

Name

CLASS.....

Adm.no.....

T/C

231/2
BIOLOGY

Paper 2
Time-2 hours

MOMALICHE 2 CYCLE 10

INSTRUCTIONS TO CANDIDATES:

- Write your **name** and **admission number** in the spaces provided.
- Answer **all** the questions in this paper in the spaces provided.
- Answer questions 1-6 (compulsory) and either question 7 or 8.

For Examiner's Use Only:

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1	8	
2	8	
3	8	
4	8	
5	8	
6	20	
7 or 8	20	

Arrange the following structures in ascending order
Chromosomes; Alleles; Genes; Chromatid; DNA

(2mks)

Alleles, Genes, DNA, Chromatid, Chromosome

b) The letters below represents nitrogenous organic bases,

CCG; ATT; CGA; TAG

i) What term is given to each group

(1mk)

codon

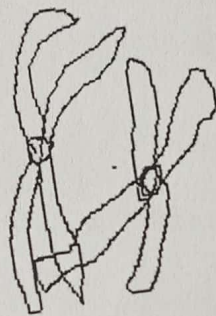
ii) Give two functions of the three bases

(2mks)

codes for a specific amino acids

Determine sequence of amino acids in a polypeptide chain

c) Study the diagram below on chromosomes and answer the questions that follow



i) Identify the type of cell division

(1mk)

Meiosis; Meiosis I

ii) Name the stage of cell division illustrated by the above diagram

(1mk)

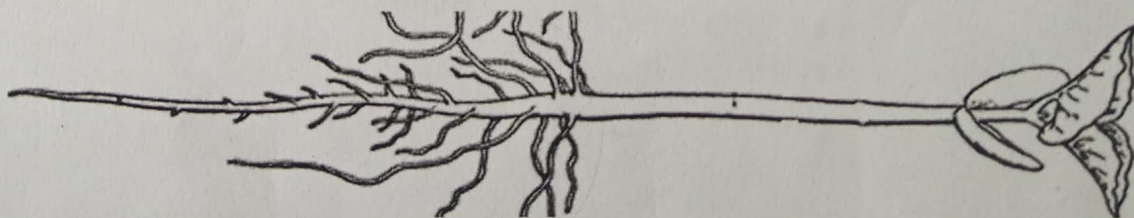
Prophase I

iii) Describe what has occurred in the above chromosomes

(1mks)

- Homologous chromosomes have paired/synapsed
- Crossing over (chiasma formation)

2. The diagram below is of a bean seedling placed horizontally in normal light condition



at is the expected observation after five days

(2mks)

Root will curve downwards;
shoot - will curve upwards;

b) Name two responses exhibited by above seedling after 5 days

(2mks)

Shoot - Negative geotropism
Root - Positive geotropism Key Geotropism alone

c) Name the chemical substances responsible for inducing observation in (b) above

Natural auxin (Indoleacetic acid) Acc Auxin (1mk)

d) Name the structure in which the chemical substance in (c) above is conducted in the seedling

(1mk)

Phloem tissue; Acc Phloem;

e) Explain two survival values of Phototropism in plants

(2mk)

Positive phototropism; expose the leaves to light energy for photosynthesis
Positive geotropism; enable the roots to absorb and uptake of mineral salts from the soil; to seek water

3. Describe how each of the following cells are adapted to their functions

a) Root hair cells

(4mks)

Elongated/long; to increase surface area for absorption of water and uptake of mineral ions

Have cell sap; with dissolved mineral salts to create steep concentration gradient for absorption of water by osmosis. Have numerous mitochondria; to provide energy for uptake of mineral salts by active transport.

b) Sperm cells

Have thin flexible cell walls; to facilitate easy penetration between soil particles. 4 pts; 1mk each

Have abundant mitochondria; in the middle piece; to provide energy (A.T.P.) for swimming towards ovum;

- Have streamlined shape; to reduce resistance hence faster swimming towards mature ovum;

- Have a long tail; for faster swimming towards ovum;

- Have Acrosome; with hydrolytic enzymes; that digest membranes of the ovum; Accept other correct

4. a i) What are sex linked genes

(1mk)

Are genes located on the chromosomes that determine sex of an individual and are transmitted together into same gametes

Positive chemotropism; enable pollen tube to grow

towards embryo sac resulting in double fertilisation;

Positive Thigmotropism - enable plants with weak stems to coil around solid objects hence obtaining mechanical support.

