

5.2 BIOLOGY (231)

5.2.1 Biology Paper 1 (231/1)



1. Plants make their own food from Carbon (IV) Oxide and water in the presence of light autotrophic/ photosynthesis; while animals eat ready made food from plants or animals/heterotrophic nutrition; (2 marks)

2. (a) Crustaceae/crustacea; (1 mark)

(b) Head fused with thorax/has a cephalothorax;
Have two pairs of antennae;
Have compound eyes/a pair of compound eyes;
Have several pairs of limbs/five to twenty pairs of limbs;
Exoskeleton is hard;
Have external gills;
Four pairs of mouth parts consisting of maxilla, mandibles, labium and labrum. (max 3 marks)

3. (a) (i) A - nucleopore; B - Rough Endoplasmic Reticulum; (2 marks)

(b) Surface covered with ribosomes; for protein synthesis;
Has interconnected channels: for transportation of proteins; (2 marks)

4. (a) The solution was hypotonic/less concentrated compared to the cell sap of pawpaw cylinder cells;
The tissue/cells gained water by osmosis; becoming turgid/longer/stiff; (3 marks)

(b) Pawpaw cylinders of the same size/length; placed in an isotonic solution;
Boiled potato cylinders of the same size; placed in a similar solution; (2 marks)

5. (a) Plant C; (1 mark)

(b) Thick cuticle reduces water loss;
Low number of stomata reduces water loss;
Large root-surface area enhances water absorption; (3 marks)

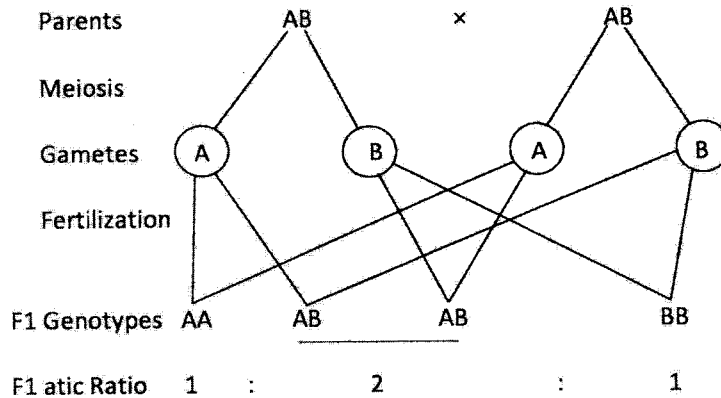
6. (a) F - Bronchiole;
G - Intercostal muscles/external intercostal muscles; (2 marks)

(b) H - (Pleural membranes) secretes encloses pleural fluid to lubricate lungs/protect lungs; (1 mark)

J - (Diaphragm) separates chest cavity from abdominal cavity/works to effect volume and pressure changes in chest cavity necessary for inhalation and exhalation/ventilation/breathing; (1 mark)

7. (a) Respiration/aerobic respiration; (1 mark)
- (b) Flask **K** Potassium hydroxide removes Carbon IV Oxide from atmospheric air; (1 mark)
- (c) **L** - Lime water remains clear because Carbon (IV) Oxide has been removed;
N lime water forms a white precipitate because the respiring cockroaches produce Carbon (IV) Oxide; (2 marks)

8. Parental genotype is AB



or

♂	A	B
♀	AA	AB
	AB	BB

Probability is $\frac{1}{2}$ or 0.5/50%;

(4 marks)

9. Reduces dehydration; Avoid predators; (max) (1 mark)
10. Ability of an organism to detect, interpret and respond to changes in the environment/stimulus; (1 mark)
11. (a) Can contract continuously without fatigue;
 Their contraction is started by the muscles themselves/myogenic; (2 marks)
- (b) stomach: smooth;
 bone: skeletal; (2 marks)
12. (a) Fine adjustment knob; (1 mark)
- (b) Avoid refraction of light;
 Prevent wetting of the slide; (1 mark)
 (max)

