

KASSUMEC-JET EXAMINATIONS

Kenya Certificate of Secondary Education

231/2

BIOLOGY -theory

Paper 2

Jun./July.2024

2hours

Name Index Number.....

Candidates signature.....Class.....Adm.No.....

Instruction to candidate

- (a) Write your name, index number and admission number in the spaces provided
- (b) Sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of two sections; **A** and **B**.
- (d) Answer all questions in sections in the spaces provided.
- (e) In section B answer question **6 (compulsory)** and either question **7** or **8** in the spaces provided after question **8**
- (f) This paper consists of **13 printed pages**.
- (g) **Candidates should check the question paper to ascertain that all pages are printed as indicated and that no question is missing.**
- (h) **Candidates should answer the questions in English**

Section	Question	Maximum Score	Candidates score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
Total score		80	

For Examiner's use only

Section A

Answer **all** questions in this section

1. Haemophilia is a genetic disorder caused by a recessive sex-linked gene. A phenotypically normal couple got a hemophiliac son.

- (a) State the genotypes of the parents (2mks)

Father: X^HY

Mother: X^HX^h

- (b) Using a genetic cross, determine the genotypes of the couple's children (4mks)

- (c) Explain why hemophilia is common in males than in females (2mks)

Since males have one X and one Y chromosome, and the genes present on X don't have counter genes on Y; only one affected gene (to be present on X) is required for the disease to occur in males;

2. A plant physiologist studying the transport mechanisms in a particular plant species under different environmental conditions. He measured the rates of water uptake, nutrient absorption and sugar translocation in the xylem and phloem over 48 hours period. The data is summarized in the table below.

condition	Water uptake in mm/hr.	Nutrient absorption Mg/hr.	Sugar translocation Mg/hr.
Normal	15	8	12
High soil salinity	10	5	7
Drought condition	6	4	5

(a). Compare the rate of water uptake during normal conditions and during high salinity conditions (2mks)

In normal conditions the rate of water uptake is higher than in high; because in high salinity soils the soil solution is hypertonic to the cell sap of root hair cells resulting to slow water absorption;

(b). Compare the rate of sugar translocation during normal conditions and during drought conditions (2mks)

sugar translocation during normal conditions is higher than during drought conditions: because less water is available for photosynthesis

(c). suggest two physiological conditions that plants use to cope with drought conditions

(2mks)

-leaf fall

-midday closure of stomata

-Reversed stomatal rhythm

(d) Name the physiological process involved in:

I. Water uptake

(1mk)

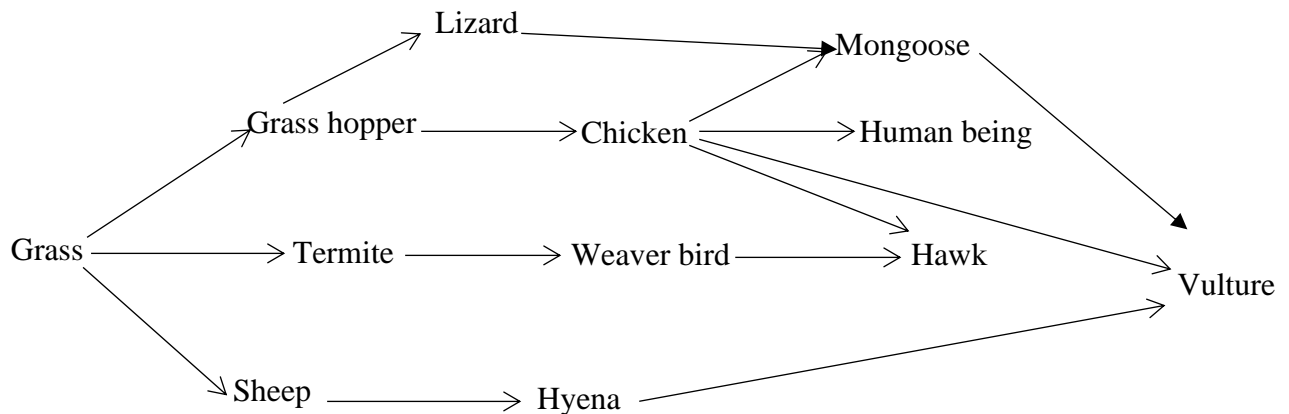
osmosis

II. sugar translocation

(1mk)

diffusion/cytoplasmic streaming/mass flow

3. The diagram below shows a food web, study it and answer the questions that follow.



(a) Name the trophic level occupied by the following organisms. (2mks)