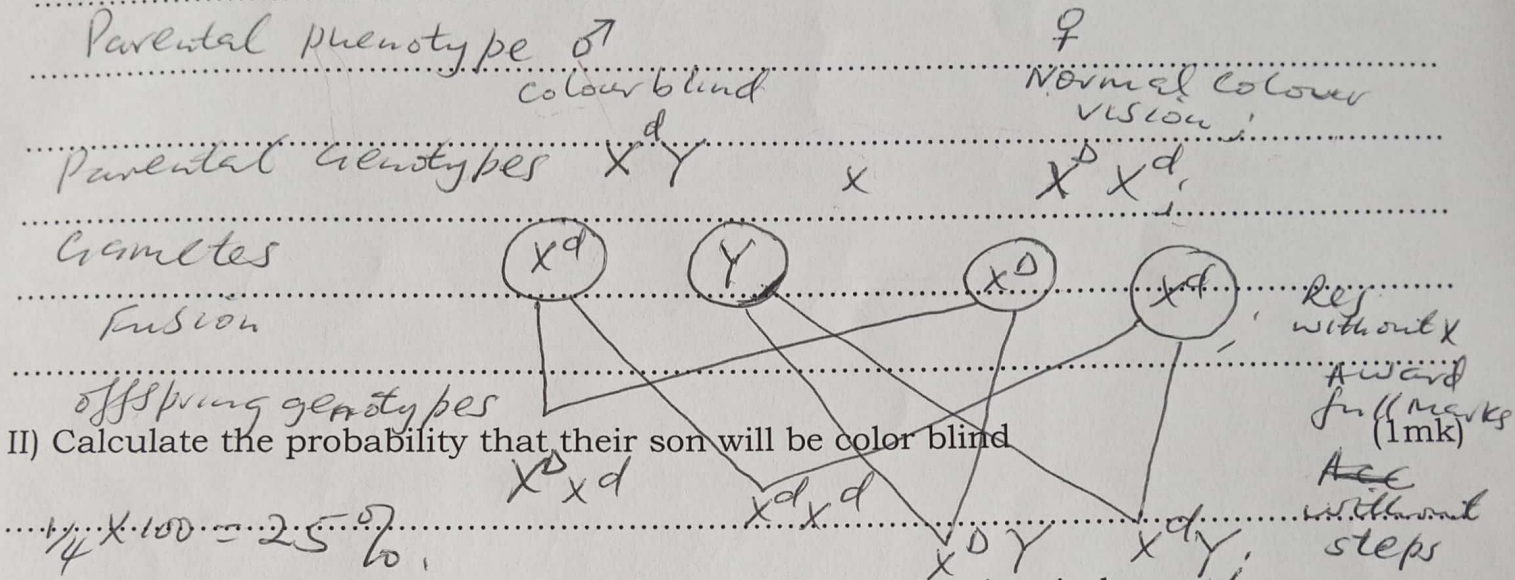
Give one reason why most sex linked genes are located on X chromosome

(1mk)

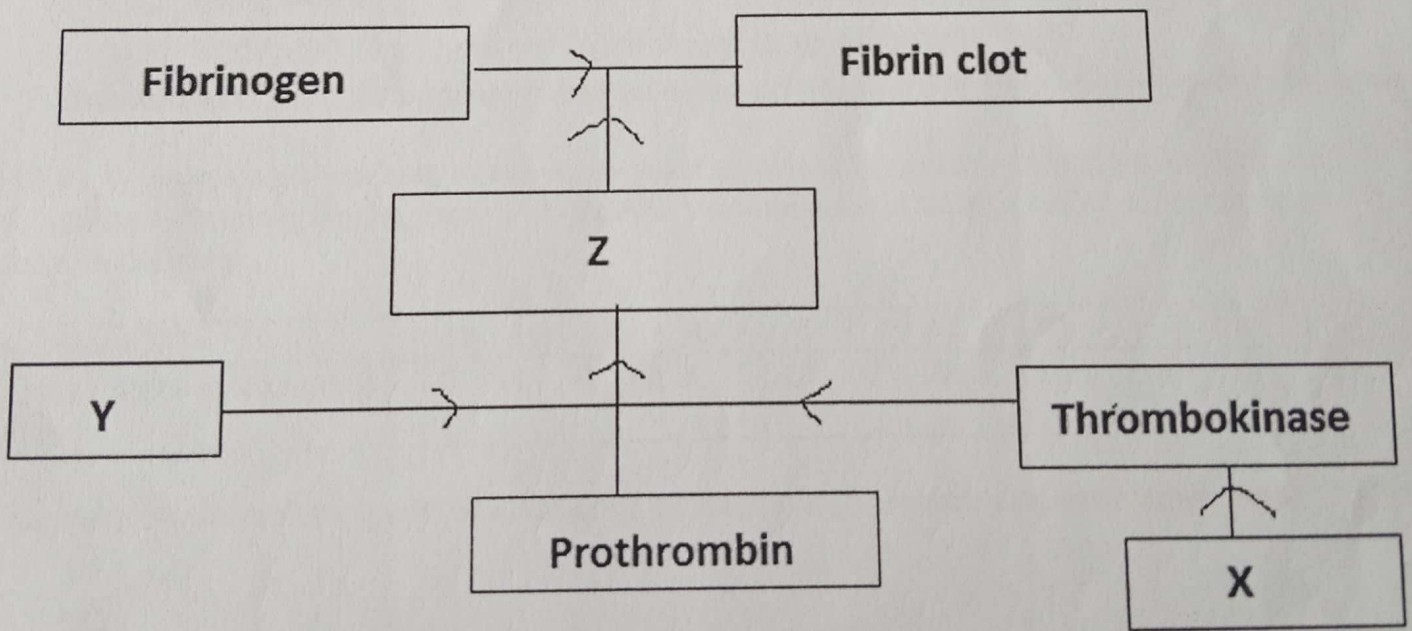
X-chromosome is large, hence can accommodate many genes.