13. Temperature; surface area; distance that particles have to travel; diffusion/concentration gradient; size/density of particles; surface area to volume ratio; thickness of membrane; medium of diffusion (3 marks)
14. (a) Aerobic respiration; (1 mark)
(b) It releases more energy per unit mass; (1 mark)
15. (a) Androgens; (1 mark)
16. The plant/flower is self sterile/not successfully self pollinated; covering prevents pollination; in flower P. Flower Q received pollen from other plants/cross pollination; (3 marks)
17. Carbon IV Oxide; Nitrogenous waste/urea; (2 marks)
18. Most of the waste products are harmless;
Converted into harmless products; (1 mark)
19. Passing urine frequently/polyuria; glucose/excess glucose in blood/hyperglycaemia; constant feeling of thirst/dehydration; loss of weight; excessive eating/increased appetite/polyphagia/hyperphagia; poor resistance to diseases; (4 marks)
20. height/length; weight/mass; surface area; (3 marks)
21. Nitrogen fixation; (1 mark)
22. Results in adaptations that enable organisms to exploit different ecological niches; leads to the formation of new species; (2 marks)
23. (a) Cellulose;
(b) Lignin; (2 marks)
24. Small/round; central nucleus/prominent nucleus; dense cytoplasm/protoplasm; no vacuoles; continuously dividing; thin cell walls (4 marks)
25. Ecdysone causes metamorphosis; towards adult stage
Juvenile hormone maintains larval characteristics; (2 marks)
26. (a) Theory of natural selection; (1 mark)
Theory of environmental influence on inherited characteristics; (1 mark)
- (b) (i) Similar organelles performing similar functions in different organisms suggest a common ancestry/cell biology; (1 mark)
- (ii) Fossil records/palaeontology/by comparing fossils to show phyllogenetic relationship between organisms/common ancestry; (1 mark)

27. Removes excess water/waste products/Homeostasis; (1 mark)

28.

Open	Closed
<ul style="list-style-type: none">• Blood flows in haemocoel/ sinuses/body cavity directly in contact with cells• Blood flows at low pressure• Blood lack pigments	<p>Blood confined in vessels;</p> <p>Blood flows at high pressure;</p> <p>Blood has pigments for oxygen and Carbon (IV) Oxide transportation</p>

(2 marks)

29. Water; mineral ions; vitamins

First two

2 marks

30. (i) Smooth endoplasmic reticulum;

(1 mark)

