

TEACHER'S COPY

Proposed Marking guide

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0701300439/076286763

P530/1
BIOLOGY (THEORY)
PAPER 1
TIME: 2¹ HOURS

EDUCAN R BIOLOGY

UGANDA ADVANCED CERTIFICATE OF EDUCATION
END OF TERM III EXAMINATIONS 2024

SENIOR FIVE

BIOLOGY PAPER ONE
(THEORY)
2 HOURS: 30 MINUTES

Instructions to semi-Candidates

- Attempt **all** questions in section A and B.
- Answers to section A **must be filled in boxes** on the right-hand side
- Answers to section B must be written in the spaces of the question paper provided and not anywhere else.

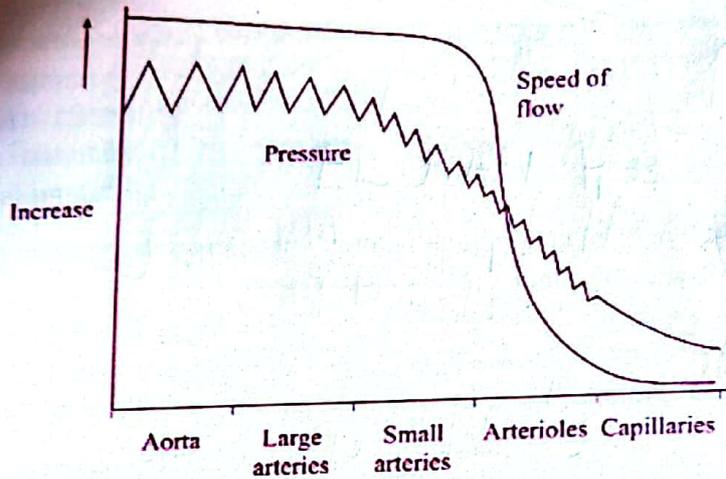
Advice

You are advised to take utmost **10 minutes**; reading through all questions in this booklet, **120 minutes** answering the questions carefully and with utmost accuracy, and **20 minutes** reading through your answers and correcting errors where necessary.

For Examiners' Use Only			
Section	Question	Marks	Examiner's signature and No.
A	1 - 40		
	41		
B	42		
	43		
	44		
	45		
	46		
Total			

SECTION A (40 MARKS)

1. The following illustrates the relationship between blood flow speed and pressure as blood travels from the aorta to the capillaries.



Which of the following best explains the decrease in blood flow speed as blood moves from the aorta to the capillaries?

- A. The total cross-sectional area of the blood vessels increases.
- B. The elasticity of the blood vessels decreases
- C. The viscosity of the blood increases.
- D. The force of the heart's contraction decreases.

D

2. Which one of the following is a simple branched tubular gland?

- A. Brunner's gland
- B. Salivary gland
- C. Sweat gland
- D. Mammary gland

C

3. Which one of the following activities does not contribute to global warming?

- A. Use of pesticides
- B. Deforestation
- C. Burning fossil fuels
- D. Use of CFCs.

A

4. Mendelian expected probabilities of genotypes in a cross occur when

- A. Small numbers of offspring are produced
- B. Migrations occur in a population
- C. Mutations arise
- D. Fertilization is random

D

5. Which one of the following is not correct about cells of a tissue? They

- A. Have similar function
- B. Are of same origin
- C. Are of one type
- D. have physical linkage

A

6. When a foetus receives antibodies from the mother through the placenta, it acquires

- A. Active immunity
- B. Long-term immunity
- C. Passive immunity
- D. Artificial immunity

C

7. During which transfer of energy is most energy lost in an ecosystem?

- A. Producers _____ primary consumers
- B. Primary consumers _____ secondary consumers
- C. Secondary consumers _____ tertiary consumers
- D. Tertiary consumers _____ decomposers

C

8. Which one of the following does **not** contribute to the movement of water from the root system to the leaves in a flowering plant?

