red light is converted into far red light to promote germination.
 - C. Pr absorbs a red light to promote germination.
 - D. Pr absorbs a red light and is converted to Pfr that promotes germination.
34. To obtain bacteria that produce insulin, genetic engineers, ☐
- A. Remove repressor proteins that inhibit the expression of the bacterial insulin gene
 - B. Insert a vector containing the human gene for insulin into bacteria
 - C. Search for bacteria that can grow in a medium that lacks insulin
 - D. Grow normal bacteria in a nutrient medium that contains a large amount of sugar.
35. Two pieces of DNA can be joined to form a single piece only if they; ☐
- A. Come from the same organism
 - B. Both have a promoter
 - C. Have single – chain ends with complementary nucleotide sequences
 - D. Contain tumour – causing genes
36. Which one of the following is not an intermediate compound in the ornithine cycle? ☐
- A. Ornithine
 - B. Citrulline
 - C. Arginine
 - D. Ammonia
37. The corresponding changes of two or more species that are closely associated with each other, such as a plant and an animal that pollinates it, are called; ☐
- A. Adaptive radiation
 - B. Divergent evolution
 - C. Convergent evolution
 - D. Coevolution

38. Bird populations that do not interbreed because they cannot recognize each other's mating calls may evolve into separate species due to;
- A. Ecological isolation
 - B. Geographic isolation ☐
 - C. Post zygotic isolation
 - D. Pre-zygotic isolation
39. An absolute limit imposed by the environment on population increase is called?
- A. Biotic potential
 - B. Mortality
 - C. Carrying capacity ☐
 - D. Environmental resistance
40. Which of the following is the correct order of formation of structures in the life cycle of a moss?
- A. Archegonium and antheridium, spores, sporophyte, egg and sperm, zygote
 - B. Zygote, spores, sporophyte, archegonium and antheridium, egg and sperm. ☐
 - C. Sporophyte, spores, archegonium and antheridium, egg and sperm, zygote;
 - D. Egg and sperm, archegonium and antheridium, zygote, spores, sporophyte.

SECTION B (60 MARKS)

All answers should be written in the spaces provided.

41. Figure 5 below shows the immigration and extinction of species on an island.

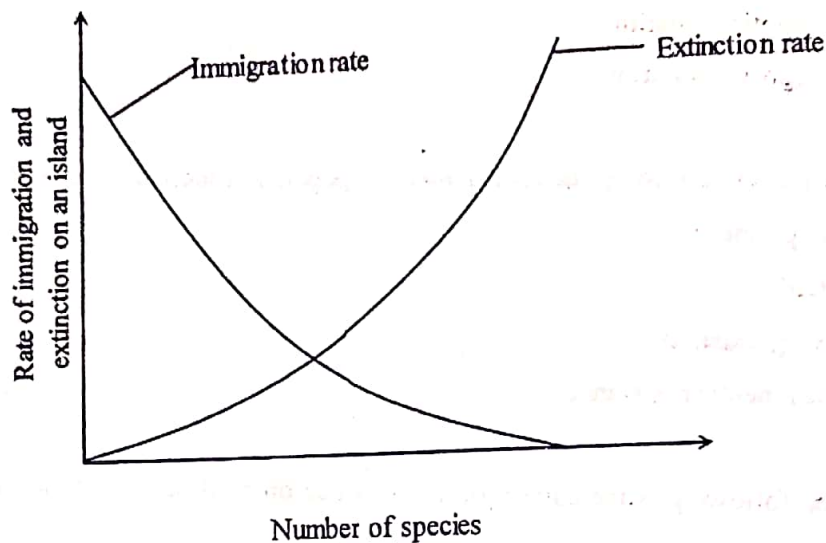


Fig.5

- (a) Explain the relationship between the measurable variables on a virgin island.

(05marks)

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- (b) From the graph, suggest **four** factors that could be determining the number of species on the island?

(02 marks)

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- (c) State **three** factors that may affect the immigration of new species to the island. (03 marks)

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42. (a) What is meant by genetic recombination? (03 marks)

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- (b) What is the importance of genetic recombination in the process of evolution? (02 marks)

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- (c) What limits the degree of recombination in animal populations? (05 marks)

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43. Figure 6 below shows the volume of air in asthmatic individual breathed out in the first six seconds of a breath.

Curve A shows volume before he used an inhaler and curve B shows the volume after he used an inhaler.

