

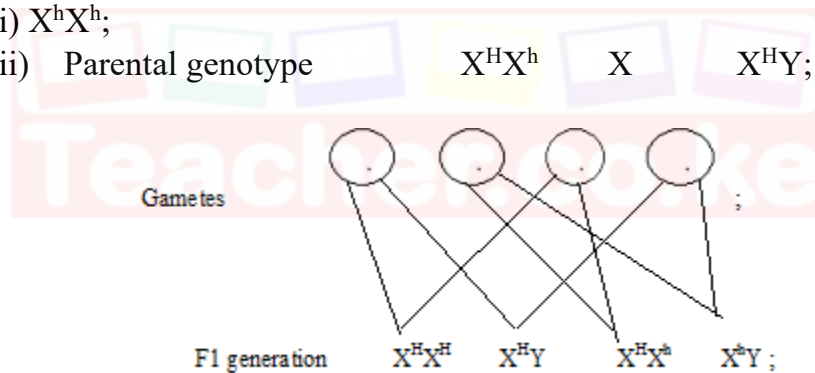
**231/2 MARKING SCHEME**  
**BIOLOGY PAPER 2 (THEORY)**  
**FORM FOUR**  
**JULY 2026**

**Mark any one**

1. a) X- guard cell;      rej. Guard cells  
 Y- Epidermal cell;    rej. Epidermal cells
- b) stoma open;
- c) chloroplast in the guard cells carry out photosynthesis producing sugar/glucose; sugar accumulates in the sap vacuole of guard cells increasing the osmotic pressure; water is drawn into the guard cells from surrounding epidermal cells by osmosis; the guard cells become turgid, bulge outwards and stoma opens;

2. a)      Genes located on the same chromosome and are always transmitted together;

- b)      (i)  $X^hX^h$ ;  
 (ii) Parental genotype       $X^HX^h$       X       $X^HY$ ;



- Phenotypic ratio      3 normal: 1 haemophiliac;
- (iii) Males lack corresponding allele on the Y chromosome; therefore they cannot be carriers; OWTTE

3. a) –To show that carbon (IV) oxide is produced during anaerobic respiration. (1mk)
- b) –There is production of bubbles in the boiling tube of carbon (IV) oxide leading to the formation of a white precipitate in the test tube containing calcium hydroxide solution. (2mks)

c) – Yeast cells undergo anaerobic respiration producing carbon (IV) oxide gas which dissolves in calcium hydroxide solution forming a white precipitate; production of the gas results in bubbles ( 3 marks, award max 2).

d) – To kill other micro-organisms present in glucose solution thus eliminating microbial respiration

e) – Through the use of glucose solution without yeast cells/ boiled yeast.

4. Study the photograph below and answer the questions that follow.

(a) Name the parts labelled A and B and state its functions. (2 marks)

A-Diastema.

B-This is where grass is pressed against and cut by the lower incisors.

(b) Identify the mode of feeding of the organism. (1 mark)

Herbivorous

(c) (i) Name the tooth labelled S. (1 mark)

Molar

(ii) State how the tooth named in (c) (i) above is adapted to its function.(2 marks)

Has wider crown for crushing and grinding of food;has cusps for grinding food;root branched to hold tooth firmly on jaw.

(d)Distinguish between competitive and non-competitive enzyme inhibitors.(2 marks)

Competitive	Non-competitive
Combines temporarily to the active site of the enzyme	Combines permanently on the active site of the enzyme
Resembles the substrate	Do not resemble the substrate

5. a. fixation by lightening

Fixation by micro-organism such as nitrogen fixing bacteria and algae

b. decomposition of dead decaying matter releases nutrients to the soil.

c. causes rapid/high/ proliferitic growth of phytoplanktons / small water plants leading to low light intensity in water hence decreasing primary productivity.

