4.5 BIOLOGY (231)

4.5.1 Biology Paper 1 (231/1)

1. (a) The scientific system of giving **two** names (Genus and species) to living organisms; (1 mark)

   (b) The Genus name starts with a capital letter while the species name starts with a small letter;
   The two names are typed in italics/two names underlined separately; (2 marks)

2. (a) The pentadactyl limb/homologous structures; (1 mark)

   (b) Divergent evolution/adaptive radiation; (1 mark)

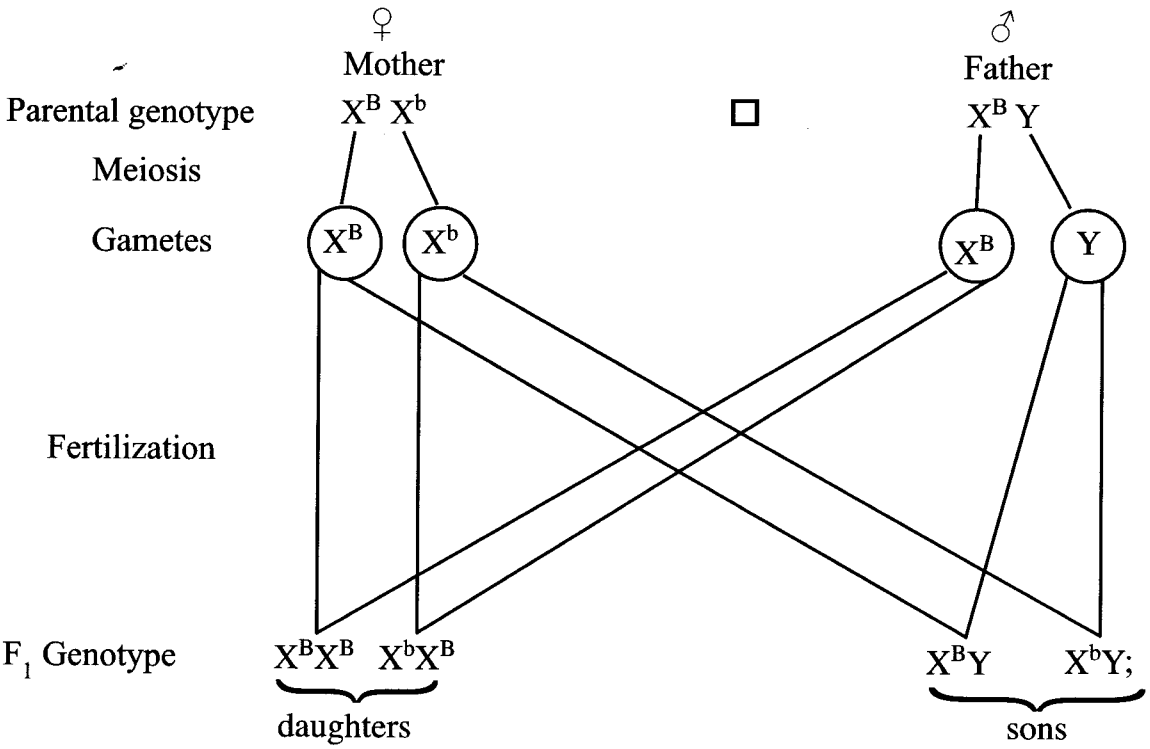
   (c) Comparative anatomy; (1 mark)

   (d) It allows the organisms to exploit different habitats to reduce competition; (1 mark)

3. (a) (Antigen) B;
   Rhesus (antigen)/Rheus factor/Antigen D

   (b) Has antibody **a** in the blood plasma of the recipient and will correspond with antigen **A** in the donor's blood, hence there will be antigen antibody reaction/agglutination.

4.