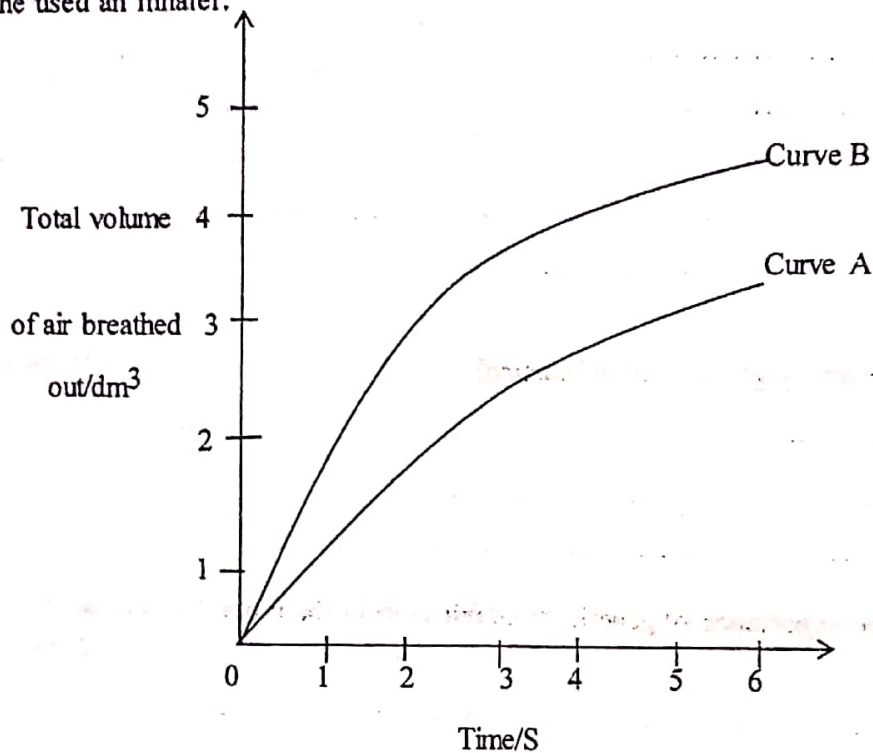


Fig.6

- a) Explain how the diaphragm brings about the changes in curve A. (03marks)
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- b) Describe how you would use curve A to find the total volume of air that this person could breathe out in one complete breath. (03marks)

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- c) Explain the difference in the volume of air breathed out between curves A and B. (04marks)

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44. (a) (i) State three features of a leaf that favour carbon dioxide diffusion. (03marks)

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- (ii) Explain how each of the features in a (i) above enhance the diffusion of carbon dioxide into a leaf. (03marks)

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- (b) State one factor in a leaf likely to resist diffusion of carbon dioxide into the leaf.

(01mark)

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- (c) Explain why plants kept in darkness fails to fix carbon dioxide. (03marks)

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45. Figure 7 below shows the effect of the substrate concentration on the rate of an enzymes-controlled reaction.

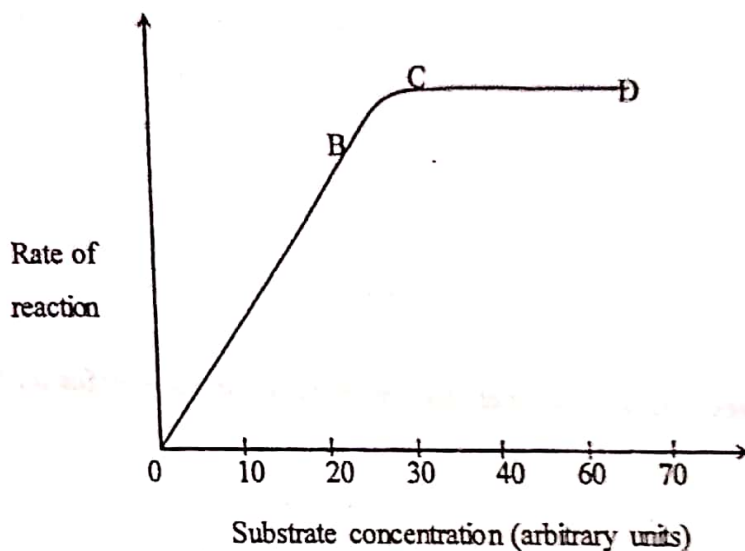


Fig.7

- a) (i) Describe what the graph shows about the effect of substrate concentration on the rate of this enzyme controlled reaction. (03marks)
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- (ii) What limits the rate of reaction between points C and D? Give the evidence from the graph for this. (02marks)
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-
- (iii) Suggest a reason for the shape of the graph between points C and D. (01mark)
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- b) Sketch a curve on the graph to show the rate of this reaction in the presence of a competitive inhibitor. (02marks)

- c) Explain how drugs lower the rate of enzyme – controlled reactions. (02marks)

46. Table 1 shows some information about the cases of high blood pressure and heart attacks in Mulago heart institute.

Sex	Condition	Percentage of people affected in each age group						
		16 24yrs	25 – 34yrs	34 – 44yrs	45 – 54yrs	55 – 64yrs	65 – 74yrs	75 – 80yrs
Male	High blood pressure	0.5	1.5	3.5	6.0	17.0	22.5	18.5
	Heart attack	-	-	0.1	0.2	1.1	2.4	3.2
Female	High blood pressure	0.7	1.6	3.8	7.8	20.5	27.9	26.9
	Heart attack	-	-	0.1	0.3	0.6	0.7	1.8

Table 1

- a) Use the pattern of data in the table to describe; (02marks)
- i) Two similarities between males and females
- ii) Two differences between males and females. (02marks)

- b) People have been advised to reduce their cholesterol intake and stop smoking as part of a healthy lifestyle.

Explain how smoking and high blood cholesterol concentration increase the risk of developing coronary heart diseases (CHD). (05marks)

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- c) State one use of cholesterol in the body.

(01mark)

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END