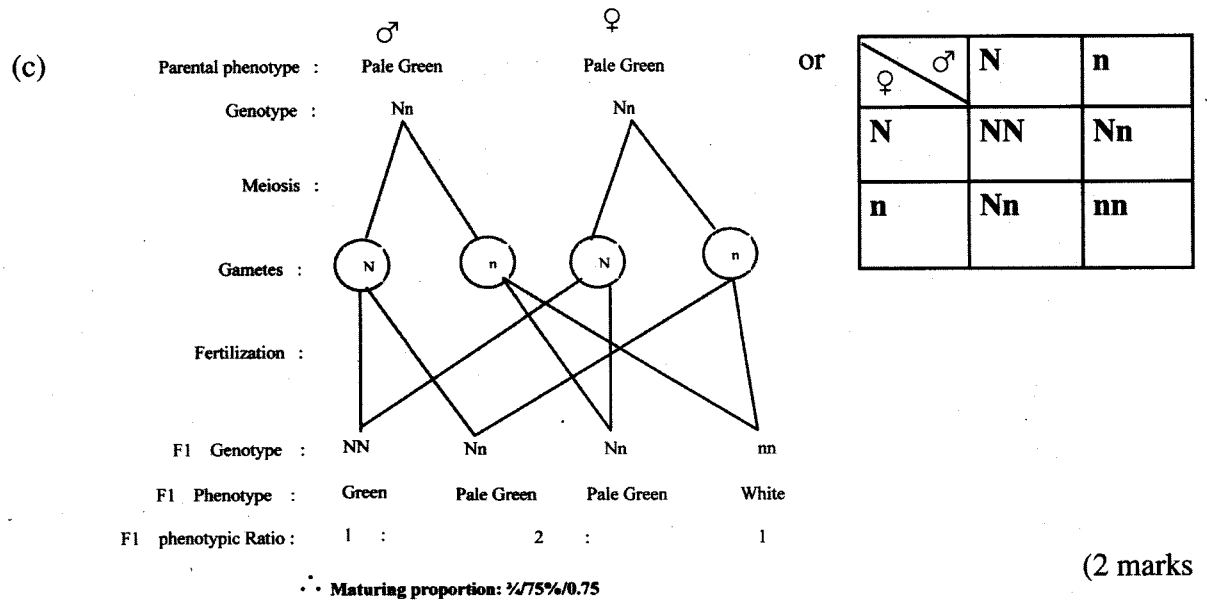
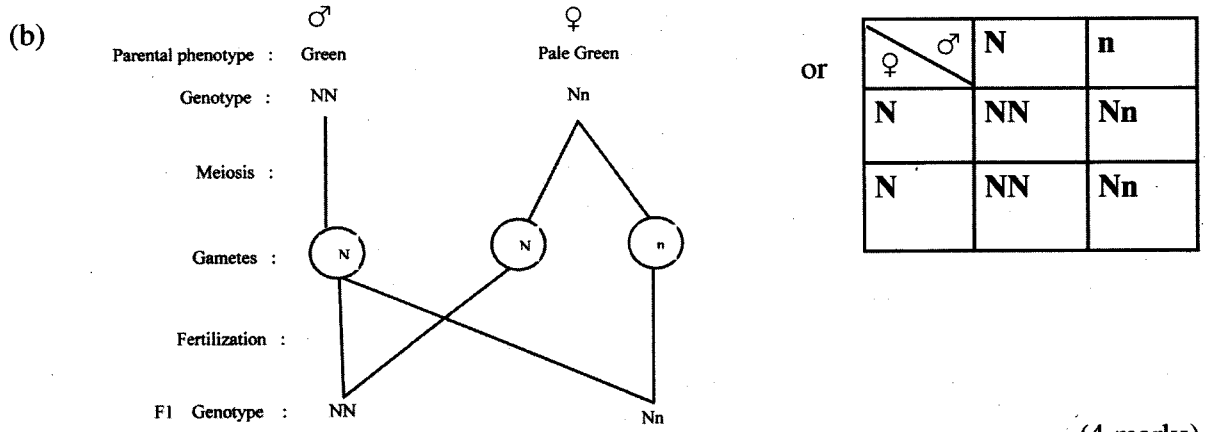
(ii) Golgi bodies/golgi apparatus.

(1 mark)

5.2.2 Biology Paper 2 (231/2)

1. (a) Lack of chlorophyll, the plants do not manufacture food photosynthesize; plants die as soon as the stored food reserves get depleted; (2 marks)

(b) Parental phenotype: Normal x pale green



2. (a) E - glomerulus; (1 mark)
 F - loop of henle; (1 mark)

(b) It is long; to increase the surface area for re-absorption of water;
 It is U - shaped; to bring about counter - current flow/multiplier effect to enhance, water absorption.
 It is lined with a network of blood capillaries; to enhance re-absorption of water; (4 marks)

(c) vasoconstriction; hair rises; metabolic rate increases; shivering (3 marks)
 First correct 3

