Name..... **Index Number**.....

School: ..... **Adm. No:** .....

Student's Signature.....

231/2

BIOLOGY

JULY, 2019

2 HOURS

MOKASA II JOINT EXAMINATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper 2

Instructions to candidates

- *Write your name, index number and signature in the spaces provided above.*
- *Answer **all** questions in section **A**.*
- *In section **B** answer question **6 (compulsory)** and either question **7** or **8.***

For Examiners Use Only

Section A	Maximum Score	Student's Score
1	8	
2	8	
3	8	
4	8	
5	8	
Section B	**Marks**	
6	20	
7	20	
8	20	
TOTAL	**80**	

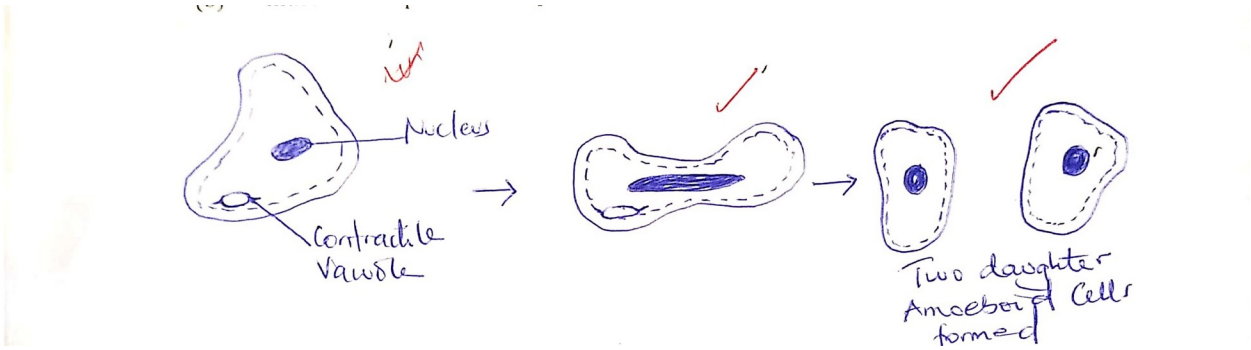
SECTION A

Answer all questions in this section

1. A student carried out an investigation on the methods of reproduction and feeding in Amoeba species. He observed that amoeba doubled in water after 20 minutes.

(a) Name the type of reproduction shown by amoeba species. **(1 mark)**
Binary fission;

(b) Illustrate the process of reproduction named in (a) above. **(2 marks)**



(c) If at the start of the investigation, there were 20 amoeba cells in a given quantity of pond water. Calculate the total number of amoeba cells which would be present in the sample of pond water after three (3) hours. **(2 marks)**

Total time=3 × 60=180minutes

Number of divisions=180÷ 20=9 divisions;

20cells→40cells→80cells→160cells→320cells→640cells→1280cells →2560cells→5120cells→10240cells;

(d) State the functions of pseudopodia in amoeba species. **(2 marks)**

i) **For locomotion;**

ii) For feeding/engulfing food;

(e) (i) Name **one** type of specialized cells in human body which shows a similar mode of feeding as amoeba species. **(1 mark)**

White blood cells/ leucocytes;

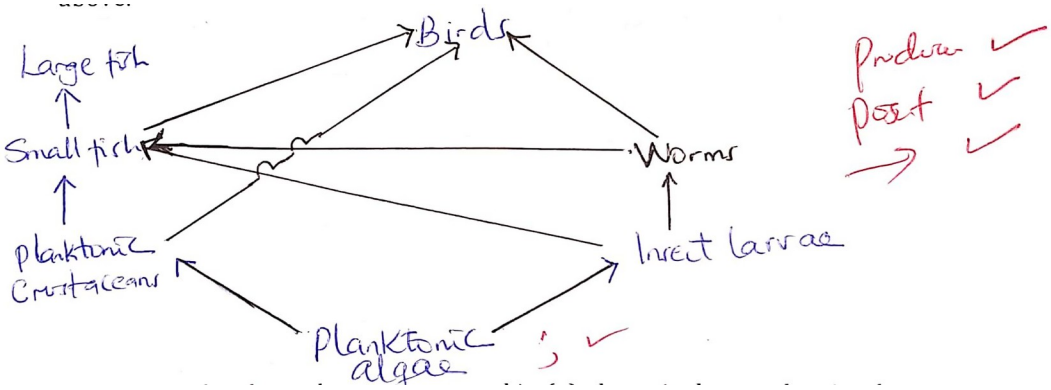
(ii) Name the process of feeding shown by the cell named in (e) (i) above. **(1 mark)**

