

BIOLOGY PAPER 2

ANSWERS

KCSE 2012

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1. (a) Lack of chlorophyll, the plants do not manufacture food photosynthesize; plants die as soon as the stored food reserves get depleted; (2 marks)

(b) Parental phenotype: Normal x pale green

(b)

Parental phenotype : ♂ Green ♀ Pale Green

Genotype : NN Nn

Meiosis :

Gametes : N N n

Fertilization :

F1 Genotype : NN Nn

or

$\text{♀} \backslash \text{♂}$	N	n
N	NN	Nn
n	Nn	nn

(4 marks)

(c)

Parental phenotype : ♂ Pale Green ♀ Pale Green

Genotype : Nn Nn

Meiosis :

Gametes : N n N n

Fertilization :

F1 Genotype : NN Nn Nn nn

F1 Phenotype : Green Pale Green Pale Green White

F1 phenotypic Ratio : 1 : 2 : 1

Maturing proportion: $\frac{3}{4}$ 75% 0.75

or

$\text{♀} \backslash \text{♂}$	N	n
N	NN	Nn
n	Nn	nn

(2 marks)

2. (a) E - glomerulus; (1 mark)

F - loop of henle; (1 mark)

(b) It is long; to increase the surface area for re-absorption of water;

It is U - shaped; to bring about counter - current flow/multiplier effect to enhance, water absorption.

It is lined with a network of blood capillaries; to enhance re-absorption of water;

(4 marks)

(c) vasoconstriction; hair rises; metabolic rate increases; shivering (3 marks)

First correct 3

3. (a) (i) chlorophyll; (1 mark)
 (ii) oxygen; (1 mark)
 (iii) Test tube **H** is at optimum temperature for enzyme activity; hence high rate of photosynthesis/more bubbles. In test tube **J** most enzymes have been denatured by the high temperature; hence low rate of photosynthesis/fewer bubbles. (2 marks)
- (b) – The villus epithelium is thin; for faster diffusion of dissolved food substances;
 – The epithelium has goblet cells; which produce mucus to lubricate food passage;
 – They have microvilli; which further increase their surface area for absorption;
 – Have lacteal; for absorption of fatty acid & glycerol/transportation of lipids;
 – Highly vascularised; for absorption of digested food. (4 marks)
 First correct 2
4. (a) (i) **K** - ulna; (1 mark)
L - humerus; (1 mark)
- (ii) movement of the lower arm upwards takes place at the elbow/olecranon process which is between the ulna and the humerus; biceps/flexor muscles contract; while the triceps/extensor muscles relax; bringing about the movement of the lower arm upwards. (3 marks)
- (b) – The rigid midrib holds leaf out away from the stem;
 – Profuse network of veins have lignified cells which support leaf to stay spread out;
 – Turgidity in spongy mesophyll and palisade cells support the leaf to remain open; (3 marks)
5. (a) The external intercostal muscles contract while internal intercostal muscles relax; the rib cage is pulled upwards and outwards; the diaphragm muscles contract and the diaphragm flattens; the volume of the thoracic cavity increases/the pressure in the thoracic cavity decreases; air rushes into the lungs; from the atmosphere through the nose (4 marks)
- (b) The osmotic pressure of guard cells increase when sugar is manufactured during photosynthesis/starch is converted to sugar in low acidity/potassium moves into guard cells during the day; water enters guard cells from the surrounding cells by osmosis; because the guard cells are bean shaped with thin outer walls and thick inner walls, the thin outer walls expand faster as the cell becomes turgid; thus the thick inner wall curves: causing the stomatal aperture to open. (4 marks)

6. (a) (i) title - Graph of Prey-predator relationship; (OWTE)

Scales X axis;

Graph should cover more than half of the grid provided.

Y axis;

Graph should cover more than half of the grid provided.

correct plotting

P;

Q;

smooth curves

P;

Q;

labelling axes;

(7 marks)

(ii) **P** represents the prey;

- Prey population is initially higher/

prey population usually starts falling earlier;

(1 mark)

