MIS.

Name.....Index no.....

Admission No..... Candidate's signature.....

School .....Date.....

231/2

BIOLOGY

PAPER 2

TIME: 2 HOURS

KASSU JET EXAMINATION

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

2021

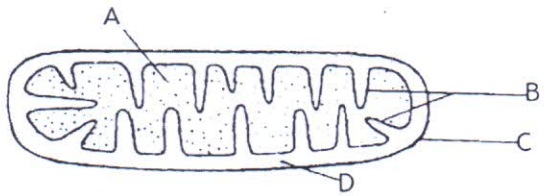
INSTRUCTIONS TO CANDIDATE:

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

For examiners use only:

SECTION	QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
	TOTAL	80	

1. a) Study the diagram of a cell organelle shown below and answer the questions that follow



i. Identify the organelle (1mark)

Mitochondrion ;

ii. State the function (1mark)

Provide site for respiration ;

iii. Name the parts labelled A and B (2marks)

A - Matrix ;
B - Cristae ;

b) When preparing plant sections to be observed under the microscope:

Water is used to mount the tissue

Very thin sections of plant should be cut

Give a reason why each of the steps are carried out (2marks)

Water is used - To enhance turgidity of the cells hence easily seen ;
Thin sections - To allow light to pass thrugh ;

c) Naomi observed an object using a microscope with eye piece lens of magnification X5 and an objective lens of magnification X20. What was the magnification of the object? (2marks)

Magnification = Eye piece lens Magnification x Objective lens Mag ;
= X5 X x20
= X100 ;

2. During an experiment a group of students took equal volumes of blood from the same person containing 50 red blood cells and were suspended salt solutions A, B and C.

After an hour the cells in each solution were counted and their sizes determined and results tabulated as shown below. Study the table and answer the questions that follow

Solution	A	B	C
SIZE	Large	Normal	Small
NUMBER	20	50	50

a) State the nature of solutions

B (1mark)

Isotonic ;

C (1mark)

Hypertonic;

b) Account for the number of red blood cells in solution A after one hour (3marks)

The red blood cells in solution A reduced in number, the solution was Hypotonic to the cells Hence the cells gained water molecules though osmosis increased in size and bursted hence the reduction

c) Explain how the above physiological process facilitates the following actions in living organisms

i. Gaseous exchange (1mark)

Movement of water in and out of the guard cells facilitate opening and closing of the stomata;

ii. Osmoregulation (2marks)

In kidney tubules of animals, water is withdrawn from the tubules through the tubular walls through Osmosis;

3. A cross between a red flowered and a white flowered Mirabilis plant produced pink flowered F1 plants

a) Suggest a reason to explain why there were no red or white flowered F1 plants (1mark)

Incomplete dominance ;

b) The F1 offsprings were selved to get F2 generation. Using appropriate letter symbols work out the following for the F_2 generation: (4marks)

i. The genotypic ratio

F1 Phenotypes : Pink flower Pink flower ;

F1 Genotypes : RW x RW

Gametes : R W R W ;

F2 Genotypes RR RW RW WW

Ratio = 1RR : 2RW : 1WW ; (3marks)

ii. The phenotypic ratio

1 Red flowers : 2 Pink flowers : 1 white flower ; (1mark)

c) What would be the result of crossing one of the F1 offspring producing pink flowers with a true breeding plant producing white flowers? (3marks)

Parental phenotype : Pink flower White flower

Parental genotypes : RW x WW

Gametes : R W W W

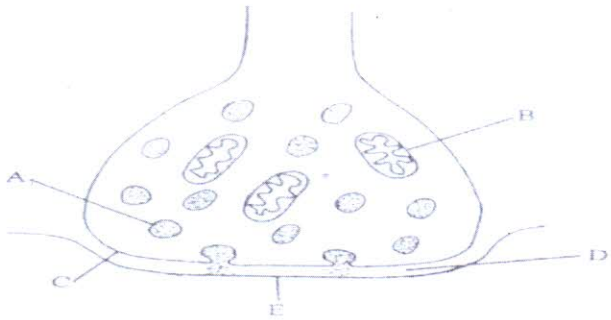
RW RW WW WW

Pink flower Pink flower white white

2 pink flower : 2 white flow

1 : 1

4. Examine the diagram of a synapse below and answer the questions that follow



a) Name the parts labelled A and C (2marks)

A- Synaptic Vesicle ;
C- Pre-synaptic membrane ;

b) Name the enzyme that exerts its effects on the structure above (1mark)