Phagocytosis;

2. During an ecological study of a lake, a group of students recorded the following observations;

(i) Planktonic crustaceans feed a planktonic algae.
(ii) Small fish feed on planktonic crustaceans, worms and insect larvae.
(iii) Worms feed on insect larvae.
(iv) A bird species feeds on small fish, planktonic crustaceans and worms.
(v) Insect larvae feed on planktonic algae.
(vi) Large fish feed on small fish.

(a) Construct a food web to represent the record of observation provided above. **(3 marks)**



(b) From the food web you have constructed in (a) above isolate and write down a food chain that ends with;

(i) Birds species as secondary consumer. **(1 mark)**

Planktonic algae-→ planktonic crustaceans-→birds;

(ii) Large fish as tertiary consumer. **(1 mark)**

Planktonic algae→planktonic crustaceans-→small fish-→-large fish;

Planktonic algae---→ insect larvae-- –→small fish-→large fish;

(c) The biomass of the producers in the lake was found to be greater than that of the primary consumers. Give an explanation for this observation. **(1 mark)**

The producers get more light energy from the sun for photosynthesis hence greater biomass;

(d) State **two** ways by which man may interfere with this ecosystem. **(2 marks)**

- over fishing in the water body;

-discharge of sewage and industrial effluents into water body;

-discharge of hot water into the water body.

3. Broad and thin lips are inheritable characteristics in humans. When a homozygote broad lipped man is married to a homozygote thin lipped woman, all the children in the family are broad lipped. In a particular family, a woman that is heterozygote for broad lips is married to a man whose parents were both thin lipped. Let B represent gene for broad lips.

(a) Work out the genotypes of the children in that family. (Use a punnet square). **(4 marks)**

Parental phenotype: thin lipped man × broad lipped woman ;

Parental genotype: bb Bb ;

bb Bb	b	b
B	Bb	Bb
b	bb	bb

(b) Work out the phenotypic ratio and genotypic ratio of the resulting children from the crossing in (a) above. **(2 marks)**

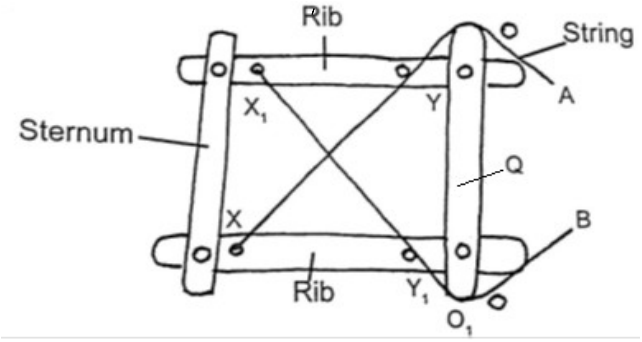
Phenotypic ratio: 1 broad lipped:1 thin lippped;

Genotypic ratio: 1Bb: 1bb;

(c) Give two sex- linked traits in man **(2 marks)**

i) Pre-mature baldness;
ii) Hairy ear pinnae

4. The figure below shows a model which was used by a group of Form 2 students to show the effect of or action of intercostal muscles on the movement of ribs.



(a) How does the sternum move when; **(2 marks)**

(i) String A is pulled tight.

Moves upwards and inwards (towards Q);

(ii) String B is pulled tight.

Moves downwards and (away from Q);

(b) Between string A and B, which one represents; **(2 marks)**

(i) External intercostal muscles?

String B;

(ii) Internal intercostal muscles?

String A;

(c) What does structure Q represent in an animal? **(1 mark)**

Vertebral column;

(c) The rates of gaseous exchange by different respiratory surfaces of plants were determined and recorded in the table below.

