Name…… Index Number……

231/2 Candidate's Signature……
BIOLOGY
Paper 2 Date……
(THEORY)
2 hours

KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
BIOLOGY
(THEORY)
2 hours

Instructions to candidates

(a) Write your name and index number in the spaces provided above
(b) Sign and write the date of examination in the spaces provided above
(c) This paper consists of two sections; A and B
(d) Answer all the questions in section A 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 12 printed pages
(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use only

Section	Questions	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
	Total Score	80	

SECTION A (40 marks)

Answer ALL the questions in this section in the spaces provided

1. In a certain plant species which is normally green, a recessive gene for colour (n) causes the plants to be white in colour. Such plants die at an early age. In the heterozygous state, the plants are pale green in colour but grow to maturity.

   (a) Give a reason for the early death of the plants with the homozygous recessive gene. (2 marks)

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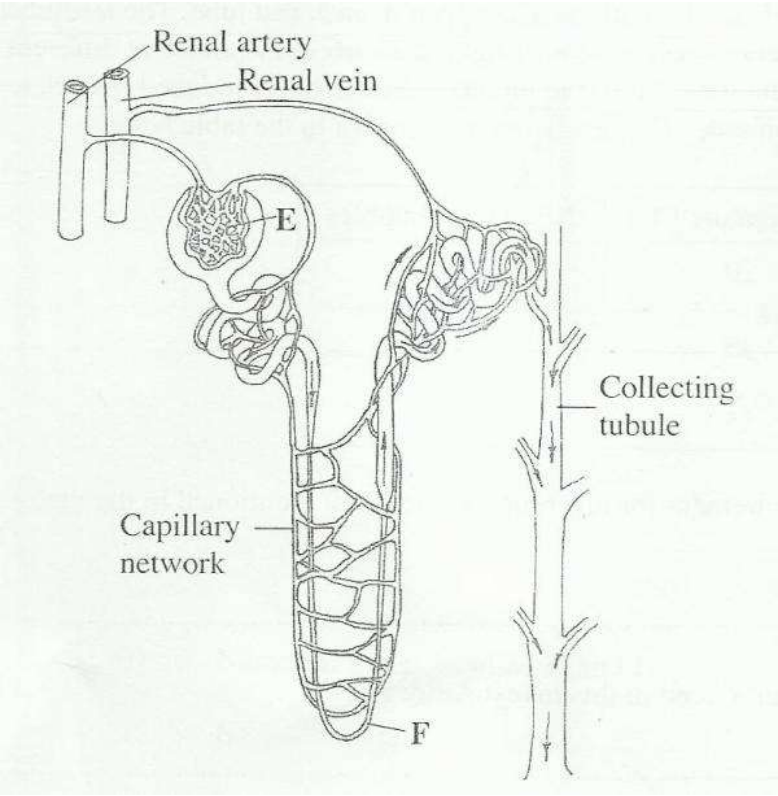
   (b) If a normal green plant was crossed with the pale green plant, what would be the genotype of the first filial generation (F_1 generation)? Show your working. (4 marks)

   (c) If heterozygous plants were self-pollinated and the resulting seeds planted, work out the proportion of their offspring that would grow to maturity. (2 marks)

2. The diagram below illustrates the structure of the kidney nephron.



(a) Name the part labeled E. (1 mark)

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(b) How is the part labeled F adapted to its function? (4 marks)

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(c) State three physiological mechanisms of controlling the human body temperature during a cold day. (3 marks)

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3 (a) In an investigation, equal amounts of water was place din three test tubes labeled G, H and J. pondweeds of equal length were dropped in each test tube. The test tubes were then placed identical conditions of light and carbon (IV) oxide at different temperatures for five minutes. After five minutes, the bubbles produced in each test tube were counted for one minute. The results were as shown in the table below.