b) A red-green color blindness is a sex linked trait controlled by a sex linked recessive allele (d). A normally sighted woman whose father was color blind marries a color blind man.

1) Draw a genetic cross diagram and show phenotypic ratio of their children (5mks)



5. The chart below is a summary of blood clotting mechanism in humans



a) Name

i) the blood components represented by X

(1mk)

Platelets / Thrombocytes [mark one]

metal ion represented by Y

(1mk)

Calcium ion;

iii) What is the role played by metal ion in (ii) above

(1mk)

Serves as a cofactor, activating enzyme

Thrombokinase, enhancing enzyme reaction;

b) Name the site where vitamin K is formed in human body

(1mk)

Colon; except large intestine.

c) Explain why an injured person loses more blood during hot weather when injured

(3mks)

Blood clotting is at optimum at 37°C;

During hot weather blood vessels near skin surface

vasodilate, increasing blood supply to the skin

surface, hence more blood is lost through bleeding

At temperature above optimum, platelets

fail to clump together, hence failing to seal the wound, loss

d) Name one way in which white blood cells defend the body against harmful microorganisms

make blood (1mk)

through phagocytosis;

Production of antibodies which

attack harmful microorganisms

SECTION B (40 MARKS)

Answer questions 6 (compulsory) and either questions 7 or 8 in the spaces provided questions 8

6) An experiment was carried out using yeast at various temperatures starting at 15 degrees centigrade by immersing boiling tube with glucose yeast mixture in a water bath and results were tabulated as follows

Temperature(°C)	15	20	25	30	35	40	45	50	55	60	65
Number of bubbles in every 2 minutes	0	1	4	9	18	28	26	20	15	10	0

a) Using suitable scale plot a graph of number of bubbles every 2 minutes against temperature (6mks)

b) from the graph determine the rate of bubble production at 27°C

(2mks)

Rate = gradient of Tangent

$$\frac{\Delta Y}{\Delta X} = \frac{7-2}{30-27} = \frac{5}{3} = 1.333 \text{ bubbles/minute}$$

what temperature was rate of bubbling at maximum

(1mk)

40°C

d) Name metabolic process taking place in the boiling tube with Glucose- Yeast mixture

Fermentation, Anaerobic respiration

(1mk)

e) Explain why there was decline in rate of bubbling if temperatures was reduced from 65 °C to 45 °C

(3mks)

All Enzyme molecules in yeast are denatured at 65°C, hence reducing temperature to 45°C; there was no chemical breakdown of glucose, hence no bubbles produced;

f) State one importance of this process to animals

(1mk)

name the method of reproduction in yeast

budding

h) State the economic importance of the above process in Agriculture

(3mks)

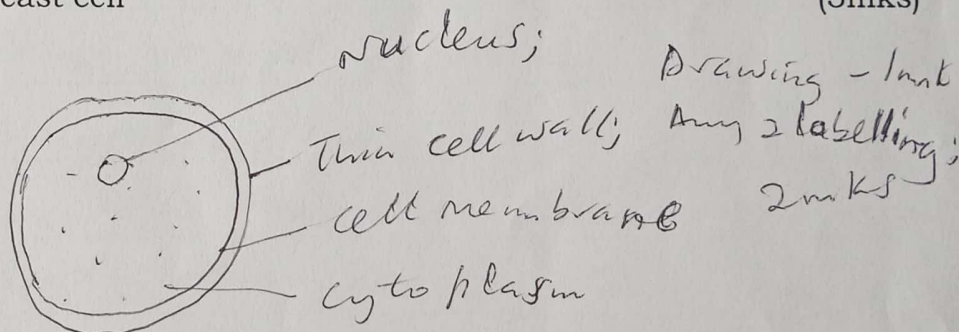
Compost Manure making

Silage Making

Biogas production

g) Draw well diagram of a yeast cell

(3mks)