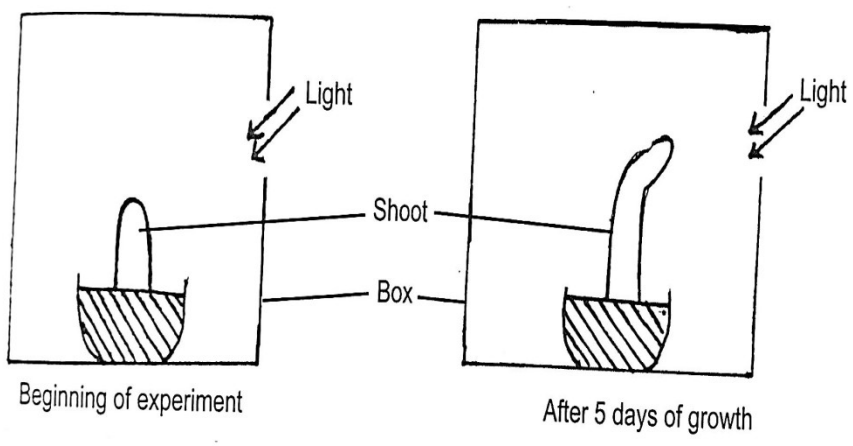
Structure	Gaseous exchange in %
A	89
B	3
C	0.3

Suggest the possible plant structure represented by A, B, C. **(3 marks)**

A stomata; B lenticels;

C. cuticle;

5. The diagram below shows an experiment set up using a seedling enclosed in a desk box with a hole on one side at the beginning of the experiment and after five days of growth.



(a) What type of response is shown by the above shoot? **(1 mark)**

Positive phototropism; Rej. Phototropism alone

(b) State **two** observable changes which took place in the seedling after five days of growth. **(2 marks)**

i) Shoot tip/ apex curved towards the source of light; Rej shoot tip bent;

ii) Shoot increased in height;

(c) Account for the observable changes in (b) above. **(4 marks)**

Auxins are sensitive to light; auxins migrated to the non-illuminated side; higher concentration of auxins at the non-illuminate side promotes cell division hence cell elongation ; thus rapid growth ; shoot increased in height due to primary growth / rapid mitotic cell division of meristemic cells present in the shoot apex; OWTTE

(d) What observations would be made after five days of growth if the shoot was placed in a box without a hole on one side? **(marks)**

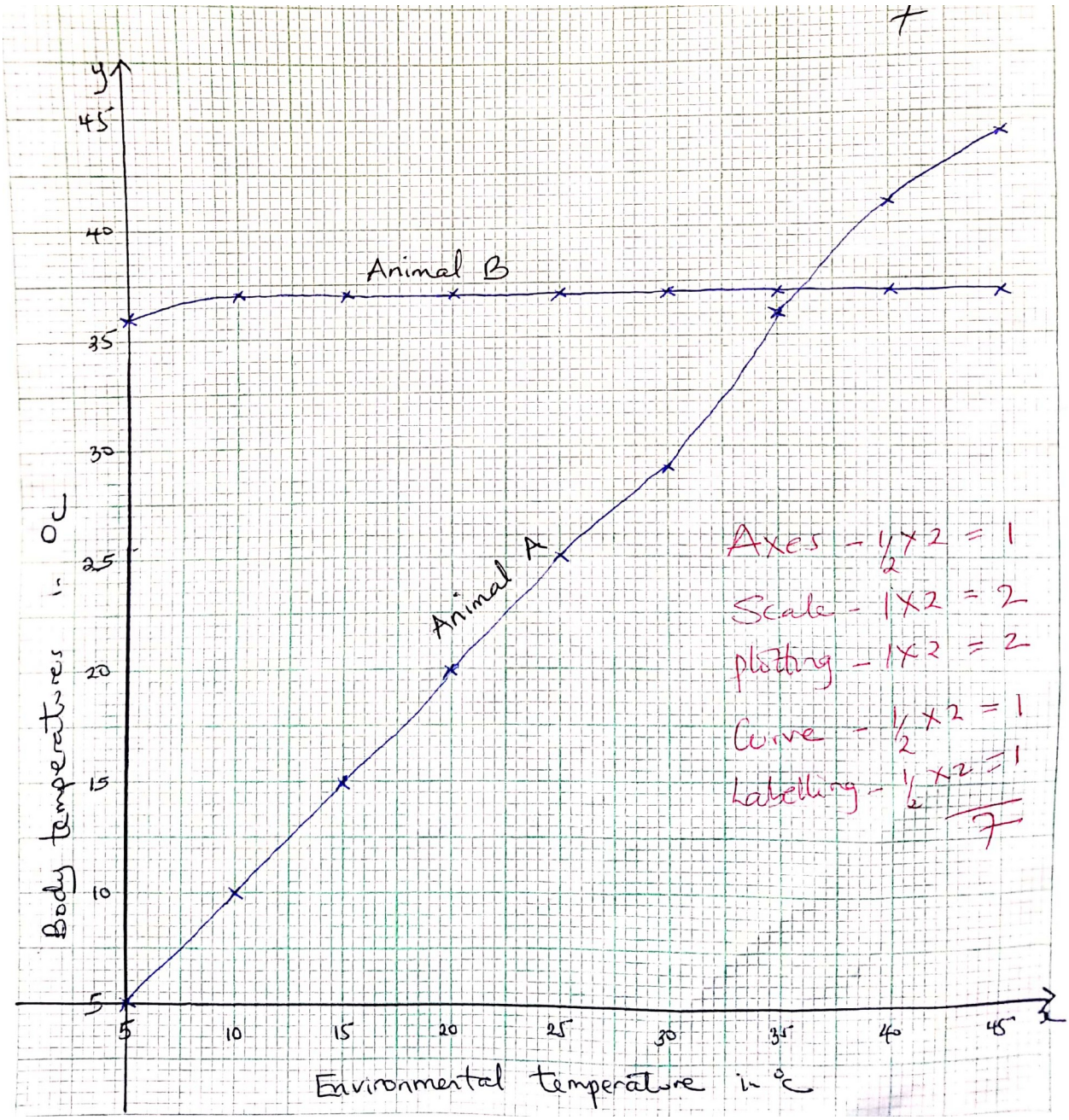
A tall thin shoot with small yellow leaves would form i.e. etiolation;