1 mark

1 mark

25% chance that a son will be colour blind; (1 mark)

OR

Punnet square

Parental genotypes X^BX^b × X^BY

♀ \ ♂	X^B	Y
X^B	X^BX^B	X^BY
X^b	X^BX^b	X^bY

25%;

5. (a) (i) To hold the specimen in place;
(ii) Protects specimen from dehydration/drying up/dust particles;
Protect objective lens from staining. (2 marks)

(b) Click the low power objective lens into position. Bring it down to the lowest level using the coarse adjustment knob;
With eyes on the eyepiece lenses and using the coarse adjustment knob gradually raise/ lower the low power objective lens to bring the specimen into focus; (2 marks)

6. (a) Osmosis; (1 mark)

(b) Absorption of water from the soil; opening and closing of stoma; feeding in insectivorous plants; support (in seedlings, leaves,herbaceous plants);
Movement of water from cell to cell in plants.
Any correct 1 (1 mark)

(c) The thistle funnel gained water by osmosis; because the sucrose solution was hypertonic; (2 marks)

7. - Thin/elastic outer wall; it bulges outwards;
- Thick/less elastic inner wall; it curves to open the stomata/straightens to close the stomata;
- Has chloroplasts; for photosynthesis/synthesizedd sugar (glucose/sucrose/fructose) that is osmotically active. (4 marks)

8. (a) (i) *Plasmodium spp/malariae, vivax, Ovale, falseparum*;
(ii) Anopheles female mosquito; (2 marks)

(b) - Controlling mosquitoes/vectors/cleaning breeding sites/draining stagnant water/use of insecticides;
- Vaccination/taking prophylactic drugs;
- Sleeping under mosquito nets / use of mosquito repellants.
Any two correct (owtte) (2 marks)

9. (a) To show that carbon (IV) oxide is produced during respiration in plants; (1 mark)
(b) (i) Absorb carbon (IV) oxide from the (incoming) air;
(ii) Exclude light / to prevent photosynthesis; (2 mark)

(c) No colour change in tube F / no observable colour change.
Carbon (IV) oxide removed/absorbed from air by potassium hydroxide. (2 marks)

10. a)

Structure	Chimpanzee Skull	Human Skull
Parietal bones	- less curved/flatter - towards the back - smaller	- more curved - more central - larger Any correct 1 mark
Mandibles	- larger	- smaller 1 mark
Browridge	- thicker /more protruding - conspicuous/prominent	- less protruded 1 mark - less conspicuous/prominent

(b) Accommodate large sized brain in humans; (1 mark)

11. - Stomata (in leaves);
- Lenticels (in stems and roots)/pneumatophores; (2 marks)
- Epidermis (roots)
- Cuticle

12. (a) (i) Pyramid of biomas represents total dry mass weight of organisms in each trophic level;
(ii) While pyramid of numbers represents the total number of organisms at each trophic level/feeding levels/nutrition levels; (2 marks)

(b) Appropriate examples for;

Grass (Vegetation)	Cattle (antelope)	Man (pastoralist)	Lion	Vulture
Producer →	Primary consumer →	Secondary consumer →	Tertiary consumer →	Quartiranery consumer

(2 marks)

13.

Mitosis	Meiosis
- two daughter cells - Daughter cells diploid - Identical to mother cell/no variation	- Four daughter cells - Daughter cells haploid/are gametes - Results in variation

(3 marks)

14. (a) Smooth muscles/visceral muscles; (1 mark)
Cardiac muscles; (1 mark)

(b) Smooth muscles - tubular visceral organs; (1 mark)
Cardiac muscles - heart (1 mark)

15. (a) (i) Mitosis;
(ii) Formation of two daughter cells. (2 marks)

(b) (i) Metaphase;
(ii) Chromosomes are at the equator. (2 marks)

16.