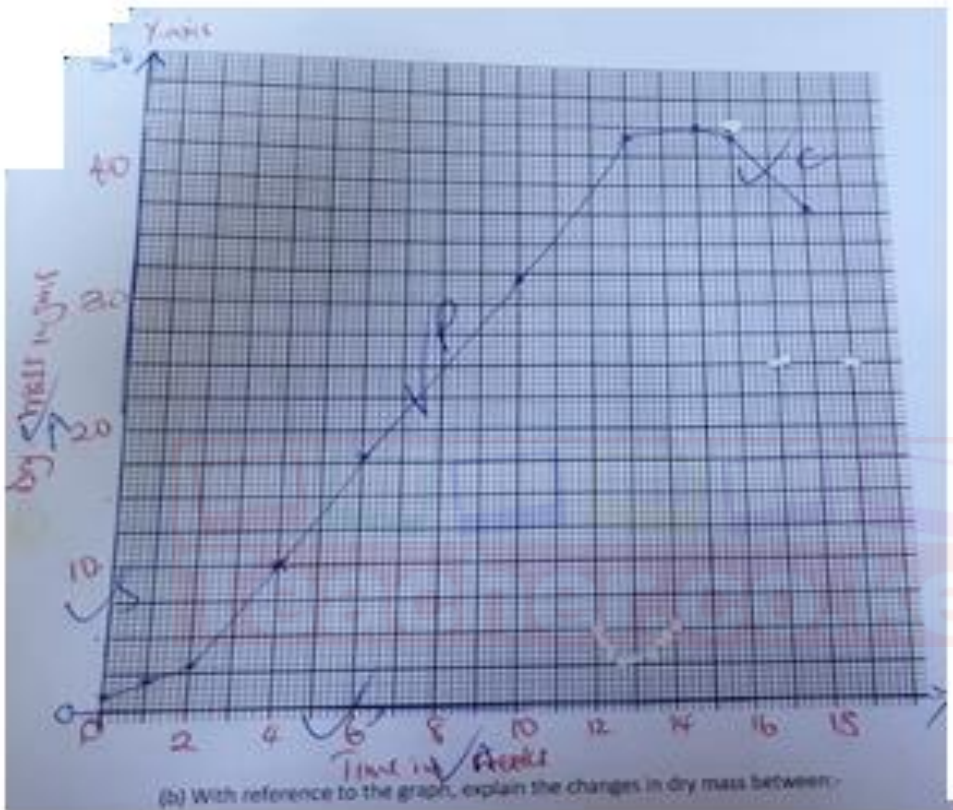
d. Organisms with advantageous variations survives and continues with generation while the organisms with disadvantageous variations die or migrate.

6. The dry mass of germinating *Cucurbita pepo* (pumpkin) seedlings of was recorded in a period of 18 weeks. The data obtained is presented in the table that follows.

Time in weeks	0	1	2	4	6	10	13	15	16	18
Dry mass in grams	1	2	3	10	18	32	44	45	44	38

(a) Using suitable scale plot a graph of dry mass against time

(6mks)



(b) With reference to the graph, explain the changes in dry mass between:-

(i) Week 0 to 2

(4mks)

Dry mass increases slowly; because the plant leaves are not well developed ; for photosynthesis; hence is depending on stored food;

(ii) Week 5 to 13

(3mks)

Rapid growth /increase in dry mass; leaves developed; photosynthesis taking place; leading to accumulation of food and rapid cell division; (max 3mks)

(iii) Week 16 - 18

(3mks)

Negative growth/decrease in dry mass; as some tissues have differentiated to form permanent tissues; toxic wastes poison tissues;

(c) (i) What is the significance of time zero? (1mk)

When dry mass was first recorded/at germination; acc start of the experiment;

(ii) What difference would be expected from the above results if the experiment started with the seeds? Give a reason for your answer.