SECTION B

6. The table below shows how variation in environmental temperature relate to the body temperatures of two different types of animals A and B.

	Body temperature (^{0}C)	
Environmental temp (^{0}C)	Animal A	Animal B
5	5	36
10	10	37
15	15	37
20	20	37
25	25	37
30	29	37
35	36	37
40	41	37
45	44	37

(a) Using the information in the table above, plot a graph on same axes of body temperatures animals against environmental temperature. **(7 marks)**


y
45
40
35
30
25
20
15
10
5
Animal B
Animal A
Body temperatures in °C
5
10
15
20
25
30
35
40
45
x
Environmental temperature in °C
Axes - ½ x 2 = 1
Scale - 1 x 2 = 2
plotting - 1 x 2 = 2
Curve - ½ x 2 = 1
Labelling - ½ x 2 = 1
7

(b) With reference to thermoregulation, state the general name given to animals of the A and B types. **(2 marks)**

A - type animals **poikilothermic/ ectodermic;**

B - type animals **homeothermic/endothermic;**

(c) What **three** advantages do B-type animals have over A-type animals? **(3 marks)**

i) active all the time of the day;

ii) respond very fast to stimuli all the time;

iii) can exploit a wide range of ecological habitats;

(d) Briefly describe how B-type

i) Physiologically respond to heat **(4 marks)**

-secretion and release of a lot of sweat on the surface of the skin;
-lying flat of hairs on the surface of the skin;
-reduced metabolic activities within the body;
-dilation of blood vessels serving the skin /vasodilation;

ii) Physiologically respond to cold **(4 marks)**

-reduced sweating/no sweating ;

-increased metabolic activities within the body;

-erection of hairs on the skin;

- Constriction of blood vessels serving the skin;

- shivering by humans;

7. Describe experiments you would conduct to show that;

(a) Carbon (IV) oxide, (b) Chlorophyll and (c) Sunlight are necessary for the process of photosynthesis under the following subheadings:- **(20 marks)**

(i) Aim
(ii) Materials and apparatus
(iii) Procedure
(iv) Expected observation
(v) Conclusion

7.