	Millipedes	Centipedes
-	Cylindrical body	Dorso - ventrally flattened
-	Head has two clumps of many simple eyes	Head has a pair of simple eyes
-	Each segment has two pairs of walking legs (except the first thoracic segment)	Each segment has a pair of waking legs
-	Head has a pair of short antennae;	Head has a pair of long antennae.
-	No poison claws	Has poison claws
-	Three body parts - head short, throrax, and trunk	Two body parts - head and trunk
-	Has anterior genital aperture	Has aposterior genital aperture
-	Has 9 - 100 segments	Has 15 - 21 segments

(4 marks)

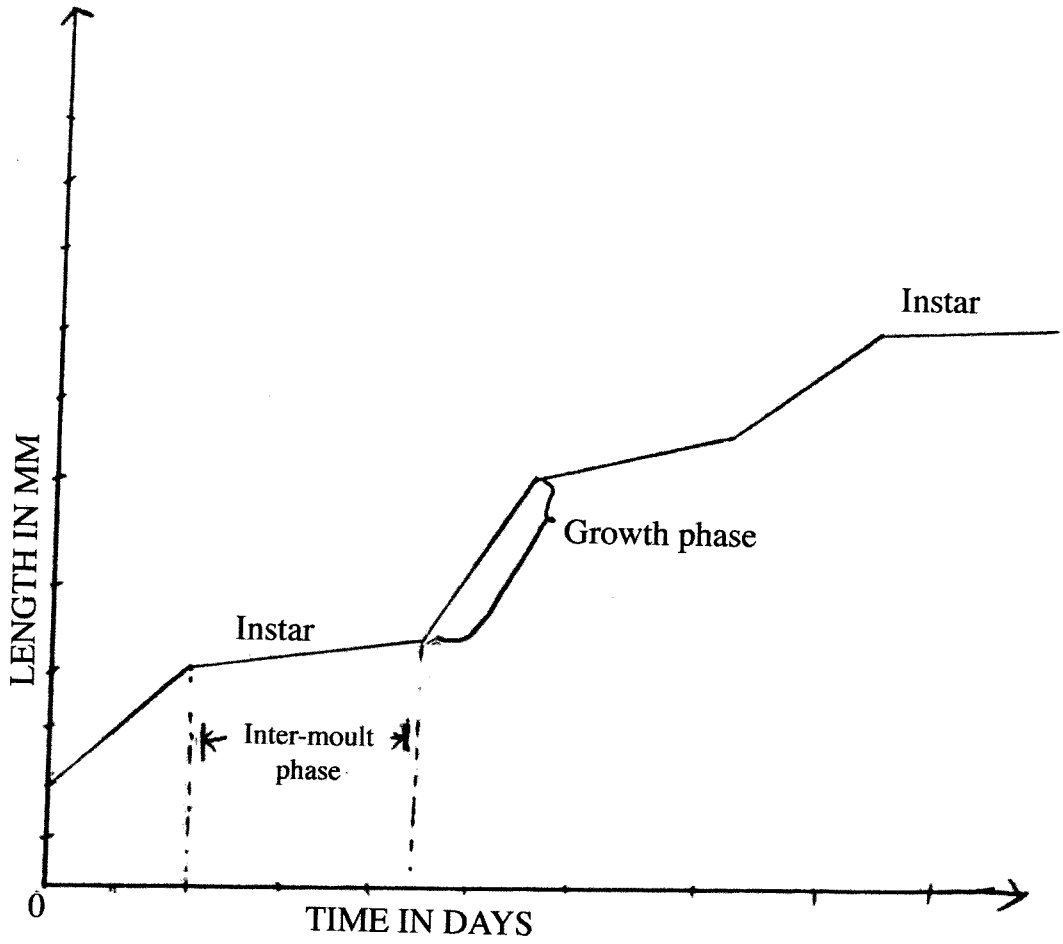
17. (a) (i) Has gastric glands; that secrete gastric juice; (2 marks)
(ii) Thick muscular wall; that contract and relax;
Accept a component of gastric juice (pepsin, Rennin, mucus, hydrochloric acid). (2 marks)

(b) - Used in plant respiration to produce energy;
- Converted to starch/sucrose/lipids/proteins/cellulose and stored; for future use. (2 marks)

18. - P - the low temperature/freezing temperature; inactivated enzymes; (2 marks)

- Q - Boiling eliminated oxygen; oil layer prevented entry of oxygen necessary for respiration during growth; (3 marks)

19. (a)



(b) Intermittent growth is as a result of the shedding of the exoskeleton/moulting/ecdysis. The growth rate slows down (flattening) as the exoskeleton hardens; after moulting, growth occurs rapidly (steep slope) until the exoskeleton hardens.