- (i) Human being
Quaternary consumer
- (ii) Grass
Tertiary consumer

(b) (i) Identify the organism with the least biomass in this ecosystem. (1mk)
vulture

(ii) Explain your answer in b(i) above. (2mks)

At each trophic level, energy is lost during respiration and decomposition; hence there is less energy available to organisms up the trophic level,

(c) Name two ways a scientist would use to identify the type of food eaten by the various organisms in order to design the food web (2mks)

- Fistulation*
- Observation*
- Dentition*
- Structure of the alimentary canal*
- Analysis of faeces*

(d) Extract a food chain with a quaternary consumer (1mk)

Grass → grasshopper → lizard → mongoose → vulture

4. An experiment was carried out to examine the rate of respiration (breaths per minute). The data was collected from infants, children and adults and the data summarized in the table below

Age group in years	Rate of respiration (breaths /min)
Infants (0-1)	30-60
Children (5-10)	20-30
Adults 20-30	12-20

a). Account for the trend in

respiration rates from infancy to adulthood (2mks)

From infancy to adulthood the rate of respiration increases; This is because infants have a higher rate of cell division which requires energy, as they grow towards adulthood the rate of cell division decrease;

b). Apart from age name two other factors that affect the rate of respiration (2mks)

Emotions

Exercise

c) Explain how anaerobic respiration can be applied in making dairy products (2mks)

Bacteria in milk breaks down lactose into lactic acid and energy: The lactic acid makes the milk sour

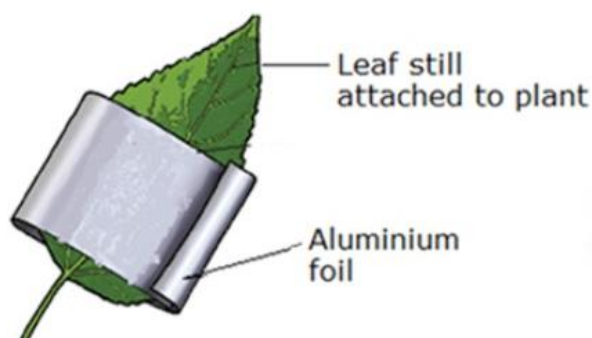
d). Name the part of the brain that controls the rate of breathing (1mk)

Medulla oblongata

e) Under which conditions is proteins are utilized (1mk)

During extreme starvation

5. In an experiment to investigate a factor affecting photosynthesis, a leaf of a potted plant which had been kept in the dark overnight was covered with aluminum foil as shown in the diagram below. The set up was kept in sunlight for three hours after which a food test was carried out on the leaf



(a) Explain the purpose of this experiment? (1mark)

To investigate the necessity of sunlight for photosynthesis

b) What food test was carried out? (1mark)

Test for starch

c)(i) State the results of the food test (2marks)

The part covered with aluminium foil retains the brown/yellow colour of iodine

The uncovered part stained blue-black

(ii) Account for the results in c (i) above. (2marks)

Aluminium prevented penetration of sunlight, photosynthesis did not take place and no starch form; Uncovered part was exposed to sunlight, photosynthesis occurred and starch was formed

(ii) Other than the factor being investigated above, State two other factors that increase the rate of the process studied (2marks)

- i. -Increased carbon (IV) oxide concentration*
- ii. Optimum temperature*
- iii. Increased water supply*