Cholinesterase ;

c) Name the neurotransmitter substance in impulse transmission (1mark)

acetylcholine ;

d) State the function of B (1mark)

Supply the energy necessary for continuous synthesis of neurotransmitter

e) Identify the two synaptic inhibitors that may poison to interfere with a transmission of an impulse across the synapse (2marks)

Atropine ;
Curare ; (any 2)
Organophosphate ;

f) State the possible causes of hypermetropia (1mark)

Axial length of eyeball is too short ; lens or cornea is flatter than normal ; (any 1)

5. a) Define natural selection (2marks)

Natural selection is a mechanism by which beneficial variations in a population are perpetuated; while disadvantageous variations are eliminated;

b) Explain the following

Survival for the fittest (3marks)

In Struggle for existence individuals with advantageous variations; are well adapted to the environment; Since they are suited to the environment they are selected hence survive and reproduce;

Struggle for existence (3marks)

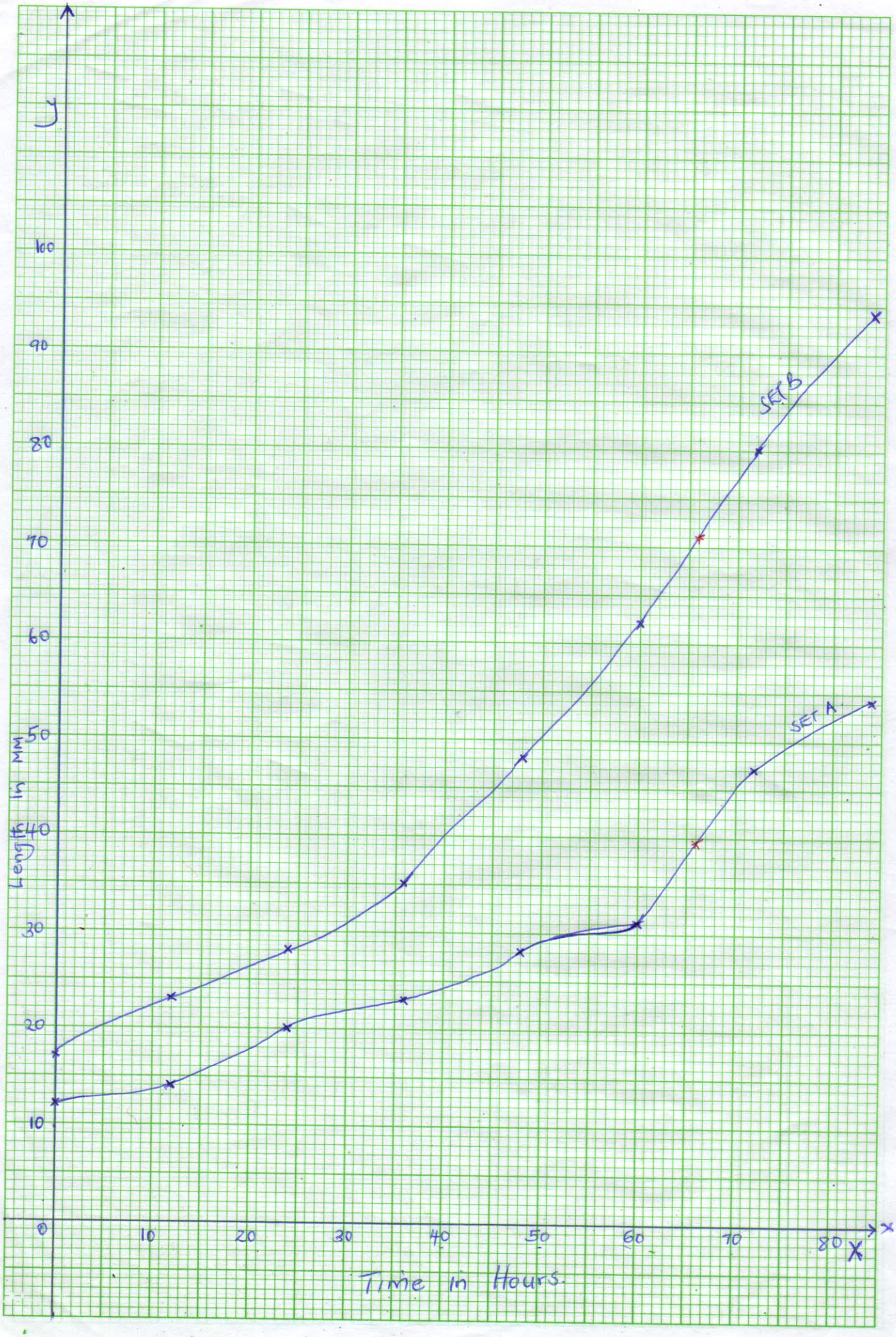
Members of the population are constantly competing with each other in an effort to survive and the strong members survive to adulthood and are able to reproduce; This is due to environmental pressures such as predation, diseases and competition for food and breeding sites.

