NAME ..... **ADM NO** ....

SCHOOL ..... **SIGNATURE** ..... **DATE** ....

231/2
BIOLOGY
PAPER 2
(THEORY)
MARCH/APRIL, 2019
2 HOURS

MOKASA JOINT EVALUATION TEST, 2019

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- **Write your name and Index Number in the spaces provided above.**
- **This paper consists of two sections. Section A and section B.**
- **Answer ALL questions in section A in the spaces provided. In section B answer question 6 (compulsory) and either question 7 or 8 in the spaces provided.**
- **This paper consists of 9 Printed pages. Candidates should check the question paper to ensure that all the papers are printed as indicated and no questions are missing**

For Examiners use only.

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	

SECTION A (40 MARKS)

1. (a) Explain how dichogamy prevents self-fertilization in flowering plants. (2 marks)

In male protandry, the male parts of flower/stamen/anthers mature and release their pollen grains; before the female parts of the flower/carpels/stigma mature and receive pollen grains;

(b) State the changes that take place in a flower after fertilization. (3 marks)

Diploid zygote develops into the Embryo;

Triploid Nucleus develops into the Endosperm;

Ovary develops into thr fruit;

Ovules develop into the seeds;

(c) Describe the adaptations of the male parts of a wind pollinated flower to their function? (3 Marks)

They have larger anthers to bear numerous pollen grains;

The Anthers are loosely attached hence are swayed by wind easily to release the pollen grains;

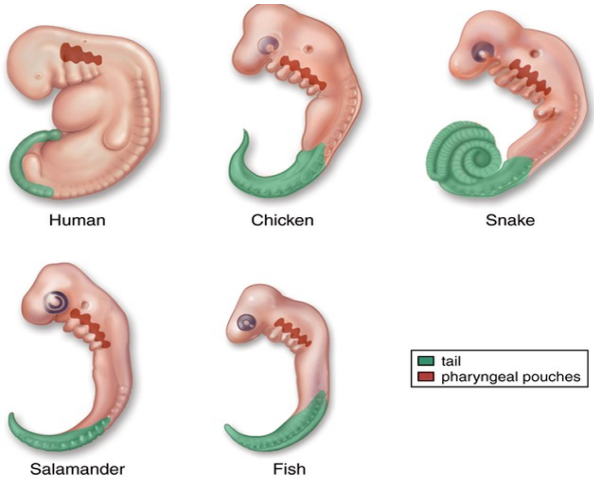
They have a flexible filament to allow swaying by wind to release pollen grains;

Produce small and light pollen grains to be carried by wind;

2. (a) Explain how convergent evolution may occur. (3 marks)

Convergent evolution occur when two dissimilar structures /species /organisms with different embryonic origins ; change in response to similar environmental conditions / occupy same environment; and develops similar characteristics / modified to perform similar function.

(b) The diagrams below show some organism structures that have been used as evidence of the process of evolution.



Name the type of evidence and explain it provides evidence to proof that the process of evolution may be taking place.
(3 marks)

(Embryology reveals that) Embryos of different vertebrate groups have similar morphological features during their early stages of development; This suggests a common ancestry; The closer the resemblance between the embryos in early stages, the closer the phylogenetic relationships;

(c) Outline two evolutionary characteristics that adapt man to his environment. (2 marks)

High intellectual capacity / Cranium greatly expanded;

Reduced incisors and canines unsuitable for killing prey or for self defence;

Use of speech in communication;

Locomotion is bipedal /on two limbs / upright;