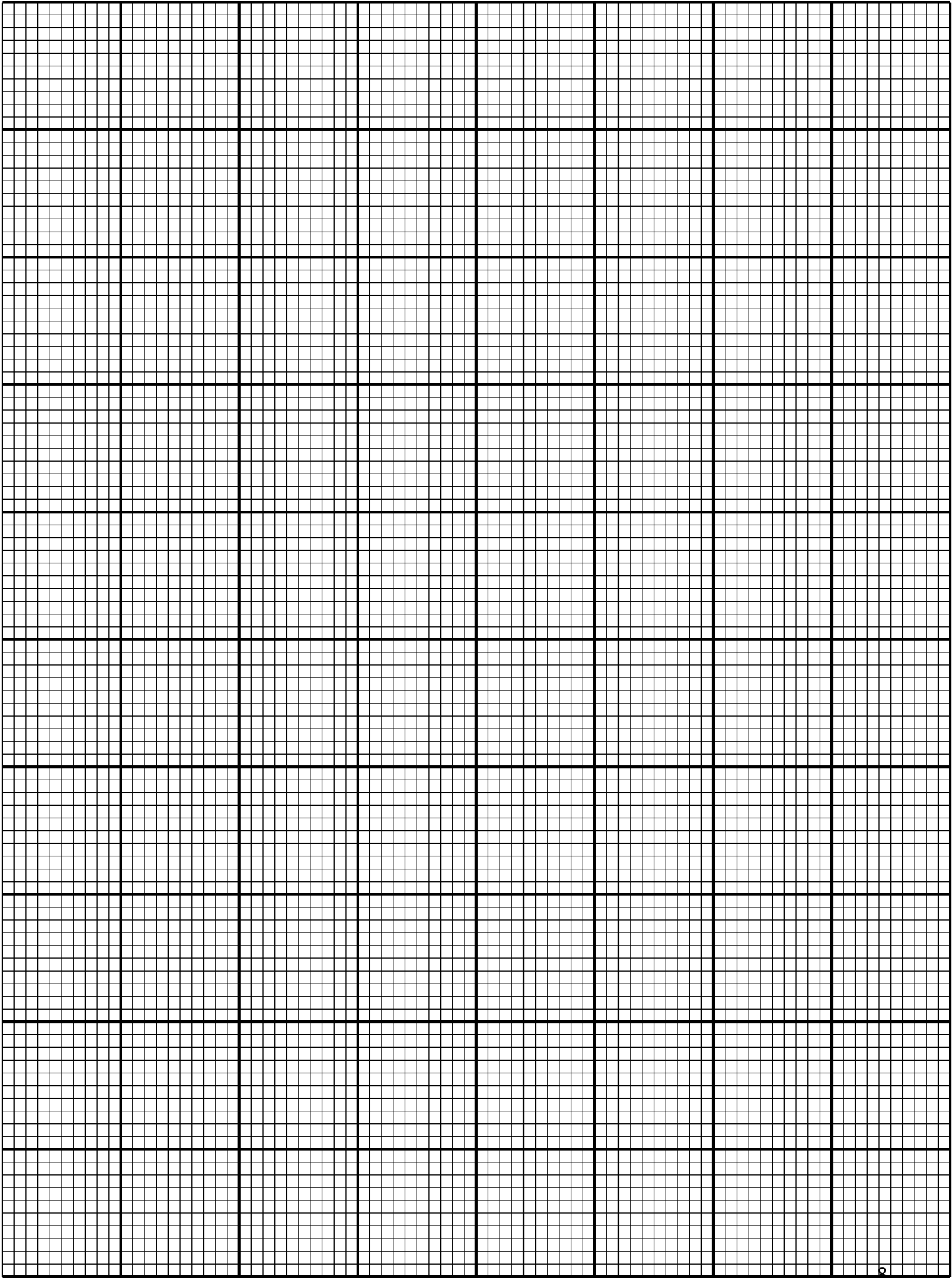
SECTION B

Answer Question 6(compulsory) and either question 7 or 8 in the spaces provide after question 8

The following results were obtained from a study of germination and early growth of cowpeas (*Vigna unguiculata*). The grains were sown in soil in a greenhouse and at two days intervals. Samples were taken, oven-dried and weighed. Graph is shown below.

Time after sowing (days)	0	2	4	6	8	10	12
Dry mass of embryo (g)	0.02	0.02	0.08	0.16	0.24	0.34	0.35

- a) Using a suitable scale, plot a graph of dry mass of embryo against time (6 marks)