Test tube	Temperature (0C)	Number of bubbles
G	20	28
H	35	42
J	55	10

(i) Name one requirement for this process that is not mentioned in the investigation. (1 mark)

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(ii) Name the gas produced in this investigation (1 mark)

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(iii) Account for the results in test tubes H and J. (2 marks)

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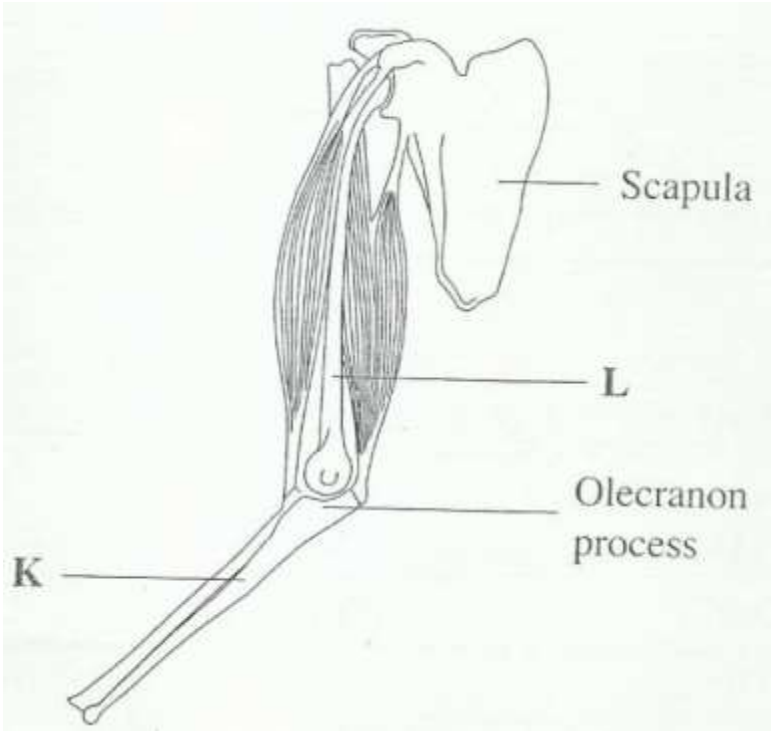
4. The diagram below illustrates the arrangement of bones and muscles in the human arm.



(i) Name the bones labeled K and L (2 marks)

K ……..

L ……

(ii) Explain how the upward movement of the lower arms is brought about by the bones and muscles shown in the diagram above. (3 marks)

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(b) State three ways in which support is brought about in a leaf. (3 marks)

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5. (a) Describe the process of inhalation. (4 marks)

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(b) Explain the mechanism of stomatal opening (4 marks)