SECTION B

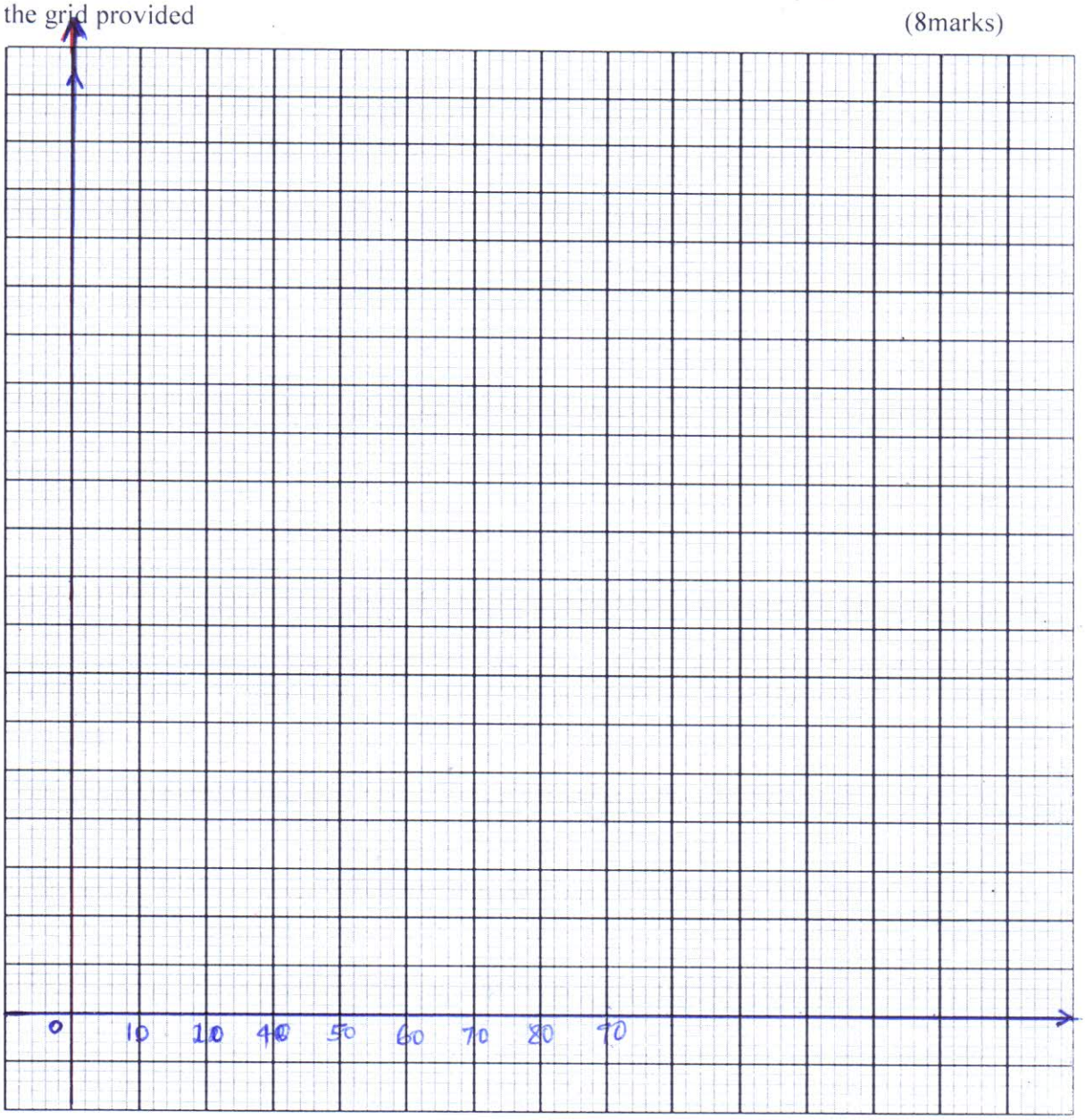
Answer question 6 and either question 7or 8

6. Two sets of a pea seeds were germinated, set A was placed in normal daylight conditions in the laboratory while set B was placed in a dark cupboard. Starting a few days later the shoots lengths were measured twice daily and their means lengths recorded as shown in the table below.

