

4.4 BIOLOGY (231)

4.4.1 Biology Paper 1 (231/1)

1. (a) Acquisition and utilization of nutrients; (1 mark)
- (b) Elimination of metabolic wastes to prevent accumulation to toxic level; (1 mark)
2. (a) A period of rest in which a seed performs its physiological processes slowly and utilizes little food; (1 mark)
- (b) - Chemical/growth inhibitors;
- Hard/impermeable seed coat;
- Low / freezing temperatures;
- Under developed embryo/immature embryo;
- Low concentration of hormones;
- Lack of appropriate light wavelength; (max 3 marks)
3. - Exchange of nutrients /metabolic wastes/gases between the mother and foetal circulatory systems;
- Secretion of progesterone hormone; (2 marks)
4. (a) Tube nucleus;
- (b) - One male nucleus fuses with the egg cell nucleus to form a zygote;
- The other male nucleus fuses with the polar nuclei to form the endosperm; (2 marks)
5. (a) Hypertonic solution; (1 mark)
- (b) Volume of sugar solution increases in the thistle funnel while that of distilled water in the beaker reduces; because the thistle funnel gains distilled water by osmosis. (2 marks)
6. - Cell division;
- Cell elongation;
- Development of adventitious roots;
- Formation of callus tissue;
- Causes apical dominance;
- Causes tropic responses. (3 marks)
- 3 x 1

7. Object length = 12 cm
 Drawing length = 6 cm
 $Mg = \frac{\text{Drawing length}}{\text{Object length}} ; \quad = \frac{6}{12} ;$
 $= X 0.5;$ (2 marks)
8. - Phenotype is the outward appearance of an organism while Genotype is the genetic make up of an organism; (1 mark)
9. - Act as shock absorbers;
 - Allow smooth movement between the vertebrae/reduce friction; (2 marks)
10. (a) - Absorption of materials e.g. diffusion of digested food into the blood stream;
 - Gaseous exchange e.g. CO₂/O₂ diffuses from capillaries into the alveoli.
 - Excretion of nitrogenous wastes; e.g urea diffuses from blood capillaries into the elimination sites. (max 4 marks)
- (b) (i) Crenated cell is a shrunk animal cell that has lost water by osmosis; (1 mark)
 (ii) Flaccid cell is a flabby /shrunk plant cell that has lost water by osmosis; (1 mark)
- 11.
- | Tactic Responses | Tropic Response |
|-------------------------------------|----------------------------------|
| - Are locomotory | - Are growth responses; |
| - Are fast | - Are slow; |
| - Not influenced by growth hormones | - Are caused by growth hormones; |
| - Temporary | - Permanent; |
- (3 marks)
12. (a) (i) Rib-cage/chest cavity; (1 mark)
 (ii) Diaphragm; (1 mark)
- (b) The balloons are inflated; (1 mark)
- (c) Pulling down the string increases the volume of **D**, hence decreasing the pressure inside;
 The low pressure causes external atmospheric air to rush in and inflate the balloons; (2 marks)
13. (a) Trap foreign particles entering the eye;
 Produce fluid/tears; (1 mark)
- (b) - Moistens the cornea;
 - Wash foreign materials out of the eye;
 - Antiseptic / kills harmful microorganisms; (max 1 mark)

14.

DNA	RNA
Double stranded/double helix	Single stranded;
Has Thymine	Thymine is replaced by uracil/reject Thiamin;
Has the four nitrogen base pairing pattern	Lack the four nitrogen base pairing pattern;
Deoxyribose sugar	Ribose sugar;

(3 marks)

15. (a) Skeletal muscles / striated muscles; (1 mark)

(b) Tendon is a (inelastic) tissue that attaches muscles to bones while Ligament is a (inelastic) tissue that attaches a bone to another bone of a movable joint; (1 mark)

16. (a) Sensory neurone; (1 mark)

(b) Cell body is located off the axon/tied outside the CNS; (1 mark)

(c) Schwann cell; (1 mark)

(d) (i) Receipt/transmits impulses to neighbouring neurons in the CNS from sense organs; (1 mark)

(ii) Insulates the axon/accept dendron for axon; (1 mark)

17. The blind spot lacks both cones and rods hence images are not perceived; (1 mark)
Accept photoreceptor cells for cones and rods;