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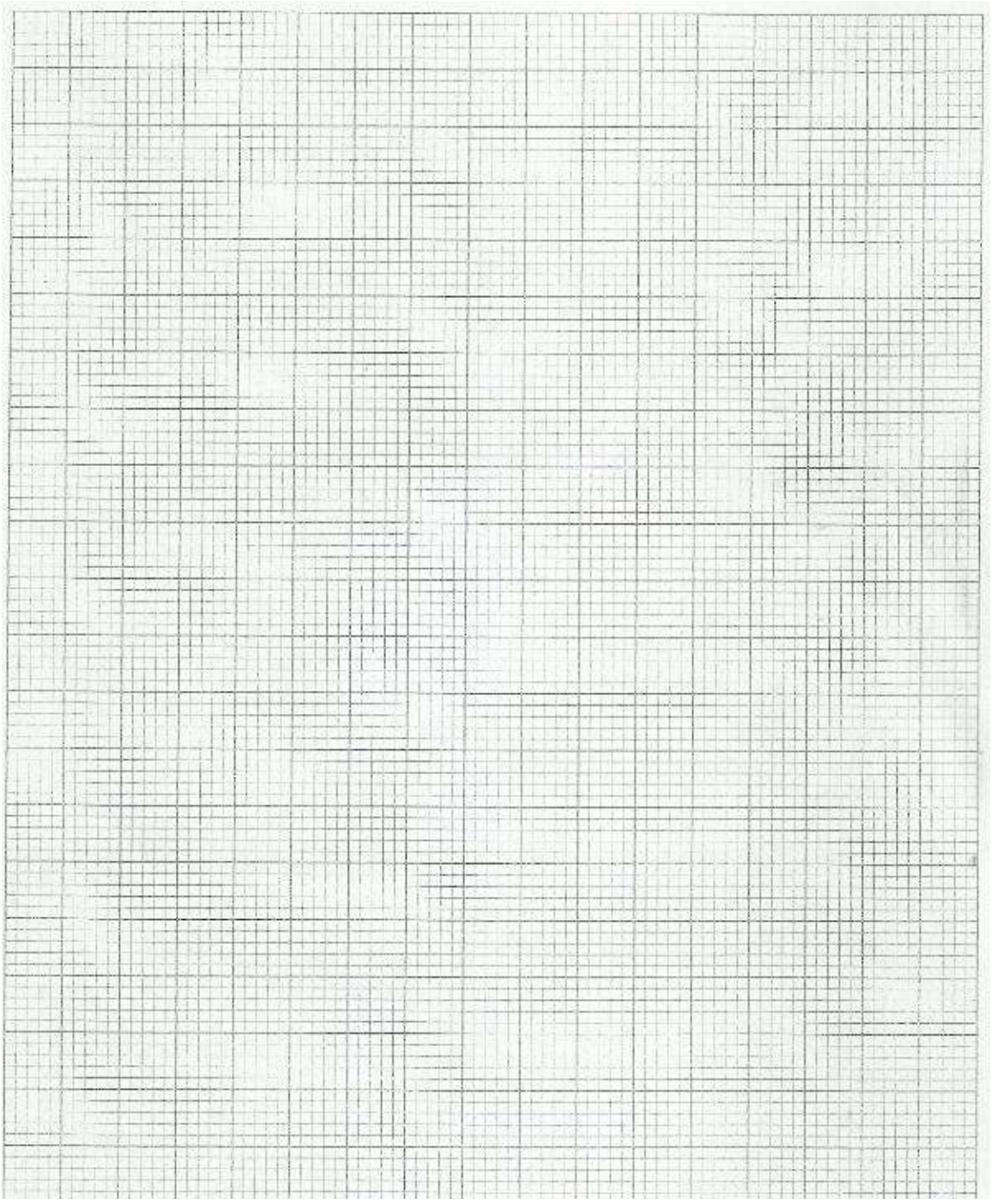
SECTION B (40 marks)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. The data provided below re-resent populations of a predator and its prey over a fifty years period.

TIME IN YEARS	POPULATION IN RELATIVE NUMBERS	
	POPULATION OF P	POPULATION OF Q
5	24500	17000
10	30000	20500
15	33500	26000
20	33500	30000
25	31000	33000
30	27000	32000
35	25000	30000
40	29000	27500
45	32500	28000
50	34000	28500

(a) (i) Using the same axes, draw graphs of the relative populations of P and Q against time. (7 marks)



(ii) With a reason, identify the curve that represents the prey. (2 marks)

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(iii) Account for the two populations between 25 and 32 years. (2 marks)

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(iv) Which years were the two populations equal? (2 marks)

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(v) Apart from predation, state three biotic factors that may have led to the decline of the prey population. (3 marks)

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(b) Describe the hazards of air pollution by Sulphur (IV) Oxide. (4 marks)

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7. Using a relevant example in each case, describe simple and conditional reflex actions. (20 marks)

8 (a) Using a relevant example, describe how an allergic reaction occurs in a human being. (10 marks)

(b) Describe how environmental factors increase the rate of transpiration in terrestrial plants. (10 marks)