- a) Using a suitable scale, plot a graph of dry mass of embryo against time (6 marks)
- b) Give the name of the type of curve you have obtained in 6 (a) above? (1 mark)
S-shaped curve/Sigmoid curve
- c) Explain why the rate of increase low between day one and day three? (2 marks)
0-2 – due to Inhibition (absorption of water)
2-3 – due to germination starts where only few cells have undergone division.
- d) State three reasons for the limited rate of increase between day nine and day eleven. (3 marks)
- 1. Most cells fully differentiated.**
 - 2. Few cells still diving.**
 - 3. Environmental factors start limiting.**
- e) Name a phylum whose growth does not take the shape of the curve drawn above. (1 mark)
Arthropoda . (Rej. Spelling error)
- f) What name is given to the curve exhibited by organisms in the phylum you have named in (e) (i) above? (1 mark)
Intermittent.
- g) State one advantage of using dry mass instead of fresh weight in estimating growth of an organism. (2 marks)
- **Dry mass is not affected by environmental conditions while fresh weight is dependent on the amount of water in the plant which fluctuate with environmental factors affecting transpiration rate.**
- h) What causes the behavior of the curve mentioned in (e) (ii) above? (1 mark)
Ecdysis(moulting) followed by development of exoskeleton
- i) State the role of the following growth hormones in plant growth and development
- i. Absciscic Acid (ABA) (2marks)
 - **Causes seed dormancy/bud dormancy;**
 - **Causes abscission of leaves/fruit fall;**
 - ii. Florigens (1 marks)
 - **Promote flowering**
- 7 (a). Describe the mechanism of inhalation in bony fish (10mks)
- (b). Discuss the role of auxins in plant coordination under the following stimuli
- (i) Gravity (5mks)
 - (ii) Light (5mks)

8.(a) Explain the role of the pancreas and the liver in blood sugar regulation (10mks)

(b) Describe the adaptations of halophytes to their habitats (10mks)

7(a)

- *The floor of the mouth cavity is lowered/the mouth is opened;*
- *This increased the volume of the mouth cavity and reduces the pressure;*
- *Water rushes/flows into the mouth cavity;*
- *The fish closes the mouth/floor of the mouth is raised;*
- *This decreases the volume but decreases the pressure;*
- *The operculum bulges outwards increasing the volume of the opercular cavity and decreasing the pressure;*
- *Water from the mouth enters the gill chamber/opercular cavity and flows the gills in a countercurrent direction to blood flow;*
- *Oxygen which is in higher concentration in water diffuses into the blood capillaries;*

(b) Light from one direction causes lateral migration of auxins to the darker side; where they accumulate causing faster growth than the lit side; which results in curvature of the shoot towards light; this helps the plant to grow towards light to obtain (light) energy for photosynthesis;

Contact/ touch causes lateral migration of auxins to the opposite side; where they accumulate and cause faster growth; which result in curvature; around the object; the curvature helps the plant to obtain mechanical support;

8(a) Role of the pancreas and liver in blood sugar regulation

- *When blood sugar raises above normal, the interstitial cells of the islets of Langerhans; in the pancreas; is stimulated to secrete insulin;*
- *Insulin is transported in blood to the liver where they stimulate the liver cell; to:*
 - *Convert excess glucose to glycogen for storage in the liver;*
 - *Convert excess glucose to fats for storage as adipose tissue in the skin;*
 - *Inhibit the conversion of glycogen to glucose;*
 - *Increasing the breakdown of glucose;*

Lowering the blood sugar level to glucose;

- *When the blood sugar level drops below normal, the alpha cells of the Islets of Langerhans of the pancreas; are stimulated to secrete glucagon; The glucagon is transported in blood to the liver cells; where it stimulates them to:*
 - *Stimulate the Conversion glycogen and fats to glucose;*
 - *Reduce the breakdown of glucose*

This raises the blood sugar level to normal

(b) Adaptation of halophytes to their habitats

Halophytes have roots which concentrate a lot of salts; in them enabling them to create a concentration gradient so as to absorb water by osmosis in the normal way;

Some plants have salt secreting cells; that secrete excess salts that enable them to increase the concentration of their cells to enable normal absorption of water by osmosis;

Some halophytes such as mangroves have pneumatophores; which emerge above water to obtain atmospheric oxygen for respiration;

Mangroves growing on mud flats have buttress roots; for support/anchorage;

Most of the submerged halophytes are found close to the surface; to ensure reception of sufficient sunlight for photosynthesis;

Halophytes in deeper waters have sensitive chloroplast; that enable them to carry out photosynthesis using light of low intensity;

They have fruits that have large aerenchymatous tissues; for air storage to enable them to float/be buoyant;