

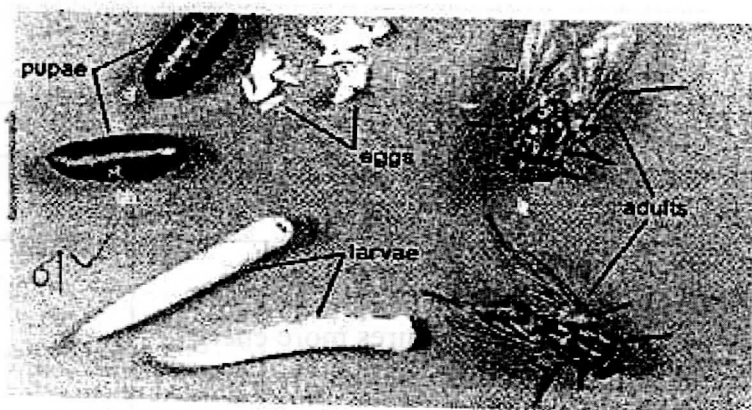
4.5 BIOLOGY (231)

4.5.1 Biology Paper 1 (231/1)

1	a) Pooter/Aspirator;	(1 mark)
	b) To prevent dirt/insects from entering the suction tube/into the mouth;	(1 mark)
2	(a) (i) F - Kidney; G - Bladder/Ureter/Urethra; (ii) Kidney - active re-absorption of solutes requires more energy; organelle F has more cristae for attachment of more respiratory enzymes producing more energy; Bladder/ureter/urethra does not require as much energy/ organelle G has less number of cristae hence fewer respiratory enzymes attached/less energy produced;	(1 mark) (1 mark) (2 marks)
	(b) i) Stroma; ii) Grana/granum;	(1 mark) (1 mark)
3	a) Non reducing sugar; b) (i) Hydrolyze/break down sucrose/ non reducing sugars to reducing sugars/glucose/fructose; (ii) neutralize the acid;	(1 mark) (1 mark) (1 mark)
4	a) $R.Q = \frac{CO_2 \text{ produced}}{O_2 \text{ consumed}}$ $= \frac{199.75}{200}$ $= 0.99875$; b) Carbohydrates/glucose; c) -Stored in the body as fat/subcutaneous deposit/adipose tissue; -Saved as glycogen (in the liver / muscle cells); -(Increase) oxidation; any 2-	(2 marks) (1 mark) (2 marks)

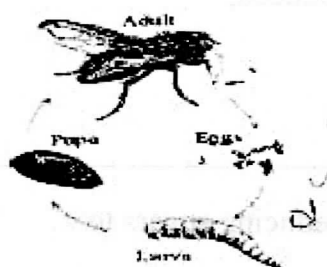


5 (a) (i)



(1mark)

(ii)



(1mark)

b (i)

Housefly	Cockroach
<ul style="list-style-type: none"> - Undergo complete metamorphosis/Egg, Larva,Pupa,Adult/has 4 steps; - Eggs have no egg case/ootheca - Many/numerous eggs 	<ul style="list-style-type: none"> - Undergoes incomplete metamorphosis/ Egg,Nymph,Adult/has 3 steps; - Eggs in egg case/ootheca - Fewer eggs

(2 marks)

2×1

- ii) Absence of larva and pupa shortens the life cycle of the organism; (avoiding adverse/extreme environmental conditions that would affect its growth/general life processes);

(1mark)

6 Pepsin (secreted as pepsinogen);
Trypsin (secreted as trypsinogen);
Rennin/chymosin (Secreted as Prorennin/Prochymosin; max-2

(2 marks)

- 7 ☐ Animal - accept correct examples (of organisms)/amoeba/plasmodium;
☐ Constriction of the cell membrane/ presence of centrioles ;

(2 marks)