3. (a) (i) chlorophyll; (1 mark)
(ii) oxygen; (1 mark)
(iii) Test tube **H** is at optimum temperature for enzyme activity; hence high rate of photosynthesis/more bubbles. In test tube **J** most enzymes have been denatured by the high temperature; hence low rate of photosynthesis/fewer bubbles. (2 marks)
- (b) – The villus epithelium is thin; for faster diffusion of dissolved food substances;
– The epithelium has goblet cells; which produce mucus to lubricate food passage;
– They have microvilli; which further increase their surface area for absorption;
– Have lacteal; for absorption of fatty acid & glycerol/transportation of lipids;
– Highly vascularised; for absorption of digested food. (4 marks)
First correct 2
4. (a) (i) **K** - ulna; (1 mark)
L - humerus; (1 mark)
- (ii) movement of the lower arm upwards takes place at the elbow/olecranon 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. (3 marks)
- (b) – The rigid midrib holds leaf out away from the stem;
– Profuse network of veins have lignified cells which support leaf to stay spread out;
– Turgidity in spongy mesophyll and palisade cells support the leaf to remain open; (3 marks)
5. (a) The external intercostal muscles contract while internal intercostal muscles relax; the rib cage is pulled upwards and outwards; the diaphragm muscles contract and the diaphragm flattens; the volume of the thoracic cavity increases/the pressure in the thoracic cavity decreases; air rushes into the lungs; from the atmosphere through the nose (4 marks)
- (b) The osmotic pressure of guard cells increase when sugar is manufactured during photosynthesis/starch is converted to sugar in low acidity/potassium moves into guard cells during the day; water enters guard 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 faster as the cell becomes turgid; thus the thick inner wall curves; causing the stomatal aperture to open. (4 marks)

6. (a) (i) title - Graph of Prey-predator relationship; (OWTE)

Scales X axis; Graph should cover more than half of the grid provided.
Y axis; Graph should cover more than half of the grid provided.

correct plotting P; Q;
smooth curves P; Q;

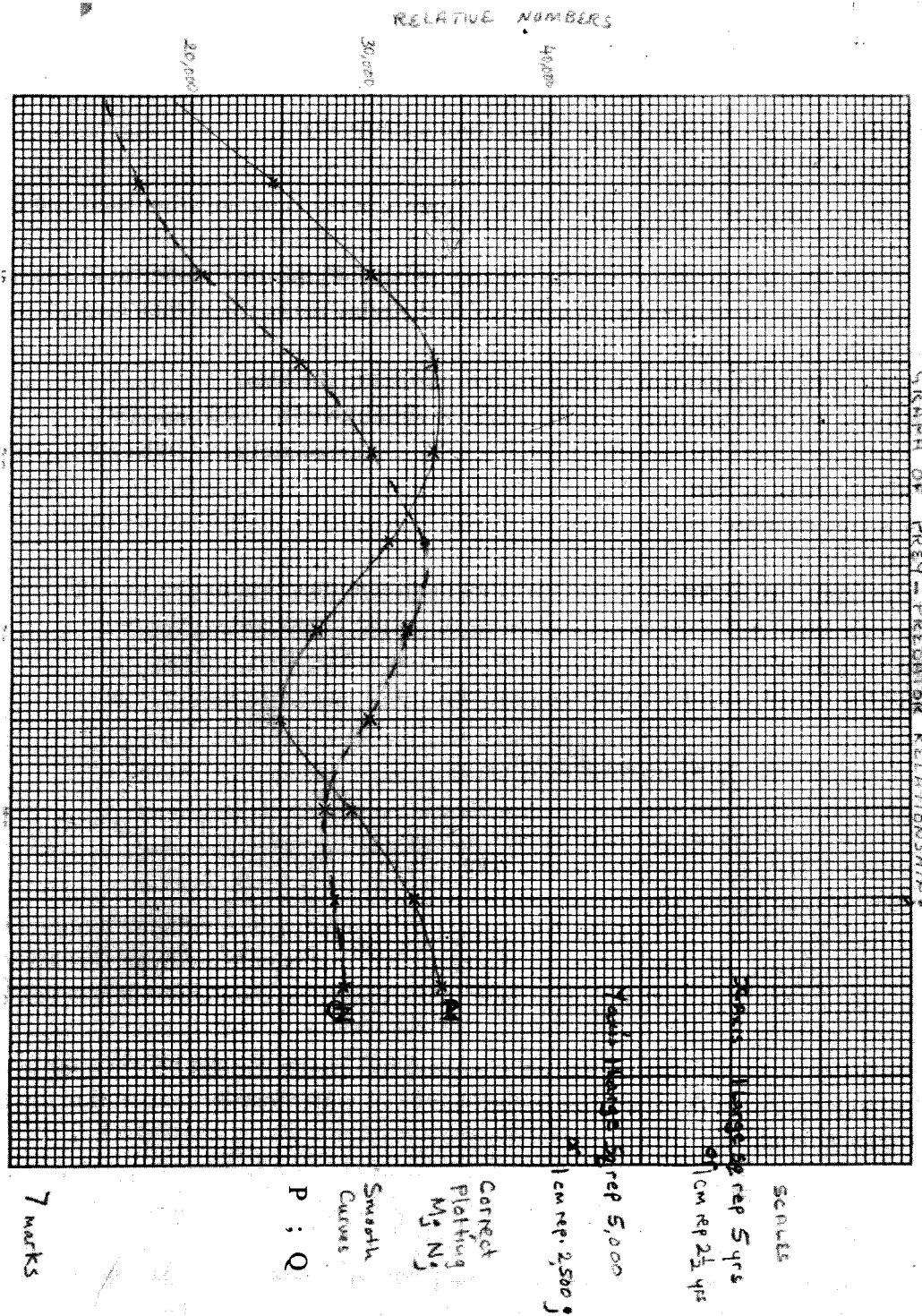
labelling axes;