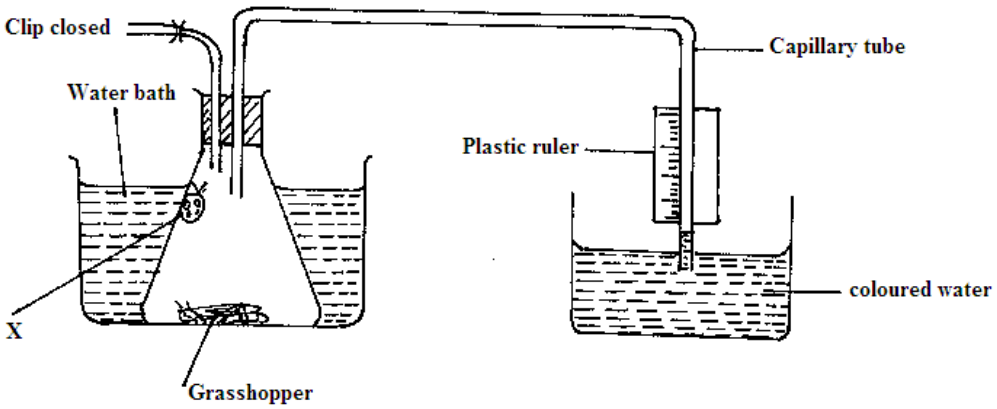
Has an apposable thumb for manipulation;

Has a non-apposable toe in the foot;

3. (a) Name the end products of glycolysis.
(1 mark)

Pyruvic acid;

(b) The diagram below illustrates an experiment to determine the rate of respiration in a small insect.



(i) Name the chemical compound labelled X and state its function.
(2 marks)

Soda Lime / Sodium hydroxide;

To absorb carbon (IV) oxide produced;

(ii) What changes would you expect to observe in the level of the coloured water in the capillary tube after the experiment has run for 10 minutes?
(1 mark)

Level of coloured water would rise;

(iii) Explain the changes you have stated in (b) (ii) above.
(3 marks)

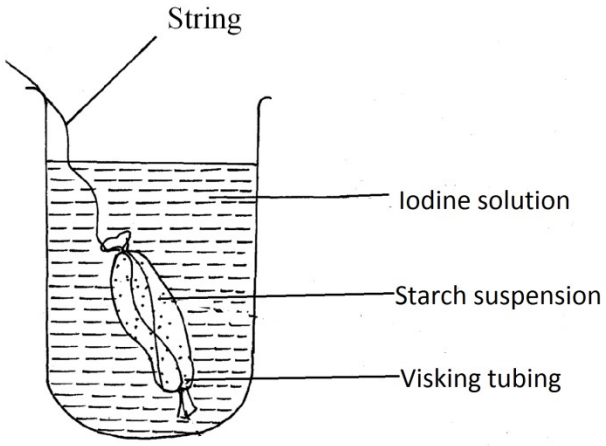
The Insect respired using oxygen and releasing carbon (IV) oxide; which was absorbed by soda lime;

Uptake of oxygen caused a decrease in the air pressure within the flask causing a rise in the level of coloured water;

(c) Why was it necessary to place the flask in a water bath?
(1 mark)

To maintain an almost constant temperature; A slight change in air temperature causes air to expand / contract;

4. An investigation was performed by a group of students as shown in the set up below.



After 30 minutes, the starch suspension had turned blue-black while iodine solution retained its colour.

(a) Name the physiological process that was being investigated in the experiment. (1 mark)

Diffusion;

(b) Account for the results observed after 30 minutes. (3 marks)

Visking tubing is semi-permeable; allowing the smallsized Iodine molecules to pass through; but preventing the large sized starch molecules from crossing;

(c) Explain what would happen to a red blood cell when placed in distilled water and left to stand for the same duration as for the experiment above. (3 marks)

The cell sap is hypertonic to the solution / distilled water; hence water molecules moved into the cell by osmosis; making the cell to swell and eventually burst;

(d) Define cell physiology. (1 mark)

It is the study of the functions of cell structures;

5. In a plant breeding research, a certain plant species was developed and found to be normally green in colour. A recessive gene for colour (g) causes these plants to be white in the homozygous state. In this state, the gene is lethal causing white plants to die at an early age soon after germination. In the heterozygous state, these plants are pale green in colour and grow to maturity.