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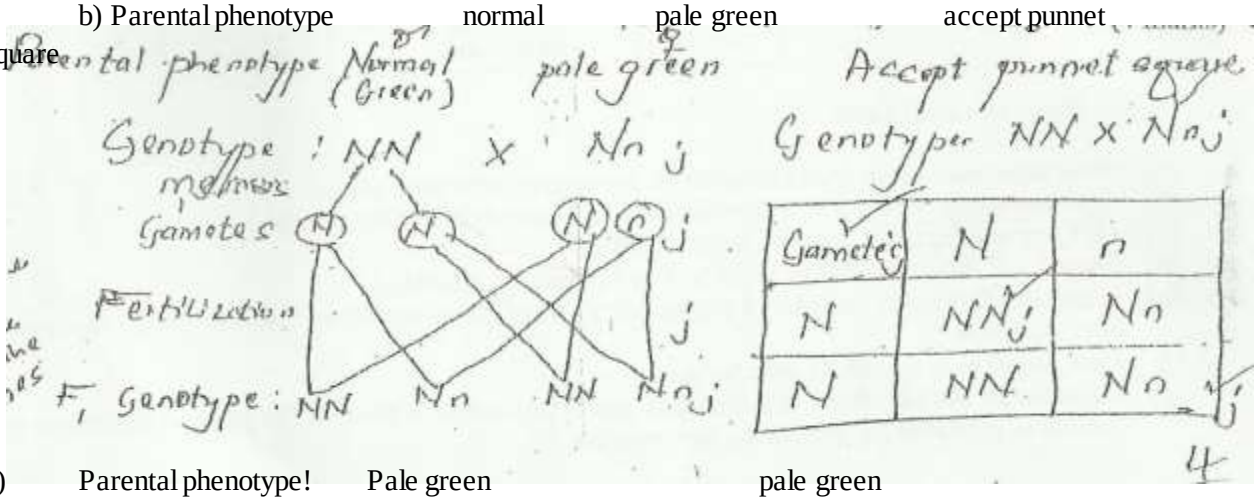
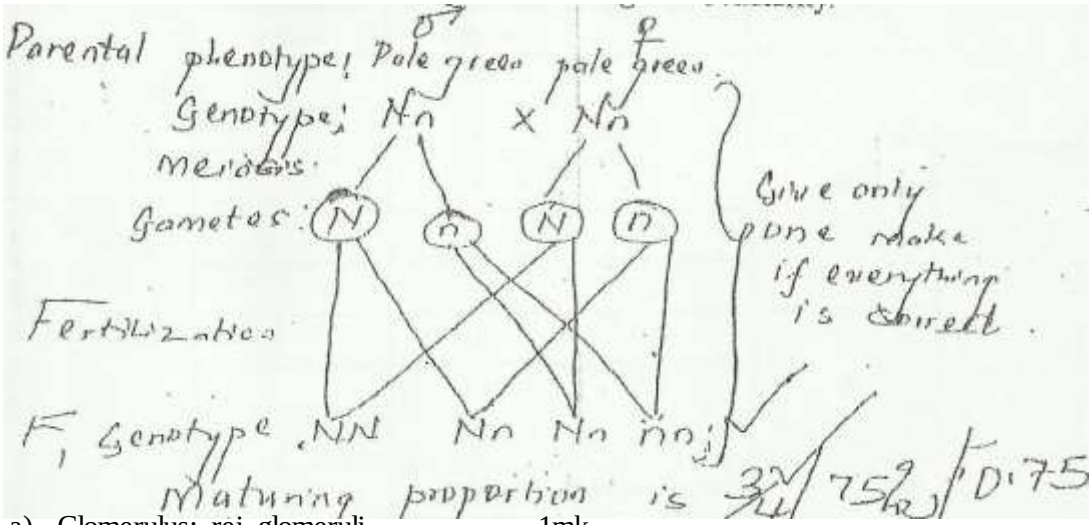
BIOLOGY P2

1 a) lack of chlorophyll plants manufacture food/ photosynthesize; plant dies as soon as the stored food become depleted

b) Parental phenotype normal pale green accept punnet square



c) Parental phenotype! Pale green pale green



2 a) Glomerulus; rej. glomeruli 1mk

b) It is long to increase the surface area for re absorption of water
It is lined with a network of blood capillaries to enhance re absorption of water
It is un-shaped to bring about a counter multiplier effect/to concentrate salt in the medulla to bring about re-absorption of water

c) Vasoconstriction
Hair rises Acc pilo erection for hair rising
Metabolic rate increases
Shivering

3 a) i) Chlorophyll
ii) Oxygen
iii) Test tube is at optimum temperature for enzyme activity; (hence high rate of photosynthesis/ more bubbles in test tube I (most) enzymes have been denature by high temperature;(hence low rate of photosynthesis/fewer bubbles

b) The villus epithelium is thin/one cell thick wall; for faster diffusion of dissolved/digested food substances/soluble food substances/glucose/amino acids/vitamins/nutrients;

The epithelium has goblet cells; which secrets much which lubricate food helping its passage/ prevent digestion of gut wall by(its own prolytic) enzyme