- A. Root pressure
- B. Cohesion forces
- C. Transpiration pull
- D. Atmospheric pressure

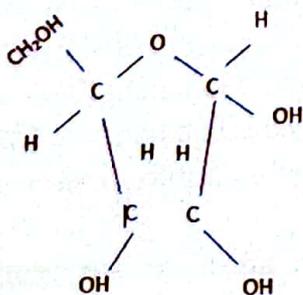
D

9. High carbon dioxide concentration in respiring tissues is important because it causes;

- A. Local vasodilation, allowing more blood into the tissues
- B. Low pH in the tissues leading to unloading of oxygen
- C. Local vasoconstriction creating high blood pressure
- D. Increase heart beat

B

10. Which one of the following molecules is represented in figure 1?



D

- A. Fatty acid
- B. Deoxyribose
- C. Glucose
- D. Ribose

11. Which one of the following is the reason why insects' eggs usually hatch rapidly into larvae?

- A. Eggs have little yolk.
- B. Hatching is controlled by external factors
- C. It is a way of avoiding predators
- D. Due to excessive production of juvenile hormone

B

12. Higher concentrations of some ions in the cell sap of some fresh water algae compared to the external water is due to

- A. Diffusion
- B. Active transport
- C. Pinocytosis
- D. Osmosis

C

13. Mixing of oxygenated and deoxygenated blood in amphibians is minimized by

- A. Rapid contraction of the ventricle
- B. Spongy nature of heart muscles
- C. Spiral valve in the truncus arteriosus
- D. Columnae carnae in the ventricular walls

~~A~~ C

12. The bacteria which converts nitrates to nitrites during the nitrogen cycle are an example of

- A. Nitrogen fixing bacteria
- B. Nitrifying bacteria
- C. Decomposing bacteria
- D. Denitrifying bacteria

D

13. Which one of the following is true about sex-linked characters in humans?

- A. Females never suffer from the trait
- B. Females do not pass on the character to their sons.
- C. Females are either normal or carriers
- D. Males are either carriers or sufferers

free

None

14. Which one of the following cannot be parents of a child of blood group O? A.

- Man of blood group A and woman of blood group B.
- B. Both man and woman of blood group A
- C. Both man and woman of blood group B
- D. Man of blood group AB and woman of blood group O.

A

15. Which one of the following is a disadvantage of a tracheal system for gaseous exchange in insects? A. Ventilation is limited

- B. Tracheoles are impermeable
- C. Spiracles are too small
- D. The system does not supply all body parts

A

16. A climax community is one in which

- A. Succession is at its peak
- B. A carrying capacity has been reached
- C. Succession has ceased
- D. Death rate of organisms is at its lowest

C

17. Which one of the following is not a function of the skeleton in insects?

- A. Support of body
- B. Protection of delicate body parts
- C. Prevention of desiccation
- D. Secretion of wax

D

18. Good drainage and ploughing of soil reduce the process of;

- A. Nitrification
- B. Decomposition
- C. Denitrification
- D. Nitrogen fixation

D

19. If the solute potential of the external solution is higher than that of the cell, the external is said to be

- A. Hypotonic to the cell solution
- B. Hypertonic to the cell solution
- C. Isotonic to the cell solution
- D. Of lower osmotic pressure than the cell solution

B

20. Which of the following is true about non-competitive inhibition in enzyme catalyzed reactions?

- A. The degree of inhibition decreases with increase in substrate concentration
- B. The inhibitor has a similar structure and chemical composition with the substrate
- C. The degree of inhibition is independent of the substrate concentration
- D. The shape of the enzyme is not affected by the inhibitor

C

21. Which of the following is not true of conifers?

- A. Lack vessels in xylem
- B. Bear reproductive structures on leaves
- C. Bear sporangia on cones
- D. Possess unprotected ovules

D

22. The lack of a nucleus in the red blood cell enables it to

- A. Have a high affinity to oxygen
- B. Be more permeable to oxygen
- C. Give up oxygen more readily
- D. Contain more haemoglobin