a) Carbon (iv) oxide:

i) **Aim :** to show that Carbon (IV) oxide is necessary for photosynthesis

ii) **Material /apparatus** **1Mark**

Potted plant, dark cupboards, potassium/sodium hydroxide pellets, iodine solution, water, methylated spirit, white tile, petroleum jelly, corks and source of heat

iii) Procedure **3Marks**

-destarch the potted plant by keeping it in a dark cupboard for 48hrs
-put pellets of NaOH/KOH into a conical flask A and distilled water in flask B
-fit the petioles of two different leaves of the potted plant in the grooves of corks and fit them as shown below;-
-seal the mouth of the conical flasks with petroleum jelly to make them air tight
-expose the apparatus to sunlight for about 3hrs
-remove the leaves from flask A and B and test each for the presence of starch using available reagents and materials

iv) **Expected observation** **2Marks**

leaf from flask A would retain iodine colour ; while leaf from flask B would turn blue.-black with iodine solutions.

iv) Conclusion **1Mark**

Starch is absent in leaf from flask A but present in leaf from flask B
KOH/NaOH pellets absorbed all CO_2 hence no photosynthesis

b) **Chlorophyll**

i) **Aim**: to show chlorophyll is necessary for photosynthesis

ii) Materials and apparatus **1Mark**

Potted plant with variegated leaves, iodine solution, white tiles, water, methylated spirit and source of heat

iii) Procedure **3Marks**

-destarch the potted plant
-expose the plant to light for a period of 3 hrs
-pluck one or more variegated leaves from the plant and test for the presence of starch using the available materials and reagents

iv) Expected observation **2Marks**

green parts of the leaves would turn blue-black with iodine solution while white or non-green parts would retain brown colour of iodine solution

iv) Conclusion **1Mark**

-photosynthesis took place in green plants but not in non-green parts
-chlorophyll is necessary for photosynthesis

c) Sunlight

i) Aim; to show that sunlight is necessary for photosynthesis

ii) Materials and apparatus **1Mark**

potted plant , clips or pins, black carbon paper, white tile, source of heat, water, iodine solution and methylated spirit

iii) Procedure **3Marks**

-destarch a potted plant
-using clips or pins , attach a piece of carbon paper on the upper surface of one of the leaves to cover part of it as shown by the diagram below
-expose the setup to sunlight for a period of 3hrs
- pluck the experimental leaf, remove the carbon paper and test it for the presence of starch using the available materials and reagents

iv) Expected observation **2Marks**

part which had been covered by black paper would turn brown while the part exposed to sunlight would turn black

v) Conclusion **1Mark**

Starch is absent in part of the leaf which had been covered by black paper, indicating that no photosynthesis took place. Light is therefore necessary for photosynthesis.

N/B 7× 3= 21Marks: MAX Score= 20 marks

8. Describe **five** evidences which support the theory of organic evolution. **(20 marks)**

a) Cell biology or cytology **3Marks**

The study of cells and structure of plants and animals reveal the presence of similar or identical cell structure and organelles in both cells of plants and animals, such as mitochondria, endoplasmic reticulum e.t.c. this is an indication that plants and animals must have a common ancestor

b) Comparative embryology **3Marks**

The embryos of all vertebrates in early stages of development look alike in sense that they possess similar structure such as notochord, pharyngeal gill slits and segmented muscle blocks (i.e. myotomes). This indicates that all vertebrates must have had a common ancestor

c) Comparative anatomy **6Marks**

Anatomy is the study of internal structures of various body organs. It reveals that certain body structures or organs found in different species of organisms have similar internal structures or plan e.g. pentadactyle limbs in vertebrates. The limbs are all five digited indicating that all the vertebrates must have a common ancestor. Such similar structures with similar origin but have undergone structural modifications to perform different functions in different organisms are called homologous structure and the basis of their origin is called divergent evolution.

Some organs have different origin but perform similar functions such organs are called analogous structures and their evolution is called convergent evolution. However some body parts or structures become vestigial in course of development/evolution.

d) Fossils records / palaeontology **5Marks**

- Fossils are remains of plants and animals preserved in the layers of sedimentary rocks, resins, mud and ice. Young fossils of recent organisms are found in the younger shallow layers of sedimentary rocks, while old ones, of older organisms are found in old, deeper layers of sedimentary rocks. Old fossils portray primitive forms of life while young fossils show advanced form of life indicating that the current species of plant and animals must have arisen gradually from the primitive forms of life.

e) Geographical distribution **3Marks**

Is the geographical distribution of living organisms, the drifting of continents isolated organisms from common ancestry leading to the formation of new different species distinct or different from those found in other climatically similar but separate regions.

Migration and subsequent isolation by physical barriers such as oceans, dry deserts and mountains seems to have given rise to wide variety of animals and plant types.