(a) Suggest a reason for the early death of the plants with homozygous recessive genes. (1 marks)

They lack chlorophyll therefore cannot carry out photosynthesis(to manufacture food);

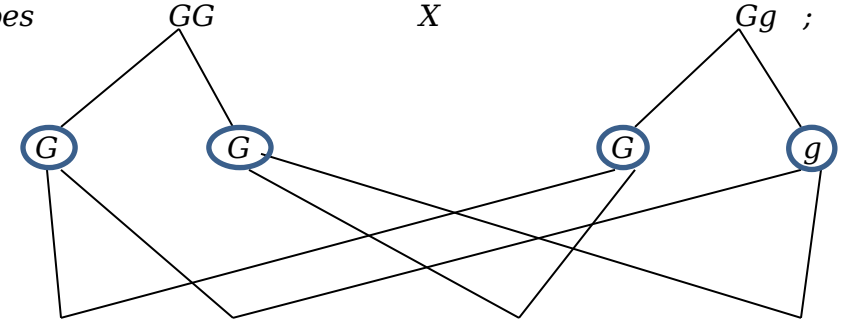
As soon as their food reserves (in the Endosperm / cotyledon) are depleted, they die;

(b) A normal green plant was crossed with a pale green plant; work out the genotypes of the F1 generation. Show your working.
(4 marks)

Parental phenotypes *Normal green* *Pale green*

Parental genotypes *GG* *X* *Gg* *;*

Gametes *G* *G* *G* *g* *;*



F1 genotypes *GG* *Gg* *GG* *Gg* *;*

Accept a relevant Punnet square as follows,

Parental phenotypes; Parental genotypes; Gametes;

Followed by the Punnet square below

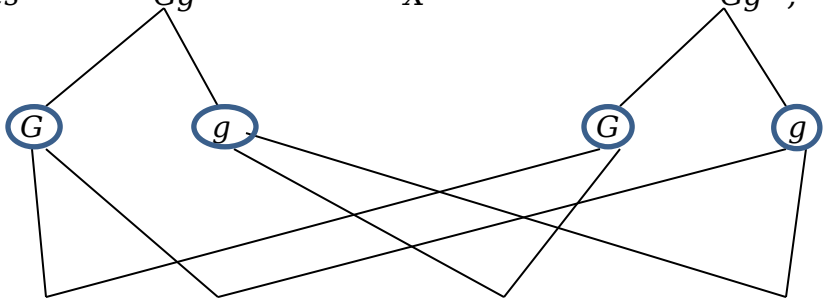
	G	*g*
G	*GG*	*Gg*
G	*GG*	*Gg*

(c) Seeds from the heterozygous plants were planted. The plant breeders allowed the resulting plants to self-pollinate. Work out the phenotypic ratio of the plants that would grow to become mature.(2 marks)

Parental phenotypes *Normal green* *Pale green*

Parental genotypes *Gg* *X* *Gg ;*

Gametes *G* *g* *G* *g* *;*



F1 genotypes *GG* *Gg* *Gg* *gg ;*

Phenotypic ratio *1 normal : 2 Pale Green;*

(The cross is 1 mark. The correct Ratio 1 mark)

(d) Give an explanation for the occurrence of the pale green colour in heterozygous plants. (1 mark)

Pale green is due to incomplete dominance;

Acc Blending and co-dominance;

SECTION B (40 Marks)