A

23. Which of the following does not always form part of a bacterium cell?

- A. Cell wall
- B. Flagellum
- C. Cytoplasm
- D. Ribosomes

B

24. Which one of the following characteristics of a parasite would increase its chances of survival?

- A. Being highly specific
- B. Inflicting severe effects on host
- C. Parasiting more than one type of host
- D. Employing no vectors

C

25. Which one of the following features of a structure of an organism is not suitable for classifying the organisms? Its

- A. Size
- B. Number
- C. Shape
- D. Presence or absence

D

26. Which one of the following is not correct about viruses? They

- A. can only reproduce in living cells
- B. are the smallest living organisms
- C. are facultative parasites
- D. do not have a cellular structure

C

27. In flowering plants, the number of chromosomes in the structure which gives rise to the embryo sac is

- A. n
- B. $2n$
- C. $3n$
- D. $4n$

C

28. Among the following compounds, one that cannot be hydrolyzed is

- A. glycogen
- B. galactose
- C. lactose
- D. maltose

C

29. Which of the following substances are not transported in the mammalian blood?

- A. urea and glucose
- B. insulin and pepsin
- C. ATP and pepsin
- D. Carbon dioxide and sodium chloride

C

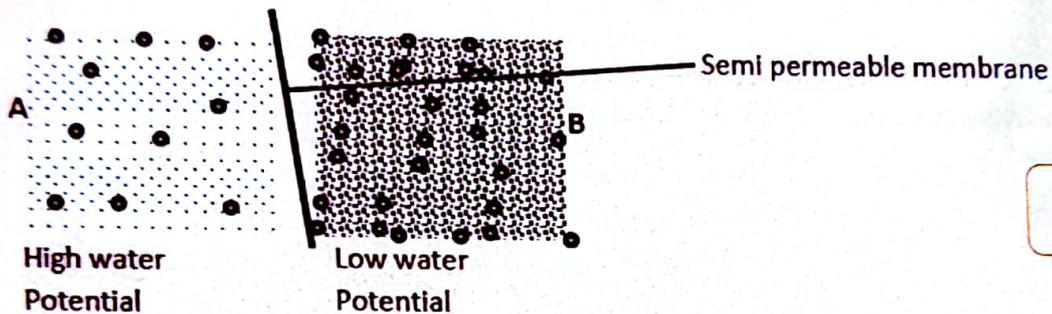
30. The mycorrhiza on some plant roots serve to;
- A. fix nitrogen from the atmosphere
 - B. absorb mineral salts from the soil
 - C. break down humus
 - D. synthesize carbohydrates

B

31. In the duodenum, the products ready for absorption are those of the digestion of
- A. Lipase and amylase
 - B. amylase only
 - C. trypsin and lipase
 - D. lipase only

B

32. Fig 4 shows conditions on two sides of a semi-permeable membrane.



Which one of the following would occur if the water potential was the same on both sides of the membrane?

- A. Movement of water molecules would stop
- B. Solute molecules would move at same rate to both sides of the membrane
- C. Solute molecules would move to side A
- D. Water molecules would move at same rate to both sides of the membrane

D

33. At which of the following stages does meiosis occur in the life cycle of a fern?

During the formation of the

- A. gametes
- B. gametophyte
- C. spores
- D. sporophyte

C

34. If a messenger RNA has a base sequence of CUGACGAGU, which one of the following would be the possible maximum number of amino acids coded for, if the code is overlapping?

- A. 7
- B. 6
- C. 4
- D. 3

D

35. Which one of the following is the mRNA strand that corresponds to the DNA strand TAGGCT?

- A. AUCCGU
- B. UCCCGU
- C. CGAAUC
- D. UAGGCU

C

36. Which one of the following features are most useful to amphibians in living in an aquatic habitat?

- A. Moist skin, membrane around eggs and gills
- B. Membrane around eggs, gills and webbed feet
- C. Long hind limbs, short fore limbs and gills
- D. Webbed feet, moist skin and gills