Time in hours	0	12	24	36	48	60	72	84
Set A length(mm)	12	14	20	23	28	31	47	54
Set B length (mm)	17	23	28	35	48	62	80	94


y
100
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
X
x
Length in MM
Time in Hours.
SET B
SET A

a. Using suitable scale draw the graphs of the mean lengths in set A and B against time on the grid provided (8marks)



b. From the graph state the mean shoot length of each of seedling at the 66th hour (2marks)

A - 39 ±1

B - 71 ±1

c. Account for the difference of curve B and A (3marks)

B Grew taller; the stem/seedling etiolated; cells elongate faster; weak, slender stem; Lengthening faster in search of light; A: Shorter, health because of normal conditions i.e sufficient light;

d. Explain what would happen to set up B if it were allowed to continue to grow under conditions of darkness (4marks)

The seedling will eventually die; ~~the~~ ~~seed~~ this because of insufficient/ lack of sunlight which is necessary for photosynthesis; Increase/continous increase of etiolants that completely supress the chloroplasts hence no chlorophyll for food formation;

e. State three external conditions which should be constant for both set ups (3marks)

Water ;
Oxygen ;
Suitable temperature ;

7. Describe the role of the following parts in human reproduction

i. Testes (4marks)
ii. Ovary (6marks)
iii. Sperm and ovum (6marks)
iv. Uterus wall/endometrium (4marks)

8.State the adaptations of the following tissues for support in plants

i. Parenchyma tissues (4marks)
ii. Collenchyma tissues (4marks)
iii. Sclerenchyma tissues (2marks)
iv. Tracheids (6marks)
v. Xylem vessels (4marks)

7) i.) Testes (4marks)
Hang outside the body to provide a cooler environment for sperm production ;
Seminiferous tubules is the site for formation of sperms ;
Final products of Meiosis enter the sertoli cells ; where they are nourished and undergo differentiation into mature sperms ;
Has interstitial cells that produce male hormones called androgens ; i.e testosterone that stimulates testes to produce sperms ;

ii.) Ovary (6marks)
Site for formation of ova ; potential eggs are enclosed by ovary cells known as primary follicles ; which provide nourishment ; few egg cells develop into ova during puberty by meiosis ; by undergoing growth to become mature graafian follicle ; that burst at ovulation to release mature sperm ;
Secretes hormones ; Oestrogen - healing and repair of endometrium ; progesterone - increased blood supply and thickening of endometrium ;

iii) Sperm and ovum (6marks)
Nucleus of a male gamete fuses with the nucleus of a female gamete to form a zygote ; Sperms are drawn by suction into the uterus where they swim using their tails ; Sperms comes into with content of ovum produced by ovary in the oviduct ; acrosome bursts to release lytic enzyme which dissolve membranes of ovum. The acrosome turns inside out forming a fine filament ; that penetrate the ovum ; Head of sperm enters ovum and bursts to release the male nucleus ; that fuses with female nucleus to form a diploid zygote ; the vitelline membrane undergoes a change which stops any other from entering the ovum ;

iv) Uterus wall / endometrium (4marks)
Site where attachment of blastocyst occurs ; blastocyst develops finger like projections called villi which grows into into endometrium ; and forms the placenta ;
Stimulated by the hormone to contract to expel foetus from uterus ;
Capable of expanding to allow growth of embryo ;

8 i) Parenchyma tissues (4marks)
When cells are turgid they provide mechanical support in herbaceous plants

ii) Collenchyma (4marks)
Cells when turgid ; provide mechanical support ; Walls are thickened with cellulose ; to provide mechanical support ;

iii) Sclerenchyma Tissue (2marks)

Cells are thickened by lignin

Consists of dead cells thickened by lignin

iv) Tracheids (6marks)

Dead cells with thick unevenly lignified walls that provide strength and support to the stem.

Long cells with tapering ends.

Pits on the walls allow lateral water to cells surroundi

v) Xylem Vessels (4marks)

Thick walled tubes with lignin deposited unevenly in rings, spirals or patches on the walls

Bordered pits on the xylem vessels permit the passage of water in and out of the lumen into the neighbouring cells

Long and hollow