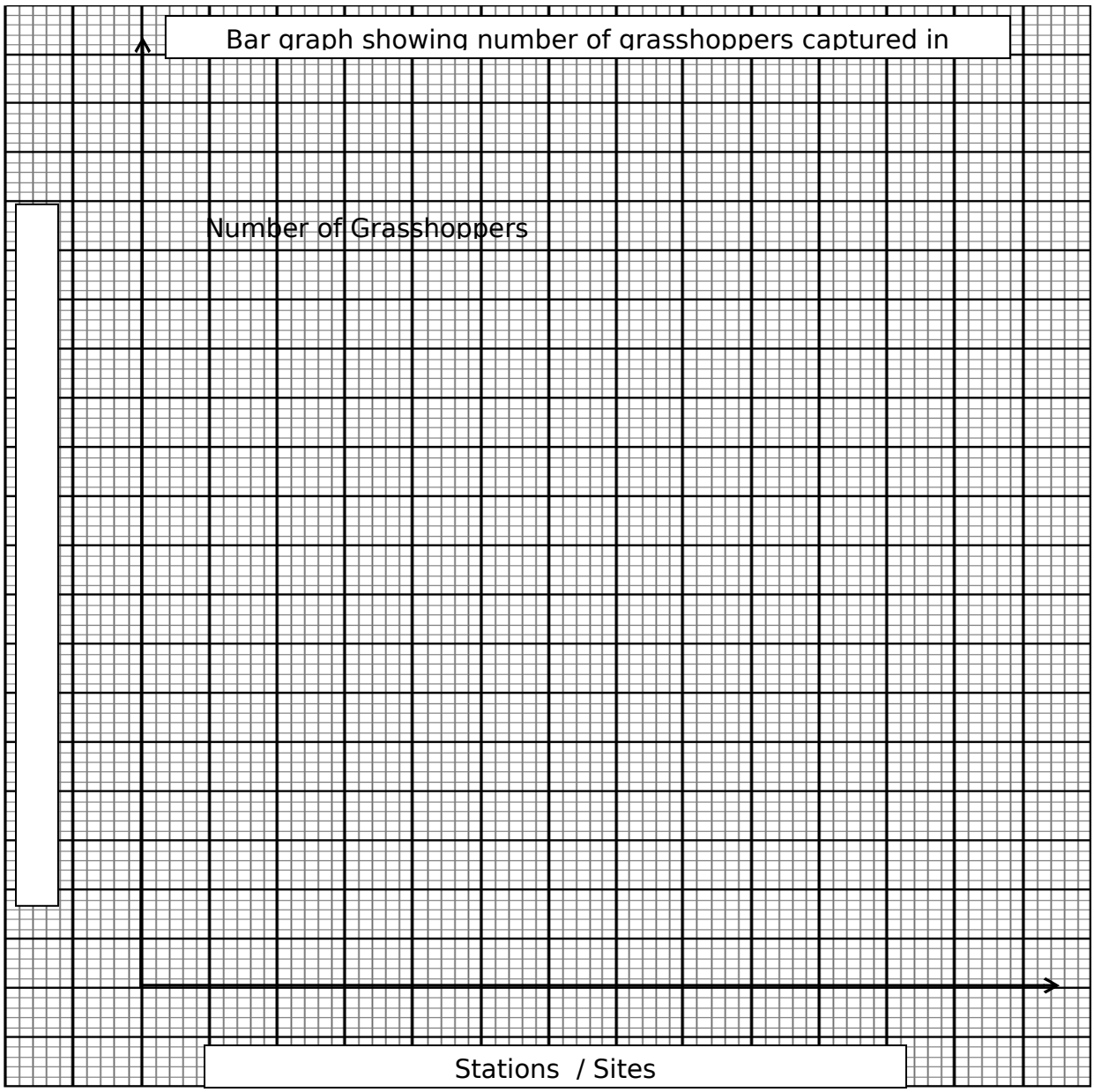
Answer question 6 (Compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. A group of students carried out a study to estimate the population of grasshoppers in their school compound. The table below shows the number of grasshoppers that were collected from eight sites within the school compound.

Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Number of grasshoppers	**280**	**50**	**190**	**220**	**85**	**300**	**175**	**30**

(a) (i) Construct a bar graph to represent the number of grasshoppers collected from each site.

(6 marks)



(ii) In a related exercise, students caught 240 grasshoppers, marked them with ink and then released them. After five days, they caught 160 grasshoppers and found that 40 were marked. Work out the estimated population of grasshoppers in the school compound. (3 marks)

Total population = First captured X Second captured ;

Marked Recaptured

$= \frac{240 \text{ X } 160 ;}{40}$

$=960$ *grasshoppers ;*

(b) (i) Identify the method described in (a)(ii) above. (1 mark)

Capture recapture method ; / Capture – mark – release – recapture method;

(ii) Identify the instrument the students might have used to get the grasshoppers. (1 mark)

Sweep net ; Specimen bottles;