D

37. Which one of the following is an intracellular parasite?

- A. Trypanosome
- B. Plasmodium

B

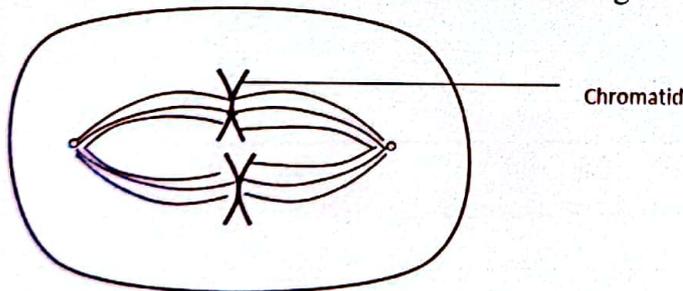
- C. Schistosome
- D. Hook worm

38. There is a limited biomass at each trophic level in a food chain because at each level, there is progressive

- A. Reduction in numbers of organisms
- B. Loss of energy
- C. Reduction in size of organisms
- D. Reduction in amount of food

B

39. Figure 1 below shows an animal cell during meiosis



Which one of the following stages is illustrated?

- A. Prophase I
- B. Prophase II
- C. Metaphase I
- D. Metaphase II

A

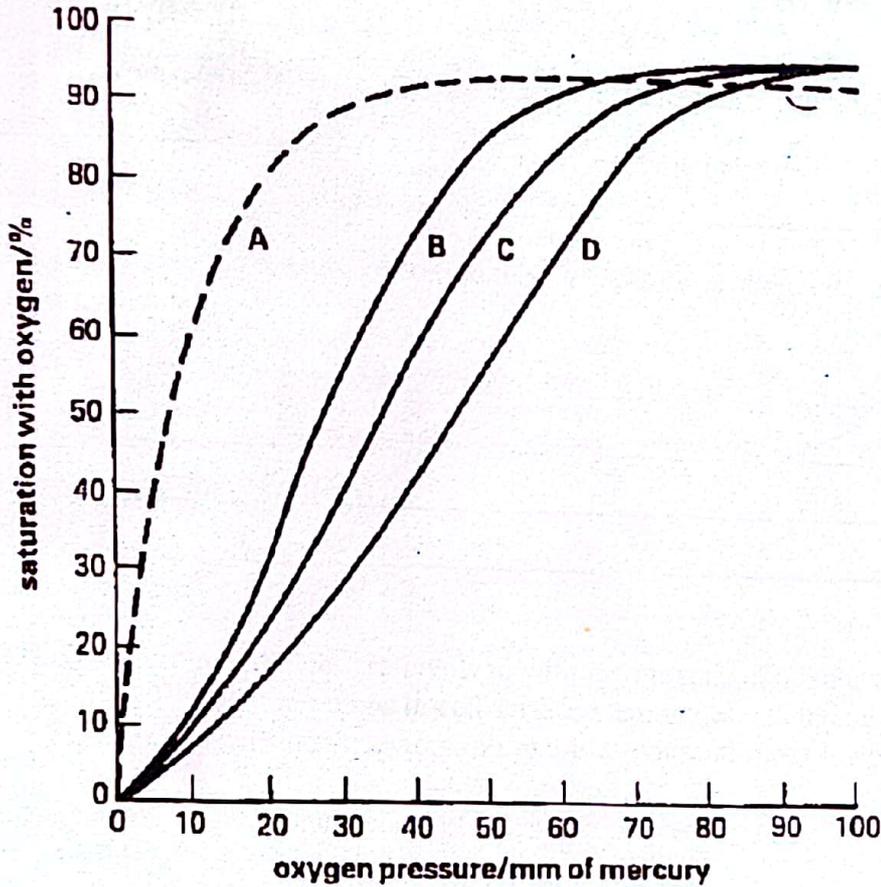
40. Which one of the following does not directly affect the pH of the soil?

- A. Absorption of bases by plant roots
- B. Production of carbon dioxide by plant roots
- C. Leaching
- D. Water logging

A

SECTION B (60 Marks)

41. The figure below shows the oxygen dissociation curves for myoglobin (A) and for three different pressures of carbon dioxide. (B at 15mm/Hg, C at 40mm/Hg and D at 70mm/Hg).