18. (a) To provide a cool environment; that is conducive for sperm formation; (2 marks)

(b) Progesterone hormone; is secreted by the placenta to maintain the pregnancy; (2 marks)

19. Due to limited oxygen, haemoglobin combines with carbon (II) oxide to form carboxyhaemoglobin; (3 marks)
Carboxyhaemoglobin does not readily dissociate hence reduces the capacity of haemoglobin to transport oxygen; Carbon (II) oxide is therefore a respiratory poison if breathed in for a long time;

20. (a) Packaging of substances/glycoproteins/ transportation of glycoproteins; (1 mark)
Secretion of synthesized proteins and carbohydrates;
Formation of lysosomes/modification of carbohydrates to form glycoproteins;

(b) - Digestion of food/Breakdown large molecules;
- Destroy worn out organelles or cells/tissue; (max 1 mark)

21. (a) Exoskeleton; (1 mark)

- (b) Endoskeleton; (1 mark)
22. (a) Appendix/accept nictating membrane; coecum and ear drum; Tail/coccyx; (1 mark)
- (b) They have a gene for resistance/acquire it through mutation; The gene for resistance is passed to offsprings establishing a population of resistant forms; (2 marks)
23. (a) **K** - Photosynthetic products/manufactured foods example vitamins/alicose/proteins/ sucrose/maltose/fructose/lipids/nitrates; (1 mark)
L - Water and mineral salts; (1 mark)
- (b) The substances are moved into the star shaped xylem; (1 mark)
24. **M** - lungs; (1 mark)
- N** - Urea, ammonia, ; (1 mark)
- P** - Digested food, water; mineral ions; (1 mark)
25. - Stimulates maturation of the Graafian follicle/stimulates ovulation;
- Stimulates corpus luteum to secrete progesterone hormone;
- Stimulates release of androgens;
- Stimulates development of corpus luteum; (2 marks)
26. (a) (i) Diffusion; (1 mark)
- (ii) Sea water contains a higher concentration of sodium ions than the cell sap; (1 mark)
- (b) (i) Iodide ions; (1 mark)
- (ii) Sea water has a lower concentration of iodide ions than the cell. The plant requires energy to take up the iodide ions (by active transport); (1 mark)
27. (a) Spiracle; (1 mark)
- (b) Keep the trachea open for air passage; (1 mark)
- (c) - Lacks spiral bands of chitin / to make it thin; for diffusion of gases;
- Moist; to dissolve respiratory gases; (2 marks)

4.4.2 Biology Paper 2 (231/2)

SECTION A (40 marks)

1. (a)
 - Fruit fleshy/juicy/succulent;
 - Fruit brightly coloured/large/inclusters;
 - Fruit scented has sweet smell/sweet aroma;
 - Seeds have tough/hard testa;
 - Some seeds have sticky/mucoid secretions;
 - Fruits have hooks; (max 4 marks)
- (b) (i) Luteinising hormone:-
stimulates ovulation;
stimulates the development of remains of the graafian follicle into corpus luteum;
stimulate corpus luteum to produce progesterone; (max 2 marks)
- (ii) Oestrogen:-
stimulates healing and repair of uterine lining /endometrium following menstruation;
stimulates pituitary gland to secrete luteinising hormone; (2 marks)
2. (a) Carbonic acid/carbaminohaemoglobin/hydrogen carbonate; (1 mark)
- (b) (i) Water;
(ii) Carbonic acid; (1 marks)
- Role: catalyses reaction between carbon IV oxide and water to form (weak) carbonic acid; (2 marks)
- (c) Prevents accumulation of acidity/maintains pH of blood since hydrogen ions combine with haemoglobin to form Haemoglobinc acids;
Faster; due to the catalytic effect of carbonic anhydrase; (max 2 marks)
- (d) Activates thromboplastin; thrombokinase to neutralize heparin/convert prothrombin to thrombin; (2 marks)
3. (a) O₂ concentration is higher outside than inside the lenticels; O₂ diffuses into lenticels; then into the cells;
CO₂ concentration is higher inside the lenticels than on the outside CO₂ diffuses out of the lenticels into the atmosphere; (4 marks)
- (b) (i) To provide a large surface area/ make them thin; for gaseous exchange/ to reduce diffusion distance for respiratory gases; (3 mark)