(iii) State three factors that would influence the results in the method above. (3 marks)

-Predation;
-Availability of food;
-Diseases;
-Competition;

(c) Outline the adaptable observations the students would make on the grasshopper regarding;

(i) Locomotion. (2 marks)

Six jointed legs for walking;
Well developed muscular hind legs for jumping / hopping ;
Wings for flight;

(ii) Protection. (2 marks)

Body colour resemble the background colour of environment /Camouflage for difficult identification by predators;

Spikes on Tibia of hind limbs for scaring away predators;

(iii) Feeding. (2 marks)

Maxillae with maxillary pulps for holding and directing food into mouth;

Mandibles for cutting and crushing food ;

Labium and Labrum for closing the mouth while food is being chewed;

7. (a) Name the tissues in flowering plants responsible for secondary thickening (2 marks).

-Vascular cambium;

-Cork cambium;

(b) Describe an experiment you would carry out to demonstrate the region of growth in the root of a bean seedling.
(8 marks).

- Select a germinating bean seedling with a (straight) radicle;

-Using a ruler, fine thread and an indelible ink, mark the radicle at equal intervals of 2mm;

-Pin the seedling firmly onto a cork and place it in a boiling tube lined with wet filter paper;

-Leave the set up undisturbed for five days;

-Examine / observe the ink marks at the end of the experiment;

-Measure the distance between successive ink marks;

-Record your observations;

-Compare with original ink marks and conclude;

(c) Explain the role of growth hormones in metamorphosis of a housefly
(10 marks).

-The housefly undergoes complete metamorphosis / egg, larva, pupa and adult;

-The process of metamorphosisis regulated by moulting stimulating hormone, juvenile hormone and moulting hormone (Ecdysone);

-Juvenile hormone secreted by corpus allatum stimulates formation of larval cuticle / retention of larval stages / youthful characteristics / inhibits metamorphosis;

-The larva feeds a lot and undergoes several moults;

-Prior to each moult the neurosecretory cells secrete moulting stimulating hormone;

-Moulting stimulating hormone stimulate prothoracic glands to secrete moulting hormone / ecdysone;

-Ecdysone stimulates moulting of larva to larva; when the concentration of juvenile hormone is high;

-When the larva matures, the corpora allatum disintegrates; and secretion of juvenile hormone ceases;

-Absence of juvenile hormone causes moulting of larva to pupa;

-The pupa does not produce juvenile hormone; hence allowing metamorphosis into an adult;

8. Describe the role of the liver in;

(a) Blood sugar regulation. (10 marks)

The Liver controls levels of glucose in blood through two hormones ; released by the islets of Lngerhans of interstitial cells in the pancreas ; when blood sugar level is above normal, the hormone Insulin is released into the blood stream; It causes Liver to convert excess glucose to glycogen; excess glucose to fat; increased oxidation of glucose; to release energy;

When blood sugar level is below normal, the hormone Glucagon is released into the blood stream; It causes the Liver to convert glycogen to glucose; reduced oxidation og glucose; conversion of fat into glucose;

(b) Thermoregulation. (5 marks)

The Liver carries out both endothermic and exothermic reactions; Under low temperature conditions the hypothalamus sands impulses to the Liver; to increase exothermic reactions; producing more heat that is distributed throughout the body by blood; Under high temperature conditions, the Hypothalamus sends impulses to the Liver; to increase endothermic reactions; producing less heat;

(c) Name and explain the process that occurs when blood reaching the liver carries excess amino acids.
(5 marks)

Deamination; Amino acids are absorbed into the blood stream are used in synthesis of proteins in the body; Excess amino acids cannot be stored in the body; since the body has no mechanism for their storage; hence deaminated; The amino group (NH_2)of amino acid is removed and used to form ammonia; Ammonia is taken into the Ornithine cycle (which is a series of reactions);resulting in the formation of Urea; a less toxic substance . Urea formed is released into the blood stream and passed out eventually through Urine; The remaining organic compounds are converted to glucose, which is oxidized to release energy; Excess is converted to glycogen or fat for storage;