(a) By reference to curve B, what is effect of increasing oxygen partial pressure on the ability of haemoglobin to carry oxygen. (02 marks)

~~increases~~ - Lowers haemoglobin's affinity for oxygen, favouring dissociation of oxyhaemoglobin molecules to free haemoglobin and oxygen molecules.

(b) Explain the significance of the fact that,

(i) with increase in partial pressure of carbon dioxide, the oxygen dissociation curves for haemoglobin shift to the right. (04 marks)

- Lowers Hb's affinity for oxygen. Within the Red blood cells, Carbon dioxide combines with water to form Carbonic acid, that dissociates to form Hydrogen ions.

that binds on oxyhaemoglobin; promoting dissociation of HbO₂ releasing oxygen into the respiring tissues; thus increasing respiration forming energy.

(ii) the oxygen dissociation curve for myoglobin (A) is displaced well to the left of that for haemoglobin.

(02 marks)

This indicates Myoglobin has a higher affinity for oxygen than haemoglobin; to enable storage of enough oxygen in muscles.

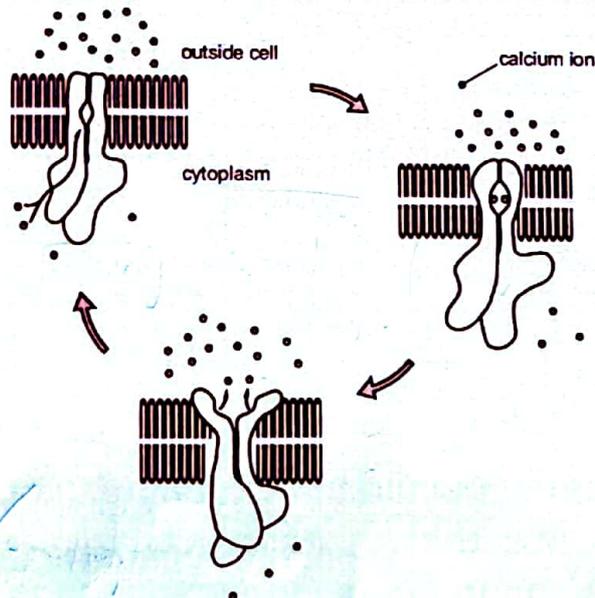
(c) Haemoglobin is commonly referred to as a *globular protein with a quaternary structure*. Explain.

(02 marks)

It consists of four polypeptide chains. Each chain is attached to a haem-group a ring-like structure with an iron atom at the centre.

42. Cell surface membranes are involved with the movement of substances into and out of cells. Calcium pumps in cell surface membranes maintain a concentration of calcium ions inside the cytoplasm that is a thousand times lower than outside the cell.

The figure below shows movement of calcium ions across a cell surface membrane.



(a) With reference to the figure;

- (i) Explain why calcium ions do not pass through the phospholipid bilayer. (02 marks)

The hydrophobic interior of the phospholipid bilayer doesn't allow ions and polar molecules to pass through because such molecules are hydrophilic.

- (ii) Name and describe the process by which calcium ions are moved across the membrane. (03 marks)

Active transport; this is how calcium ions (Molecules) are transported from a region of lower concentration to a region of higher concentration using energy from hydrolysis of ATP.

- (b) Phagocytosis is the process by which bacteria are ingested by cells. Describe the role of the cell surface membrane during phagocytosis. (03 marks)

The bacteria binds on the cell surface membrane of phagocyte (neutrophil); forming pseudopodia enabling easy engulfing of the bacteria.

- (c) Phagocytic cells contain many lysosomes. What is the role of lysosomes in destroying ingested bacterial cells? (02 marks)

Lysosomes fuse with bacteria; and then it ruptures releasing its hydrolytic enzymes that breakdown the bacteria.

43. (a) Give two structural differences between each of the following; (02 marks)

- (i) Villus and micro-villus.

Villus are larger than Micro-villus.

Villi contain more cells than microvilli ✓

(ii) Cilium and flagellum.