They have which (further) increase their surface area for absorption of dissolved digested and soluble food substances/glucose/amino acid/vitamins nutrients

Has lacteal; for absorption of fatty acids and glycol transportation of lipids

It is highly vascular dense network of capillary for absorption/transportation of dissolved digested

4. a) i) K- ulna
L- humerus

ii) Movement (of the lower arm upwards) takes place at the elbow/olecranium 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)

b) The (rigid) midrib holds lead (out away) from the stem

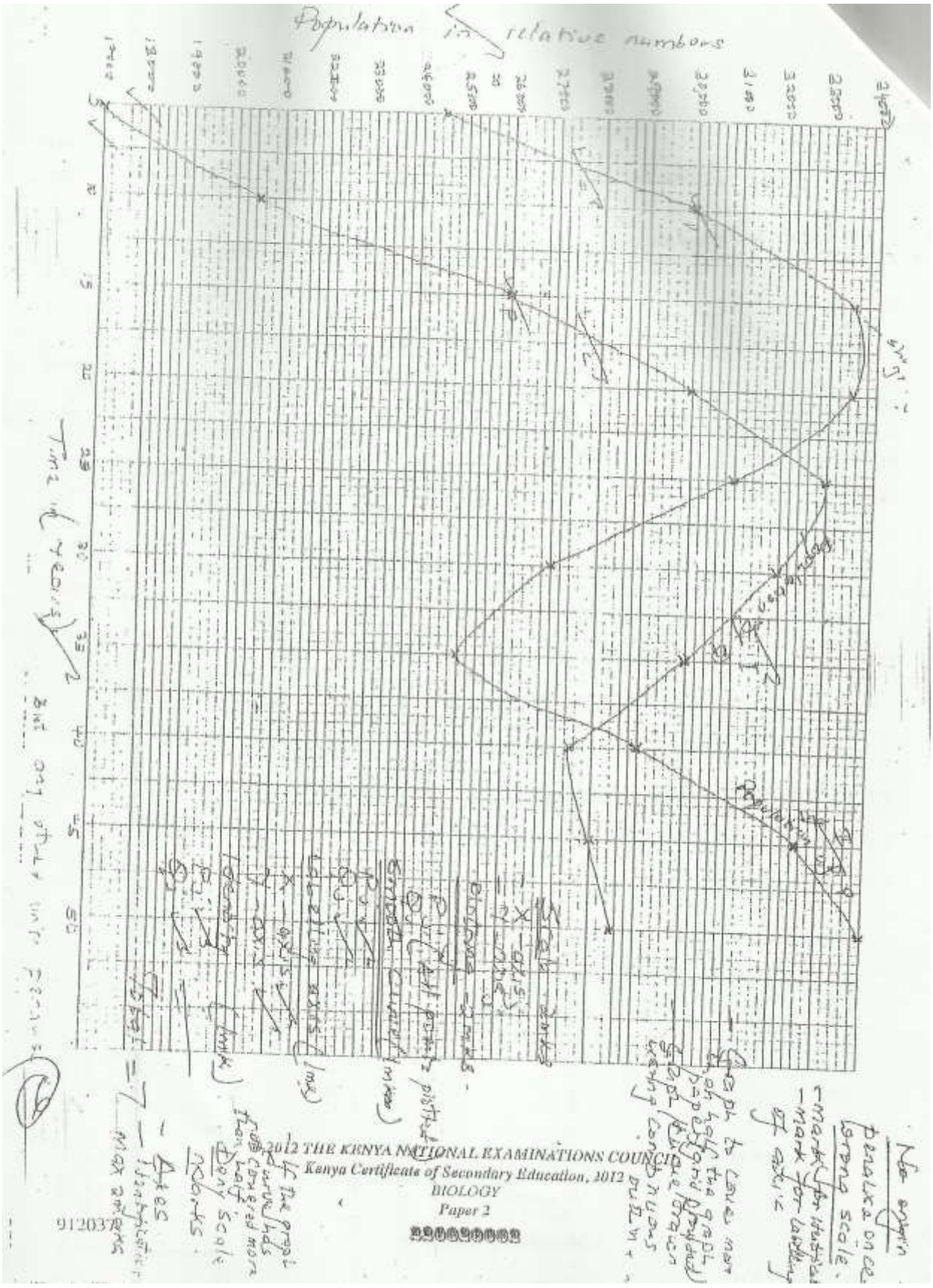
Have lignified xylem

Turgidity in spongy mesophyll /palisade cell

5 a) The external intercostal muscles contract while internal intercostals muscle relax; the rib cage is pulled upwards and outwards; the diaphragm muscle contract and the diaphragm flattens; the volume of the thoracic cavity/lungs increases/the pressure in the thoracic cavity/lungs decreases; air rushes into the lungs;(from the atmosphere through the nose)