(ii) This increases the volume of the buccal cavity while decreasing the pressure; which forces water to rush into the mouth; (2 mark)

4. (a) Males have two dissimilar chromosomes X and Y/heterogametic; Females have two similar chromosomes X and X/homogametic; Male gamete/sperms have either X or Y chromosome, while all ova have X chromosome; If a sperm with X fuses with an ovum a female is formed and if a sperm with Y fuses with an ovum a male is formed; (4 mark)

(b) (i) Sickle-cell trait is heterozygous while sickle cell anaemia is a homozygous condition; (2 marks)

(ii) People with sickle cell trait are resistant to malaria; because the plasmodium cannot survive in sickle shaped red blood cells. (2 marks)

5. (a) H - cell body; (1 mark)

(b) – Has nutrients for nourishment of neurons, brain, spinal cord;
– Acts as a shock absorber for protection of spinal cord from mechanical damage; (2 mark)

(c) Contains myelin sheaths (of neurons which are made up of fats that make it have a shiny white appearance); (1 mark)

(d) Cholinesterase; (1 mark)

Breaks down Acetylcholine; to acetic acid and choline; (2 marks)

(e) Correct arrow on neurone 1 points towards the grey matter; (1 mark)

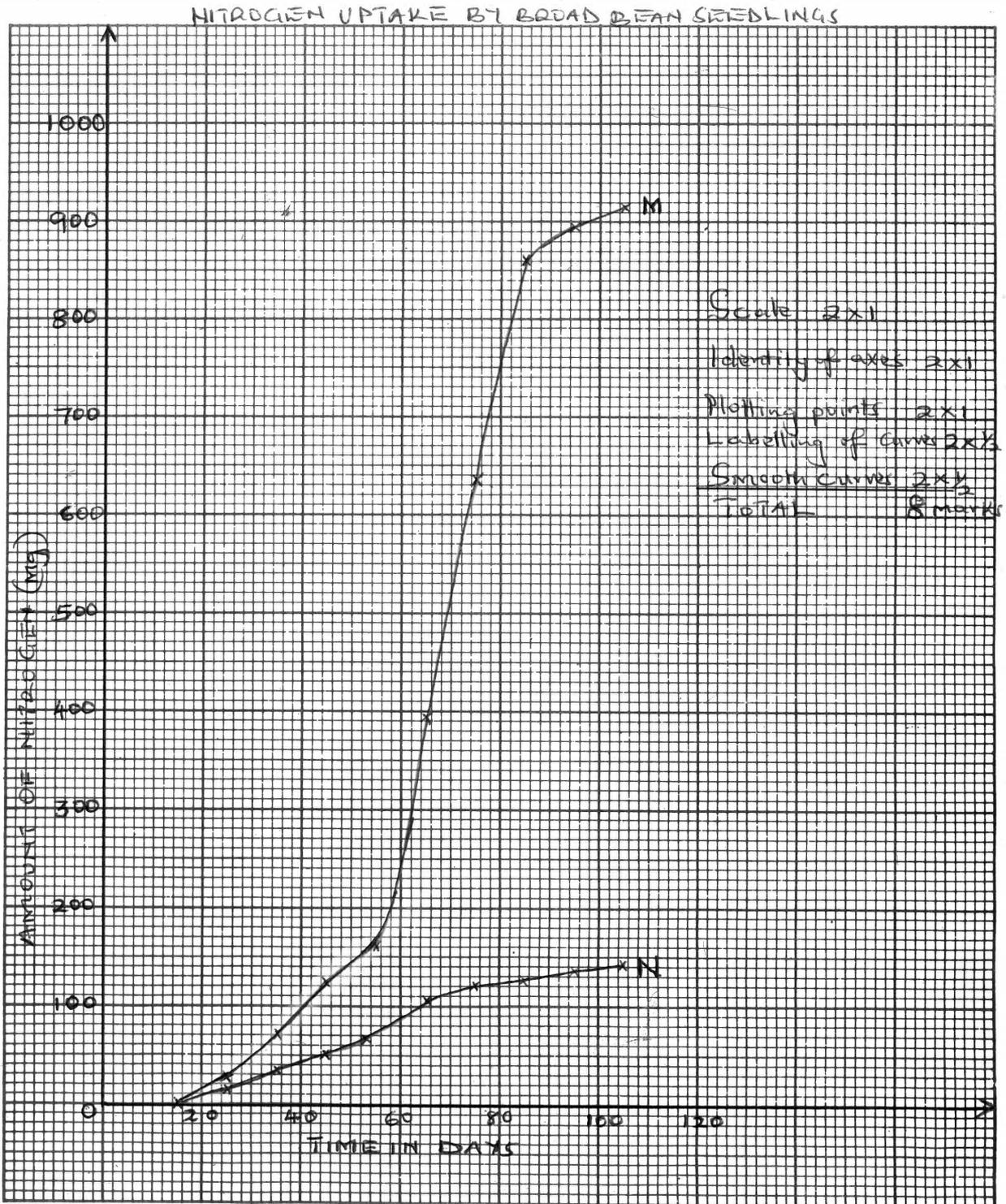
SECTION B (40 marks)