7. Describe the role of the kidney in the following homeostatic processes

a) Osmoregulation

(10mks)

b) Selective reabsorption of sodium ions

(10mks)

8. Explain the factors that affect the following processes in living organisms

a) Diffusion

(10mks)

b) Active transport

(10mks)

Q7 Osmoregulation;

When osmotic pressure of blood plasma rises; eg due to dehydration; Osmoreceptors cells in hypothalamus are stimulated; and send impulses to the ^{posterior} ~~anterior~~ pituitary gland; Pituitary gland release (more) ADH into blood stream; ~~More water is~~ ADH stimulates distal convoluted tubule and ^{blood} capillaries to become (more) permeable to water; More water is (reabsorbed) back into blood stream;

The Osmotic pressure is consequently reduced to the normal; leading to low volume of concentrated urine;

When Osmotic pressure of blood falls; due to drinking a large volume of water;

the hypothalamus send impulses to Posterior Pituitary gland; to ~~send~~ release less vasopressin/ADH; into blood stream; the DCT and blood capillaries become (less) permeable to water; less water is reabsorbed into blood stream; The Osmotic pressure of (blood plasma) rises to the normal; large volume of dilute urine is produced; i.e. Diuresis.

(b) Kidney regulates Na^+ under influence of hormone Aldosterone, produced by Adrenal glands.

When concentration of Na^+ in the blood is low, Adrenal glands are stimulated to release Aldosterone into blood stream.

Aldosterone selectively stimulates Ascending loop of Henle; to reabsorb Na^+ actively into blood.

The level of Na^+ increases, bringing concentration of Na^+ to normal.

When concentration of Na^+ in the blood is above normal, Adrenal glands are less stimulated hence secrete (less) Aldosterone into blood stream.

Ascending loop of Henle are less stimulated; hence less Na^+ are selectively reabsorbed actively into blood stream.

The level of Na^+ in blood plasma decreases; thus lowering concentration to the norm, max 10 mEq.

Q8 Explain factors that affect

the following processes in living organisms.

(a) Diffusion (1)

Diffusion gradient; the greater concentration gradient the faster the rate of diffusion.

Accept converse;

Surface area to volume ratio; (1)

The higher the surface area to volume ratio

the faster the rate of diffusion; (1)

and the lower the surface area to volume ratio

the slower the rate of diffusion;

Thickness of the membrane; (1)

The thicker the membrane, the lower the rate of

diffusion; because molecules take longer time

to pass across thicker membrane than across

thinner membrane;

Temperature; (1) Increase in temperature increases (1)

kinetic energy of the molecules; increasing the

rate of diffusion.

Accept converse; (1)

Size of the molecules; The smaller the molecule;

the faster the rate of diffusion; the larger the

molecules the slower is the rate of diffusion;

because the molecules experience more resistance in

diffusion medium;

8(b) Actual transport

Oxygen concentration; Actual transport requires energy; Energy production is by respiration and respiration in the cells require oxygen; An increase in oxygen concentration increases the rate of energy production and hence actual transport; vice versa.

change in pH; Energy production is influenced by respiratory enzymes; respiratory enzymes work best at specific pH values; Extreme pH denatures enzymes decreasing rate of respiration (energy production) and hence actual transport;

Glucose concentration; Glucose is the main substrate during respiration; An increase in glucose concentration; increases the rate of respiration and hence actual transport; up to a certain point; beyond which further increase in glucose concentration does not ~~increase~~ affect it

Temperature; Respiratory enzymes work best at temperature of ~~40°C~~ 35-40°C, which is the optimum temperature; at this temperature respiratory enzymes are activated and actual transport is at optimum

Accept converse - Very low temp inactivates enzymes decreasing rate of respiration and actual transport. Temperature above optimum, above 40°C denature enzymes; reducing rate of respiration and energy production and actual transport; finally stops

Enzyme inhibitors; slow down or completely to enzyme activity which in turn slow down / stop respiration hence actual transport
eg cyanide poison

5 minutes

