## 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 x 1 (3 marks)

7. Object length = 12 cm
Drawing length = 6 cm

$$Mg = \frac{Drawing\ \ length}{Object\ length}; \qquad = \frac{6}{12};$$

= 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. $CO_2/O_2$ 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 waster 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 relix | 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;
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;
(3 marks)

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

(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 haemoglobim 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) $O_2$ concentration is higher outside than inside the lenticels; $O_2$ diffuses into lenticels; then into the cells;
$CO_2$ concentration is higher inside the lenticels than on the outside $CO_2$ 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 diffussion 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 make 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

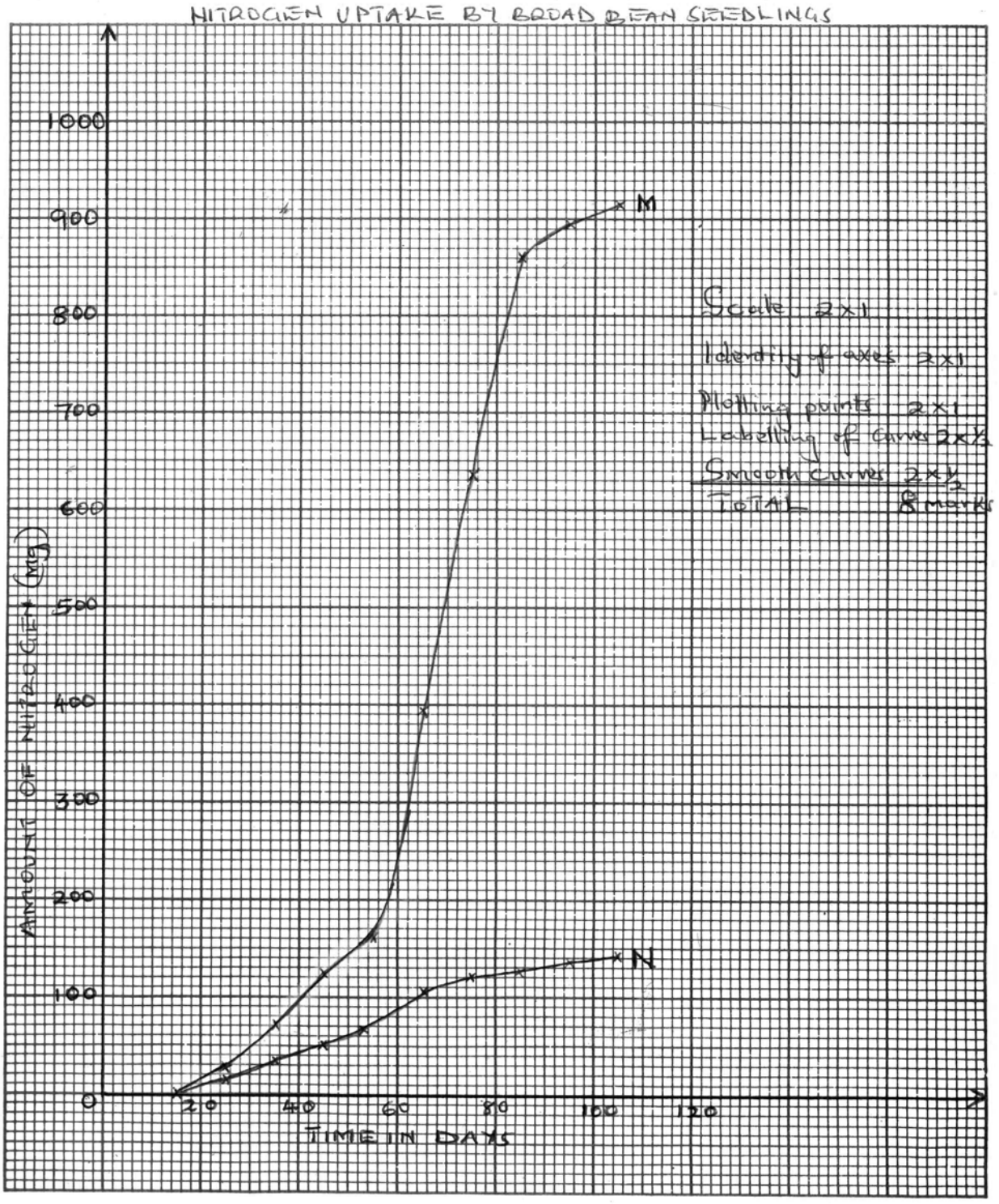
Plotting of points 2x1 mark

Labelling of curves 1 mark $(\frac{1}{2} \times 2)$

Smooth curves 1 mark $(\frac{1}{2} \times 2)$

(b) At 65 = 395; $\frac{860-395}{20}$ $\frac{465}{20}$; = 23.25 ± 1 mg/day
At 85 = 860

(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;

(1mark)

(ii) Despite decline in $CO_2$; 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/$Co_2$/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

$$\text{Glucose (sugar)} + \text{Oxygen} \xrightarrow{\text{yeast / enzymes}} \text{Carbon (IV) Oxide} + \text{water} + \text{energy}$$

Or

Anaerobic Respiration / Fermentation

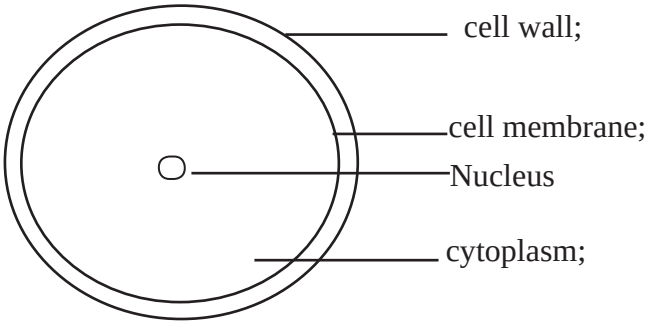
$$\text{Glucose (sugar)} \xrightarrow{\text{yeast / enzymes}} \text{Ethanol} + \text{Carbon (IV) Oxide} + \text{Energy}$$

(1 mark)

(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** | **LEAF G** |
|---|---|
| Opposite | Alternate; |
| Net-veined | Parallel veined; |
| Serrated margin | Smooth / entire margin; |
| Rough surface | Smooth surface; |
| Green | Purple; |
| Thin | Thick; |
| Broad | Narrow; |
| Has petiole/Compact petiole | Has sheath/sheath - like petiole; |
| Not succulent/fleshy | Succulent/fleshy |

Max. (5 marks)

(ii)

| **STEM E** | **STEM G** |
|---|---|
| Opposite leaves | Alternate leaves |
| Angular/square/four sided/rectangular | Round/cylindrical |
| Pricky/thorny/spiny/spines | Smooth/hairy; |
| Woody / hard | Herbacious / soft |
| Green / Grey | Purple; |
| Non-succulent | Succulent/juicy fleshy |

Max. (2 marks)

(iii) Pricky/thorny/spiny: for protection against brosers/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** | **Function** |
|---|---|
| Ligament; | Attach a bone to another bone; |
| Cartilage | Shock absorber/facilitate gliding/reduce friction |
| Synovial fluid | Lubrication/reduce friction/shock absorber |
| Synovial membrane; | Secretes synovial fluid; |

Max. (4 marks)