6. (a) Scale 2x1 mark
Identity of axes 2x1 mark
Plotting of points 2x1 mark
Labelling of curves 1 mark ($\frac{1}{2} \times 2$)
Smooth curves 1 mark ($\frac{1}{2} \times 2$)

(b) At 65 = 395;
At 85 = 860

$$\frac{860 - 395}{20} \times \frac{465}{20} = 23.25 \pm 1 \text{ mg/day}$$

(2 marks)



- (c) (i) The higher the carbon (IV) oxide content in air, the higher the nitrogen uptake and vice versa; (1 mark)
- (ii) More Carbon (IV) oxide in the air makes the seedlings to photosynthesize more; hence more amino acids/protein; are formed in the dark stage; formation of amino acids/protein requires nitrogen; (max 3 marks)
- (d) (i) The concentration of nitrogen would remain constant; (1 mark)
- (ii) Despite decline in CO₂; the nitrogen already absorbed/taken up by the plant will still remain; (3 marks)
- (iii) Lightning;
By free-living bacteria/micro organisms;
By Rhizobium (in root nodules of legumes); (3 marks)
7. (a) (i) Reactions in photosynthesis are catalysed by enzymes; at optimum temperature photosynthesis proceeds faster;
Below optimum temperature the rate of photosynthesis decreases because enzymes are inactivated by the low temperatures / above optimum the rate of photosynthesis decreases because enzymes are denatured; (2 marks)
- (ii) Chlorophyll traps energy from sunlight for photosynthesis;
The higher the chlorophyll concentration the higher the rate of photosynthesis and vice versa; (2 marks)
- (b) **In the mouth;**
Food is chewed; to increase surface area for enzyme activity/saliva contains salivary amylase;
Saliva mixes with food and provides an alkaline medium; for amylase enzymes;
Salivary amylase acts on starch and converts them to maltose;
In duodenum;
Food is mixed with bile; and pancreatic juice;
Bile provides alkaline medium; for activity of duodenal enzymes; and neutralizes acidic chyme from the stomach;
Pancreatic juice contains pancreatic amylase; which converts starch to maltose;
In the Ileum;
Epithelial cells in Ileum secrete *succus entericus*; which contains enzymes;
sucrase; which acts on sucrose and converts it to fructose and glucose;
Lactase; which acts on lactose and converts it to galactose and glucose;
Maltase; acts on maltose and converts it to glucose;

max 16 marks

8. (a)
- Diffusion of Carbon (IV) Oxide; and oxygen; through stomata and lenticels;
 - Some wastes are stored in tissues in non-toxic form e.g. calcium oxalate;
 - Some of these tissues or organs drop off from plants e.g. leaves, flowers, fruits and bark of caffeine, nicotine, quinine;
 - Some wastes are released by transpiration through stomata and lenticels such as water vapour;
 - Others are released by guttation through hydathodes as water;
 - Others are released by exudation.
- (max 4 marks)

- (b)
- When body temperature is lowered below normal;
arterioles in the skin constrict;
blood is diverted to a shunt system;
less blood flows to the skin/less heat is lost;
when body temperature is raised above normal;
arterioles in the skin dilate;
more blood flows to the skin;
more heat is lost by convection and radiation;