20. Pain receptor → Sensory neurone; Interneurone → CNS; Motor neurone → Muscle.

OR

Pain receptor → sensory neurone; inter neurone → CNS → interneurone; motor neurone → Muscle.

Pain receptor → sensory neurone; CNS → interneurone; motor neurone → muscle

4.5.2 Biology Paper 2 (231/2)

SECTION A (40 marks)

1. (a) Alveolus; (1 mark)

(b) **Y** - oxygen/O_2;
Z - Carbon (IV) Oxide/CO_2;
(2 marks)

(c) Oxygen concentration is lower in the blood capillary than in the alveolus; oxygen diffuses; through the epithelium and endothelium of capillary wall, plasma into the red blood cells where it combines with haemoglobin. (3 marks)

(d) Cigarettes/tobacco contains tar; tar contains carcinogenic substances; which trigger cancer (2 marks)

2. (a) **W** - ovary wall/ovary; (1 mark)

(b) Tip of pollen tube bursts open; one of the nuclei fuses with the egg cell nucleus; to form a diploid zygote; while the remaining male nucleus fuses with the polar nuclei; to form a triploid endosperm nucleus;
(5 marks)

(c) **R** - Endosperm/primary endosperm;
T - testa/seed coat;
(2 marks)

3. (a) Branch of Biology that deals with the study of **inheritance** and **variation**.
(1 mark)

(b) (i) Sex;
(ii) ABO blood group system/Rhesus factor;
(iii) Ability to roll tongue;
(iv) Free or attached earlobe;
(v) Presence/ absence of hair in the nose/ on the ear pinna;
(vi) Finger prints; ability to taste PTC (phenythiocarbamide) PTV (phenylthio urea)
(vii) Winglength in prosophila;
(viii) Size of abdomen in drosophila;
(ix) Eye colour in prosophila;
(x) Smooth/wrinkled seed coats in pea plants;
(xi) Green/yellow seed coats/seed coat colour in pea plants;
(xii) Polymorphism/melanic and non melanic forms in moths. (2 marks)

Parental genotypes ♂ Hb^AHb^A x ♀ Hb^AHb^s

Gametes Hb^A | Hb^A Hb^s

Fertilization

Female \ Male	Hb^A	Hb^A
Hb^A	Hb^A Hb^A	Hb^A Hb^A
Hb^s	$Hb^A Hb^s$	$Hb^A Hb^s$

; F1

F_1 Genotypes

Complete punnet;

Probability of sickle cell trait (Hb^A Hb^s)

$= \frac{2}{4} = \frac{1}{2} / 0.5 /$ 50%;

(5 marks)

4. (a) To destarch/remove starch from the leaves; (1 mark)

(b) Carbon (IV) Oxide/CO_2; (1 mark)

(c) (i) Test for starch; (1 mark)

(ii) **P** - Retained the colour of iodine solution/brown/yellow; (1 mark)

Q - Turned blue-black/black/dark-blue; (1 mark)

(iii) **P** - Did not photosynthesize /no startch is formed because Sodium Hydroxide pellets absorbed Carbon (IV) Oxide;

Q - Photosynthesized /starch was formed because Carbon (IV) Oxide was in the flask; (2 marks)

(d) Control (experiment); (1 mark)

5. (a) Geotropism/Gravitropism; (1 mark)

(b) (i) The shoot tip/plumule curved upwards; root tip/radicle curved downwards; (2 marks)

(ii) Auxins migrated downwards to lower side; Higher concentration on the lower side; caused more growth on the lower side than on the upper side in shoots/ inhibited growth on the lower side than on the upper side in the roots; (3 marks)

(c) (i) The seedling will continue growing horizontally; (1 mark)

(ii) There was even distribution of auxins (on the tips); (1 mark)

SECTION B (40 marks)

6. (a) (i) Producer - M (1 mark)

Reason - Largest in number hence source of food for the other species/

- Abundant on the water surface to trap light for photosynthesis;