(7 marks)

(ii) P represents the prey;
- Prey population is initially higher/
prey population usually starts falling earlier;

(1 mark)

(iii) Both populations decrease; (1 mark)
because prey is not enough to sustain predator/population environmental stress limit
population of prey; (1 mark)



(iv) at 23 ± 0.5 years; and at 39 ± 0.5 ;

(2 marks)

(v) less food for the prey/intra specific competition;
 emigration of the prey;
 diseases causing death of the prey;
 parasitism;
 human activities

(3 marks)

- (b) sulphur dioxide in the air - causes respiratory diseases; poisons plants; forms acid rain which increase soil pH; corrodes metals in buildings; (4 marks)
Total (20)

7. **Simple reflex action** - withdrawal of finger from a sharp object.
Is an automatic response to a specific stimulus;

When the finger touches a sharp object, pain receptors in the skin; are stimulated and trigger off a nerve impulse;

The nerve impulse is transmitted via the sensory neuron; to the grey matter of the spinal cord;

The impulse is then transmitted via a synapse; to the relay neuron; and then through another synapse; to the motor neuron;

The impulse is then transmitted to the effector muscles in the hand;

These effector muscles contract; and the finger is withdrawn from the hot object;

(Accept use of other relevant examples)

Conditioned reflex action

Is an 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 of behaviour through learning; It weakens with time; and must be reinforced by repeating the unrelated stimulus;

Students salivate when the bell for lunch rings; because they have learned to associate the ringing of the bell at lunchtime with food; from experience; every time it rings, they are offered food;

(Accept use of other relevant examples)