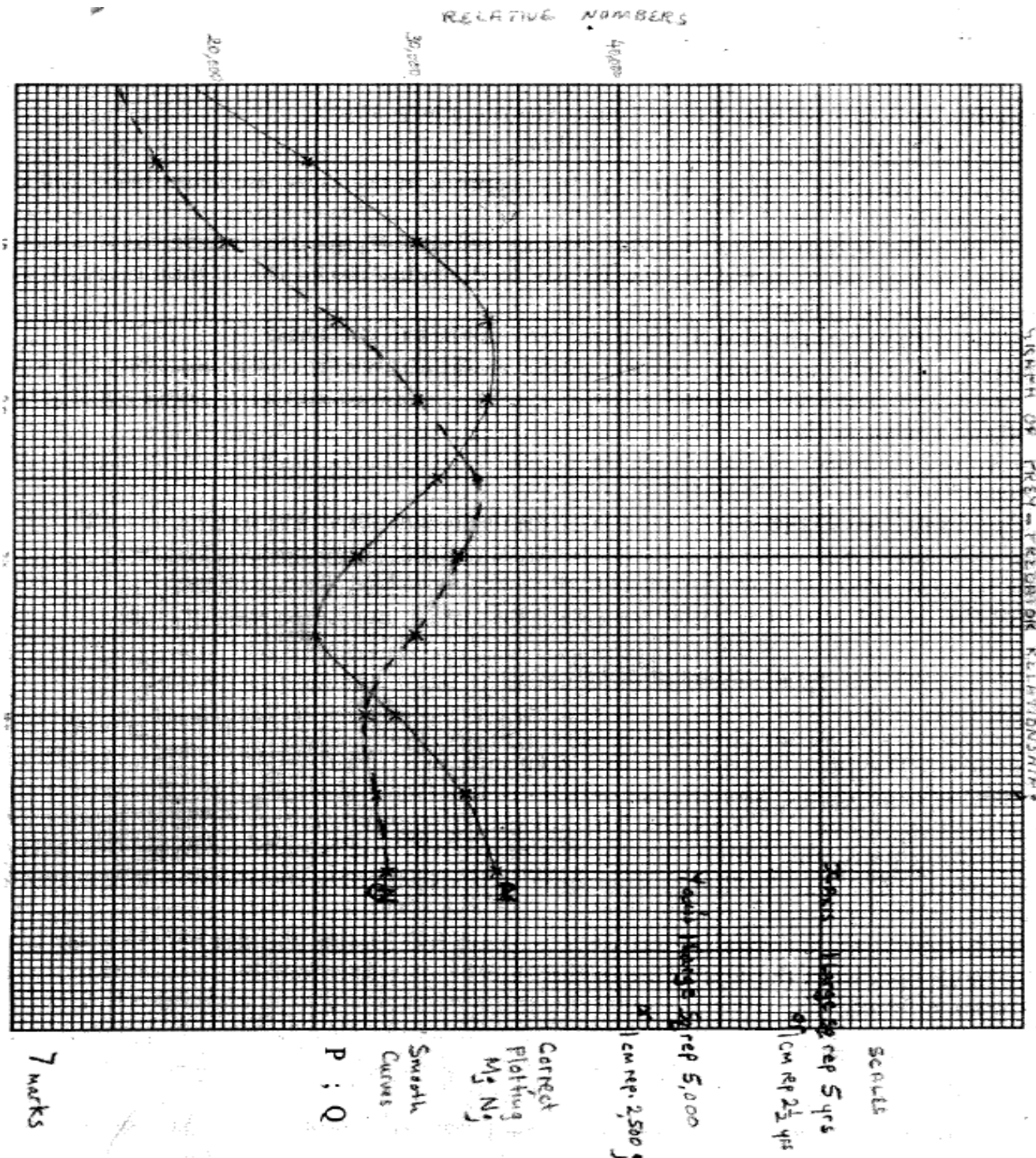
(iii) Both populations decrease;

(1 mark)

because prey is not enough to sustain predator/population environmental stress limit

population of prey;

(1 mark)



(iv) at 23 ± 0.5 years; and at 39 ± 0.5 ;

(2 marks)

(v) less food for the prey/intra specific competition;
emigration of the prey;
diseases causing death of the prey;
parasitism;
human activities

(3 marks)

- (b) sulphur dioxide in the air - causes respiratory diseases; poisons plants; forms acid rain which increase soil pH; corrodes metals in buildings; (4 marks)
Total (20)

7. **Simple reflex action** - withdrawal of finger from a sharp object.
Is an automatic response to a specific stimulus;

When the finger touches a sharp object, pain receptors in the skin; are stimulated and trigger off a nerve impulse;

The nerve impulse is transmitted via the sensory neuron; to the grey matter of the spinal cord;

The impulse is then transmitted via a synapse; to the relay neuron; and then through another synapse; to the motor neuron;

The impulse is then transmitted to the effector muscles in the hand;

These effector muscles contract; and the finger is withdrawn from the hot object;

(Accept use of other relevant examples)

Conditioned reflex action

Is an automatic response evoked from an animal by unrelated stimulus; substituted for the one which normally elicits the response;

It develops from past experience; and involves modification of behaviour through learning; It weakens with time; and must be reinforced by repeating the unrelated stimulus;

Students salivate when the bell for lunch rings; because they have learned to associate the ringing of the bell at lunchtime with food; from experience; every time it rings, they are offered food;

(Accept use of other relevant examples)

Maximum 20 marks

8. (a) An allergic reaction is a hypersensitive response; to an antigen by the body immune system; The body immune system responds by overproducing antibodies; against harmless antigens; The antigen-antibody reaction occurs on the surface of body cells; which burst open; and release histamines; Histamines cause inflammation/itching/swelling/pain, etc; which damage the body; Allergic people are hypersensitive to materials like dust/pollen grains/some foods/some drugs/some pollutants, etc; (10 marks)

- (b) In bright light; stomata are fully/wide open; increasing contact between the atmosphere and air spaces in the leaf; This in turn increases water loss by evaporation through the open stomata

High environmental temperatures; increase the rate of evaporation from the leaf surface thus more water leaves cells due to the increased diffusion gradient;

In a windy day; air around the leaf is carried away reducing water vapour around the leaf; more water moves into the atmosphere from the leaf air spaces;

In low humidity/when the atmosphere is less saturated with water vapour; more water will move from leaf air spaces into the atmosphere; leading to increased rate of transpiration;

Low atmosphere pressure; increases diffusion gradient between atmospheric and leaf increased rate of evaporation;

Availability of water; causes turgidity of guard cells hence stomata open; increasing rate of transpiration.

(10 marks)