(02 marks)

— Cilium are shorter while flagellum are longer ✓

— Cilium are hair-like structure while flagellum are thread like structures ✓

(b) How is the structure of a unit membrane related to its function?

(06 marks)

— It is selectively permeable to allow certain substances to pass through while blocking others ✓

— Has glycolipids for cell-cell recognition ✓

— It is fluid to allow easy movement of non-polar molecules ✓

— Has glycoproteins that act as markers for recognition ✓

— It has transport proteins to ensure removal and entry of molecules ✓

— It has cholesterol that ensures its fluidity ✓

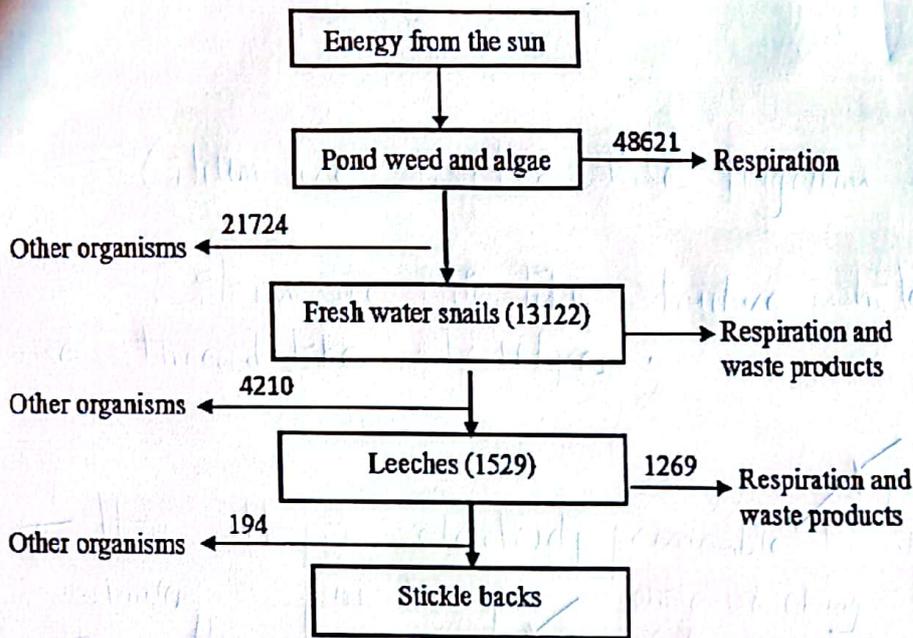
— It has hydrophobic tails that form a layer permitting passage of O_2 ✓

44. (a) what is meant by primary productivity?

Rate at which energy is converted to organic substances by photosynthetic producers. 02

Accept Amount of energy and organic material stored in primary producers. 02

(b) The diagram below shows the energy flow in $\text{KJm}^{-2}\text{year}^{-1}$ through a freshwater ecosystem.



(i) Calculate the gross primary productivity of the pond weed and algae.

(03 marks)

$$\text{Gross primary productivity} = \text{NPP} + \text{Respiration} \checkmark$$

$$\text{GPP} = (21724 + 13122) + (48621) \checkmark$$

$$= 83,467 \text{ KJm}^{-2}\text{year}^{-1} \checkmark$$

Award mark

for formula.

(ii) How much energy is lost in respiration and waste products by the freshwater snails? (03 marks)

$$\text{GPP} = \text{NPP} + \text{Respiration} \checkmark$$

$$\text{Respiration} = \text{GPP} - \text{NPP}$$

$$= (13122) - (4210 + 1529) \checkmark$$

$$= 7383 \text{ KJm}^{-2}\text{year}^{-1} \checkmark$$

Award mark

for formula.

(iii) Explain why trophic levels do not exceed 5.

(02 marks)

The loss of energy at each trophic level is so great that very little usable energy remains after trophic level 5.

45. (a) Illustrating with a cell of one pair of homologous chromosomes, draw diagrams in the space below to show

(i) Mitotic metaphase.