b) The osmotic pressure of guard cells increases when sugar is manufactures during photosynthesis/starch is converted to sugar in low activity/potassium ions moves into guard cells during the stay; water enters guan 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 more as the cells becomes turgid; thus the think inner wall curves;(causing the stomata aperture to open

6.


Population in relative numbers
2012 THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education, 2012
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ii) P - Represents the prey; prey population is initially higher/prey population usually starts
falling earlier

iii) Both population decreases; because prey is not enough to sustain predator population environment stress limit population of prey;

iv) 23 ± 0.5; and 39 0.5 (years);
Specific values between the range

v) Less food for the prey/competition for food;
Competition for mates/water/space;
Diseases (causing death of prey);
Migration out
Emigration (causing death of prey);
Human activities; pollution;/poaching/or any other correct example of human activity
Parasitism

b) Sulphur (iv) oxide in the air causes respiratory diseases/pneumonia/bronchitis/emphysema/ aggecuate sulphur (iv) oxide in high concentration can kill humans/damage plants
Forms acid rain; which lowers soil PH; corrode metals/damage/destroy buildings/machines/ stones/sculptures/statues
Poison damages/destroys/kills plants/ kills animals/leaves
magnesium/calcium/aluminum;

7 Simple reflex action
Example- withdrawal of finger from a sharp/hot object ;(accepting any relevant example
Definition Automatic response to a specific stimulus;
Explanation when the finger touches a sharp object /hot object pain receptors/thermoreceptors in the sin are stimulated; and trigger off a nerve impulse;
The nerves impulse is transmitted the/sensory neuron; to the grey matter of the spinal cord CMS/brain; the impulse is then transmitted via a synapse; to the/relay neuron; and then through
another synapse; to the motor neuron;
The impulse in then transmitted to the effect muscles in the hand; the effector muscles/bicep contract; and the finger is withdrawn from the sharp/not object
Conditional reflex action
Example Salivation of fog/student/human in response to sound ;(any other relevant example e.g. swimming, playing a guitar
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 y behavior/learning; it wakens with time; and must be reinforced by related/ original/primary stimulus;
Dog/ human/students salivate when the bell for rings; because they have learnt to associate the ringing of the bell of meal time with food; every time the rings they are offered food

8. a) Allergic reaction

Example/asthma they fever; accepts any other specified example: 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 releases histamines;

Histamines cause inflammation /itching/swelling/pain/breathing difficulties/constriction of bronchi/dilation of capillary/excessive secretion of mucus/anaphylaxis/diarrhea/vomiting/sneezing/coughing wheezing, which damage the body; allergic people are hypersensitive to materials like dust pollen grains/some foods/some drugs/some pollutants (fungal) spores/feathers/fur/strong/perfumes/cold;

b) How environmental factors increase the rate of transpiration in terrestrial plants

In bright light; stomata are (fully/wide) open; exposing air spaces in the leaves to atmospheric

This in turn increases water loss by evaporation through the open stomata.

High (environmental) temperatures; increases the rate of evaporation from the leaf surface/stem; thus more water vapour leaves cells due to the increases diffusion gradients;

In a windy day; air around the leaf/stem is carried away restoring water vapor around the stem/leaf; (more water vapour moves into the atmosphere from the leaf/stem/increasing diffusion gradient between stem/leaf/air space and the atmosphere ;

In low humidity/when the atmospheric is less saturated with water vapor; more water vapor will move from leaf/stem to spaces due to increased diffusion gradients;

Low atmospherics pressure; increases the rate of evaporation;

Availability of water; cause turgidity of guard cells hence stomata open; increasing the rate of transpiration