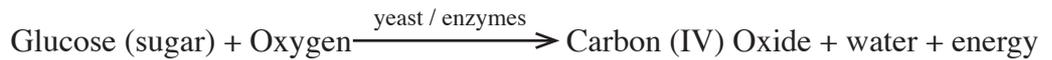
when body temperature is lowered below normal:
erector-pilli muscles contract, hair stands erect;
more air is trapped, air is a bad conductor;
and insulates the body against heat loss;
when body temperature is raised above normal:
erector-pilli muscles relax, hair lies on skin;
less air is trapped, more heat is lost;

when body temperature is lowered below normal:
less fluids are absorbed by sweat glands;
less sweating, less vaporisation of water;
when body temperature is raised above normal:
sweat glands are more stimulated and more sweat is produced;
water in sweat evaporates and takes up heat from the body;
body is cooled/body temperature is lowered;

(max 20)

4.4.3 Biology Paper 3 (231/3)

1. (a) (i) Bubbles / gas formed/effervescence/foam/frith;
lime water turns white/white ppt/milky/cloudy; (2 marks)
- (ii) Gas produced is carbon (IV) Oxide/CO₂/carbon dioxide;
which reacts with lime water to form a white precipitate/calcium carbonate/
insoluble sent; (2 marks)
- (iii) Respiration / anaerobic respiration / fermentation/ aerobic respiration; (1 mark)
- (iv) Respiration

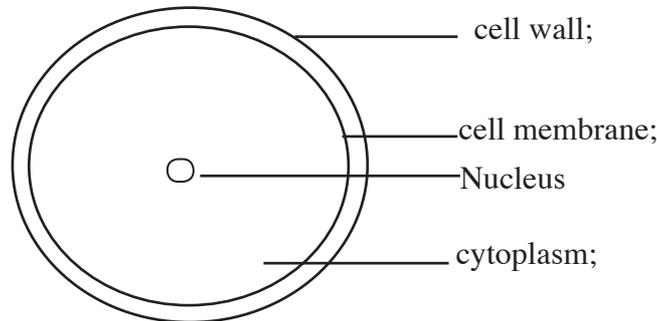


Or

Anaerobic Respiration / Fermentation



- (v) To provide optimum temperatures; for enzymes activity/action/working/
reaction; (2 marks)
- (b) (i)



Labelling - 2 marks

Drawing - 1 mark

Max.

- (3 marks)
- (ii) X400; (eye piece lens x high objective lens) (1 mark)
- (iii) Yeast; (1 mark)
2. (a) (i) Angiospermatophyta/Angiospermae; (1 mark)
- (ii) E - veins on leaves / flowers / seeds;
F - narrow / parallel veined leaves. (2 marks)

(b)	(i)	LEAF E Opposite Net-veined Serrated margin Rough surface Green Thin Broad Has petiole/Compact petiole Not succulent/fleshy Max.	LEAF G Alternate; Parallel veined; Smooth / entire margin; Smooth surface; Purple; Thick; Narrow; Has sheath/sheath - like petiole; Succulent/fleshy	(5 marks)
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(ii)	STEM E Opposite leaves Angular/square/four sided/rectangular Pricky/thorny/spiny/spines Woody / hard Green / Grey Non-succulent Max.	STEM G Alternate leaves Round/cylindrical Smooth/hairy; Herbacious / soft Purple; Succulent/juicy fleshy	(2 marks)
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(iii) Pricky/thorny/spiny: for protection against broswers/herbivourous/animals;
Woody/hard: for mechanical support;
(4 marks)

3. (a) (i) A (1 mark)

(ii) Presence of scapula/shoulder blade;
Presence of Olecranon process/ulna/radius/humerus (2 marks)

(b) J Radius
K Femur
M Metatarsals
(3 marks)

(c) Pelvic girdle (1 mark)

(d) H Gliding joint
L Hinge joint
(2 marks)

(e)	Component Ligament; Cartilage Synovial fluid Synovial membrane; Max.	Function Attach a bone to another bone; Shock absorber/facilitate gliding/reduce friction Lubrication/reduce friction/shock absorber Secretes synovial fluid;	(4 marks)
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