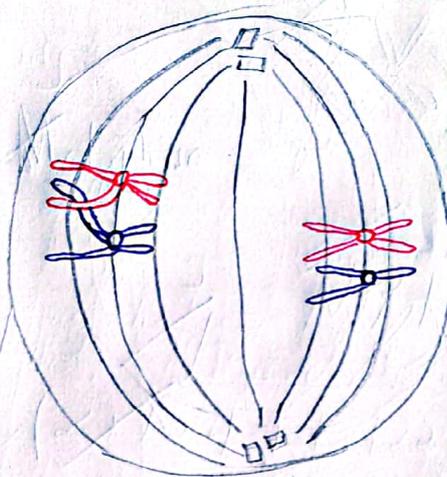
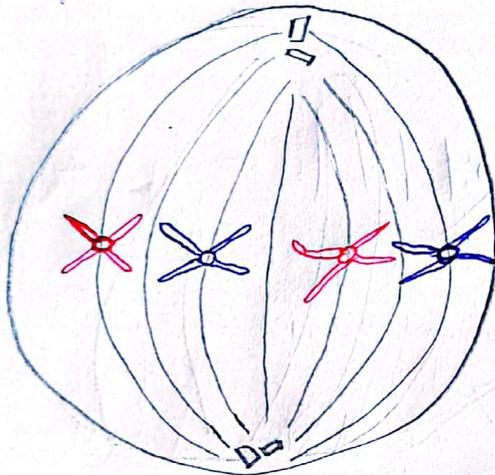
(02 marks)

(ii) Meiotic metaphase I.

(02 marks)

Mitotic Metaphase.

Meiotic Metaphase I



Equator ✓ 0.2m

Very 2-Cross over

(b) Explain how meiosis contributes to genetic variation.

(04 marks)

Crossing over in prophase I of meiosis creates new combinations of genes in gametes that are not found in either parent. Chromosomes are formed and homologous chromosomes exchange genes.

Independent assortment of chromosomes in metaphase I of meiosis increases the number of possible chromosome combinations that can occur in offspring.

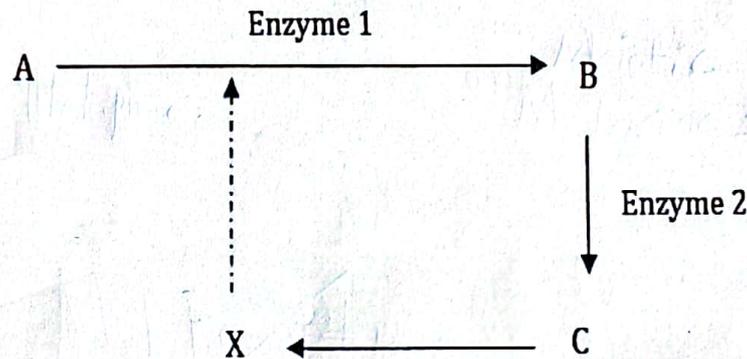
(c) State the importance of meiosis in plants.

(02 marks)

Produces genetic variations by the way of the process of recombination

- Basis for sexual reproduction.

46. Consider the multi-enzyme-controlled reaction below;



The end-product X inhibits enzyme 1.

(a) What does this tell you about the binding sites of A and X on enzyme. (02 marks)

A binds directly into the active site of enzyme, since it's a substrate due to similarity in shape

X - an inhibitor, that binds on body of enzyme, but not active site.

(b) How does the amount of X regulate the metabolic pathway?

(04 marks)

When the amount of X accumulates, X molecules tend to inhibit enzyme 1, and switch off its own production, by binding on the part of the enzyme body other than active site, distorting active sites of enzyme 1 until most of X is utilised; then detaches and then switches on the pathway.

- (c) What name is given to the control system operating here? (01 mark)

Negative feedback mechanism

- (d) Outline three applications of enzyme inhibition. (03 marks)

- Manufacture of medicines for treatment in humans

- Regulation of enzyme activity

- Making of insecticides and herbicides in agriculture.

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"Nature has given us all the pieces required to achieve exceptional wellness and success, but has left it to us to put these pieces together"

END