(1 mark)

(ii) Secondary consumer - N (1 mark)

Reason - Smaller in number than L and M

(1 mark)

(b) L - 1.125 m;

M - 0.75 m;

N - 2.00 m;

(3 marks)

(c) (i) Capture - Recapture (method) /Capture - mark - release - recapture;

(1 mark)

(ii) Animals are highly mobile; (1 mark)

(iii) - No migration during the period of survey/study;
- No deaths/variation/reproduction in population during the period;
- Method of marking does not affect the animal behaviour;
- Marked/released animals will freely mix with others in the pond;
- Released/marked animals will have enough time to mix with the others;
- There is uniform/random distribution of animals within the period.

(Max. 4 marks)

(d) Decrease in light intensity as depth increases; (1 mark)

Decrease in temperature as depth increases; (1 mark)

(e) Breakdown of organic materials/decompose/rot/decay of materials; to release plant nutrients; (2 marks)

(f) Flood water may mix with human waste contaminated with cholera bacteria; The flood water may then contaminate food / water sources; The contaminated water/food causes cholera infection when ingested; (3 marks)

7. - Wind - dispersed seeds / fruits are light / small to be carried by air currents;
  - Some seeds / fruits have developed hairy structure feather-like projections; wing like structure which increase their surface area to be blown about /carried away by wind;
  - open capsules; borne on long stalks, which are swayed by wind scattering seeds.
- Water - dispersed fruits / seeds are also light; to float on water;
  - Some, (like coconuts) have fibrous /spongy mesocarps to trap air; making them

buoyant/ floating on water;
- Others (like the water lily) produce seeds whose seed coats trap air bubbles; making them float on water;
- Some have water-proof seed testa / pericarp; remain afloat without soaking / sinking immediately they are released from parent plants;

- Animal - dispersed fruits have developed hooks; to stick on (the fur of passing) animals;
  - In some cases, fruits are succulent, brightly coloured / scented; to attract animals, birds;
  - The seed coats (of some seeds) are hard; and resistant to the digestive enzymes; hence passing out through the gut undigested;
- Self dispersal by explosive mechanism;
- Fruits have sutures/lines of wakness; which split open when drying scaterring seeds.

Max = 20 marks

8. (a) Has cardiac muscles; which contract and relax continuously/without fatigue;
- Cardiac muscles are interconnected/form a network of fibres; to rapidly and uniformly spread the contractions;
- Divided into four chambers; for the atria to receive blood and ventrical to pump blood out of the heart.
- Divided into two sides by a longitudinal septum; to prevent mixing of oxygenated and deoxygenated blood;
- Ventricles have thicker walls; to generate high pressure to pump blood;
- Wall of left ventricle are thicker than those of right ventricle; to pump blood over a longer distance;
- Has valves; to prevent back flow of blood for double circulation;
- Cuspid valves have strands of connective tissues/cordaetandinae/tendinous; to prevent the valves from turning inside out during systole when ventricles contract;
- Has coronary artery to nourish/supply oxygen/nutrients the heart muscles;
- Has coronary vein; to remove metabolic wastes;
- Enclosed by a pericardium; to keep it in position/prevent overdilation;
- Pericardium is externally surrounded with a layer of fats; to cushion the heart against mechanical damage;
- Pericardium secretes pericardial fluid; to reduce friction/absorb shock;
- Has Sino Atrio Node (SAN); which acts as a pace maker;
- Has Atrio Ventricular Node (AVN); which relays contraction waves from Sino Atrio Node to the purkinje tissue;
- Has purkinje tissue/bundle of HS; to relay waves from Atrio Ventricular Node; to the ventricular myocardium;
- Cardiac muscles have numerous mitochondria; to generate energy for the muscular contractions;
- Vena cava and pulmonary vein; supply blood to the heart;
- Aorta and pulmonary artery; transport blood away from the heart.