(2mks)

Dry mass would decrease first; because food is oxidized to produces energy; water and carbon (IV) oxide/utilized in respiration;

(d) Name the phase of growth curve represented by the curve between 2<sup>nd</sup> and 13<sup>th</sup> week.(1mk)

Exponential phase;

### 7. a. Discuss the functions of placenta. (4x2).

i. **Nutrition** – serves as a passage for the supply of nutrients such as glucose , amino acids, lipids and mineral salts which are needed for healthy growth of the foetus.

ii. **Gaseous exchange**- oxygen diffuses into the foetal blood stream from that of the mother. The haemoglobin of the foetal red blood cells has a higher affinity and capacity for oxygen so that the foetal blood can meet high demand of oxygen that the foetal tissues require.

iii. **Hormone production**- during the initial development stages of the embryo, the placenta secretes human chorionic gonadotrophin (HCG) which sustains the corpus luteum and so allows it to continue secreting progesterone. Progesterone maintains the placenta. Later during pregnancy, the placenta stops producing HCG and starts secreting progesterone and oestrogen, both of which sustains placenta up to the end of pregnancy.

iv. **Protection**- the foetus is protected from injury by the mother's high blood pressure since the maternal and foetal blood vessels at the placenta are not directly connected. It also prevents from agglutination due to differences in blood groups, chorionic villi at the placenta act as a filter preventing entry of harmful bacteria from the mother, antibodies from the mother that pass through blood stream of foetus buildup its resistance to diseases (natural immunity).

### b) Describe the role of hormones in the female reproductive cycle. (12 marks)

The pituitary/ master gland secrete a number of reproductive hormones which carry out various reproductive functions

follicle stimulating hormone; secreted just after menstruation; to stimulate the development of graafian follicle; it also stimulates the ovarian tissues to secrete oestrogen; which controls development of female secondary sexual characteristics; causes healing and repair of the endometrium; and stimulates pituitary gland to secrete luteinizing hormone; luteinizing hormone (LH); stimulates maturation of graafian follicle; causing ovulation; LH also stimulates the corpus luteum to start secreting progesterone;

Prolactin; stimulates secretion of milk; (by the secretory cells of the mammary gland)

Oxytocin; stimulates contraction of uterine muscles during labour; to facilitate birth; it also stimulates milk let-down; **total 17mks** **max 12 mks**

8. a. special creation theory

Chemical evolution theory ( 6 marks ; 3 marks each stated and explained).

b. . Fossils records/Study/palaentology; ( 14 marks; 7 points x2).

Fossils are remains of ancient organisms preserved in natural occurring materisl for a long period of time. These show morphological changes of a group of related organisms over long period of time, Nature occurring materials include the sedimentary rocks : Fossils that have been used include human skull,bnes, teeth etc. Fossils near common ancenstry army different species of man.

(b) Geographical distribution.

The theory ofcontinental draft suppose that the present continents originated from one large land mass called pangea/Laurasian and GODmana/ and; when the land mass broke up due to drift. Animals with common ancestry becaome separated/isolated; and underwent different line of evolution;

Illamas of South America and camels of Africa point at common ancestry

Lap tailed monkeys of S.America and Leopard of Africa

The Elephants of Africa and those of Asia

Australia with distinct Marsupials (Kangaroo)

(c) Comparative Anatomy

When comparing from and structures of different organisms, some organs show basic structural similarities which suggest common ancestry e.g

Homologous structures;

They have similar embryonic/ancestral origin but perform different functions; this si as a result of development evolution;

Forelimbs of vertebrates, show similar basic pattern hence called pentadactyl limb in bats, it is modifies for flight, while in manit is for manipulation; Beaks in birds/feet in birds.

Analogous structures; the y have different embryonic origin but are modified to perform similar function eg wing of birds as those of insects. Thus shows convergent evolution even through are not related.

d) Vestigial structures; are structures which have become sedimentary/reduced in size hence have became functionless. This show evolution has indeed taken place.

e) Coccyx in man appendix in man, wings of flightless kiwi/Emu/Ostrich

f) Comparative embryology; when embryo of vertebrate are compared; they show similarities eg pharyngeal slit and possession of tail; pointing at common ancestry

g) comparative serology;

Analysis of blood proteins with reference to antigen and body reaction of different animals reveal some (phylogenetic) relationship.

h) Cell biology; when organelles of cell from different organs is made, it shows some cells have common organelles like mitochondria chloroplast which suggest common ancestral origin.

g) Comparative serology

Analysis of blood proteins with reference to antigen –antibody reaction of different animal reveal some phylogenetic relationship.