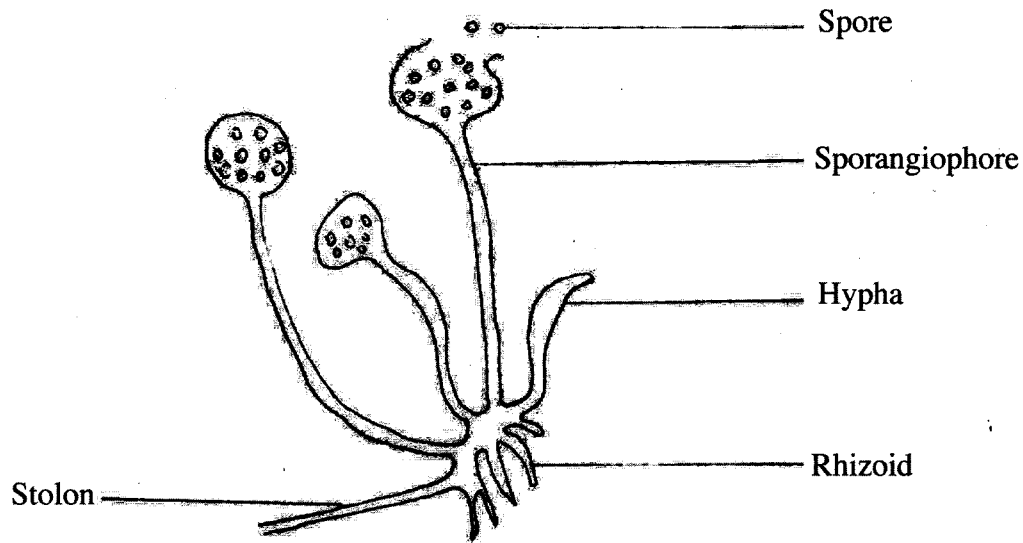
Maximum 20 marks

8. (a) 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 release histamines; Histamines cause inflammation/itching/swelling/pain, etc; which damage the body; Allergic people are hypersensitive to materials like dust/pollen grains/some foods/some drugs/some pollutants, etc; (10 marks)
- (b) In bright light; stomata are fully/wide open; increasing contact between the atmosphere and air spaces in the leaf; This in turn increases water loss by evaporation through the open stomata
- High environmental temperatures; increase the rate of evaporation from the leaf surface thus more water leaves cells due to the increased diffusion gradient;
- In a windy day; air around the leaf is carried away reducing water vapour around the leaf; more water moves into the atmosphere from the leaf air spaces;
- In low humidity/when the atmosphere is less saturated with water vapour; more water will move from leaf air spaces into the atmosphere; leading to increased rate of transpiration;
- Low atmosphere pressure; increases diffusion gradient between atmospheric and leaf increased rate of evaporation;
- Availability of water; causes turgidity of guard cells hence stomata open; increasing rate of transpiration.

(10 marks)

5.2.3 Biology Paper 3 (231/3)

1. (a) (i) Epigeal germination; (1 mark)
 (ii) Hypocotyle grows faster; raising the cotyledons above the ground level; (2 marks)
- (b) Protection of the embryo/plumule/plumule and radicle;
 Food storage;
 Photosynthesis; (3 marks)
- (c) Emergence of the hypocotyle exposes it to light;
 Light stimulates migration of auxins to the lower side of the hypocotyle;
 High concentration of auxins; on the lower side;
 Stimulates faster rate of growth than on the upper side;
 Faster elongation of the lower side straightens the seedlings; (6 marks)
2. (a) (i) Rhizopus/Bread mould/cassava mould/ugali mould/mould/mucor; (1 mark)
Rhizopus spp;
- (ii) By spores/sporulation/sporulation; (1 mark)
- (iii)



Mg x5 - x 25

Drawing (D)

1. Continuous outline
2. Use of double lines
3. Stolon/Rhizoid not a must

L = 5 max 2 marks

D = 1

mg = 1

Max = 3 marks

- (b) (i) Dicotyledonae; (1 mark)
- (ii) Net/Reticulate venation/network venation;
Floral parts in 5s/fours/five sepals/five petals;
Broad leaf lamina/bract;
Presence of leaf paticle; (3 marks)
- (iii) Insects; (1 mark)
- (iv) Conspicuous bracts/ petals/ sepals/brightly coloured petals/bracts;;
Tabular corolla;
Landing stage/corolla stage/platform; (3 marks)
- First correct three (3 marks)
- (v) Bract; (1 mark)

3. (a)

	F (pH 5)	G (pH 7)	H (pH 9)
Volume of solution + portion of potato	2.2 ± 0.2;		
Volume of solution + portion of potato + foam	4.2 ± 0.5;		
Volume of foam	2.0 ± 0.5;		

- Award accuracy for volume of solution + portion of potato 3 × 1 = 3 marks
 - Values should be F < G < H and solution + potato + foam is > solution + potato; 3 marks
 - Award correct subtraction for volume of foam 3 × 1 = 3 marks
- (b) The enzyme catalase; in the potato tissue breaks down hydrogen peroxide to water; and oxygen; (3 marks)
- (c) More foam is produced at pH 9; which is optimum for catalase activity; (2 marks)