(max 20 marks)

4.5.3 Biology Paper 3 (231/3)

1. (1) (b) go to 5;

(2) (a) Eagle;

(b) go to 3;

3. (a) Fish;

(b) go to 4;

4. (a) Tortoise;

(b) Frog;

5. (a) go to 6;

6. (b) Spider;

7. (b) go to 8;

8. (a) go to 9;

(b) Starfish;

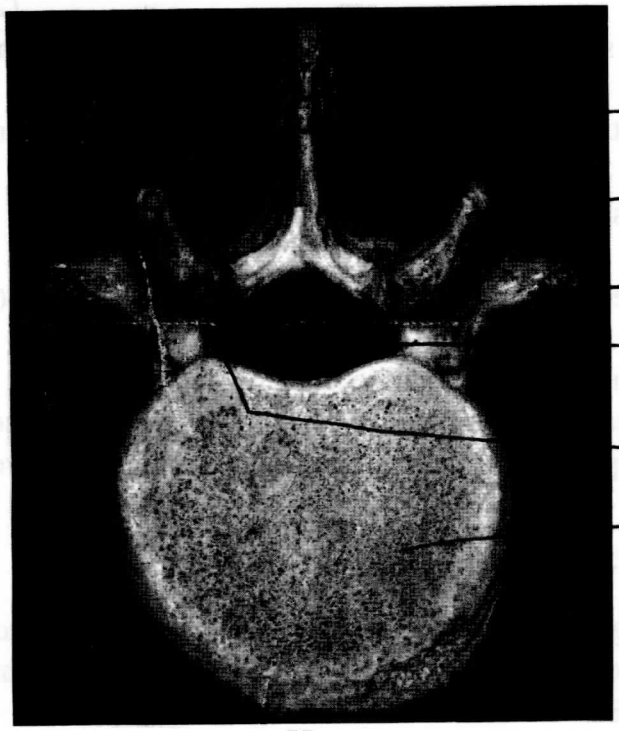
9. (a) Earthworm (13 marks)

2. (a) F Cervical/Cervical bone; (1 mark)

G Thoracic/Thoracic bone; (1 mark)

H Lumbar/Lumbar bone; (1 mark)

(b)



H

Neural spine;

Metopophyses;

Transverse process;

Neural canal;

Neural arch;

Centrum;

Labels $\frac{6}{2}$ = 3 marks
Labels touching object = 1 mark
Labels not crossing = 1 mark
maximum = 5 marks

(c) K - Tubercular (facet);
K - Capitular (facet);

(2 marks)

(d)
- (Large) centrum to support the body vertebrae;
- Neural arch to protect the spinal cord;
- (Extended) transverse processes for attachment of (abdominal) muscles;
- (Long) neural spine for attachment of abdominal muscles/ligaments;
- Facets for articulation with other vertebrae;
- Neural canal for passage of spinal cord.

(4 marks)

3. (a)

NO.	TEST TUBE	OBSERVATION	CONCLUSION
1.	**D+Iodine**	Turns blue black/blue/ black;	Starch present;
2.	**D+E+Iodine**	Turns colourless/ blueblack colour disappears	Starch absent/decreases;
3.	**D+Benedict's solution**	Remains blue/no colour change;	Reducing sugars absent;
4.	**D+E+Benedict's solution**	Turns green, yellow, orange, blown/reddish blown	Reducing sugars present;

(8 marks)

(b) (i) Breaks down (hydrolyses) starch; into maltose/reducing sugar;

(2 marks)

(ii)
- Provides optimum suitable temperature; for activity of E/enzymes;
- Required when testing for reducing sugars using Benedict's solution;
- Activates enzymes.

(c) Salivary amylase or ptyalin/ amlyse/pancreatic amylase. (1 mark)

(d) Substance D tests negative with Benedict's solution because it is a complex/ polysaccharide; addition of E on heating gives positive results with Benedict's solution, since E hydrolyses, the starch/ complex sugar into simple sugars; testing positive.

OR

Starch in D/D is a non-reducing sugar/complex sugar/polysaccharide/not a reducing sugar; startch is hydrolysed/digested/broken down into reducing sugars by E/Amylase in E/Amylase/Diastase/enzyme in E.

(2 marks)