8	To increase the supply of oxygen (in the tissues); to offset the "oxygen debt"/halt/manage the accumulation of lactic acid (in the muscles);	(2 marks)
9	a) Reflects light (through the condenser) to the object; b) - Can break the objective lens/cover slip/slide; - Can destroy the specimen (making the microscope dirty);	(1 mark) Any one correct (1 mark)
10	a) The diaphragm contracts and flattens; leading to increase in volume of the thoracic cavity; decreasing the pressure inside it, (forcing in the air); b) - Thin leaf lining/epidermis for faster diffusion of respiratory gases/ to reduce diffusion distance for respiratory gases; - Numerous stoma to increase surface area for gaseous exchange; - loosely packed cells in the spongy mesophyll region/ intercellular air spaces (lower layer) to allow for free movement of respiratory gases;	(3 marks) Any 2 (2 marks)
11	a i) Diffusion; ii) - Gaseous exchange/excretion of carbon (IV) oxide and oxygen; - Translocation of materials; - Absorption/uptake of mineral ions/salts; b. - Lowering the temperature of the medium; - Increasing thickness of the membrane; - Use less dye/add more water/reducing the concentration gradient;	(1 mark) Any 2 (2 marks) (2 marks)
12	a) Geotropism - enables plants access water/mineral salts; - Anchorage; b) Phototropism- Exposes plant leaves to light for photosynthesis/for formation of chlorophyll;	(2 marks) (1 mark)
13	<i>Mycobacterium tuberculosis/ Mycobacterium bovis</i> ;	(1 mark)
14	a. Epigeal; b. G - Elongates to expose the foliage leaves to light photosynthesis H - Stores food (for growth); - For photosynthesis (it is green); - Protects plumule during germination;	(1 mark) Any one (1 mark)
15	Osmosis; water moves into the cells becoming turgid; attaining mechanical support ; OWTTE	(3 marks)



16	a. I – Deletion;	(1 mark)
	II- Inversion;	(1 mark)
	b. The characteristics /traits of an organism are determined by internal factors/ genes (which occur in pairs). Only one of the genes can be carried in a gamete/ passed onto the next generation;	(1 mark)
	c. <ul style="list-style-type: none"> – Most have lost most of the original (desirable) qualities eg taste; - Poor/undesirable qualities are perpetuated through subsequent generations; - Products' qualities are irreversible- can't get original species/qualities; 	Any 2 (2 marks)
17	<ul style="list-style-type: none"> - Presence of numerous villi/microvilli; - Being long; - Being highly coiled; 	Any 2 (2 marks)
18	a. Comparative embryology;	(1 mark)
	b. Fish remained in the aqueous media/ aquatic habitat; well-developed tail/ fin for propulsion/movement;	(2 marks)
	<ul style="list-style-type: none"> -Ability to rationalize / higher thinking capacity/higher brain activity/advanced brain; -Ability to walk on two's/ bipedal modification of the limbs/ opposable thumbs/upright posture; -Communicate through speech; -Have binocular/stereoscope vision; 	(2 marks)
19	a. i) Less water and urea; since some is excreted/eliminated through the skin (as sweat);	(2 marks)
	ii) increased amount of urea in the urine; due to deamination of amino acids (from proteins);	(2 marks)
	b. i) ultra filtration;	(1 mark)
	ii) Selective reabsorption;	(1 mark)
20	<ul style="list-style-type: none"> i. Petrification/change into rock; ii. Entire organism or parts preserved; iii. Impressions (eg casts/moulds); 	(3 marks)
21	Differences in distribution of chlorophyll/leaf is variegated; green patches would photosynthesize forming starch; giving blue-black colour with iodine solution unlike the regions without chlorophyll;	(3 marks)



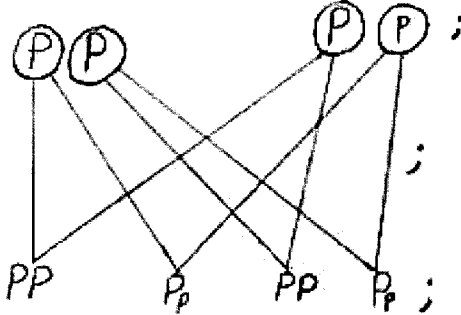
22	<ul style="list-style-type: none"> - Storage in tissues in non-toxic forms; - Deposited in plant tissues/organs- which age and fall off; (eg leaves, bark, fruits, flowers) 	(2 marks)
23	<p>a. i) To investigate how ants respond to moisture/water/ hydrotaxis (varied environments with/without moisture/ water);</p> <p>ii) Silica gel/anhydrous calcium chloride pellets/pyrogalllic acid/dehydrating/ drying agent;</p> <p>iii) The colour of cobalt (II) chloride paper remained blue/all the moisture/ water vapour was absorbed/There was no water/moisture in the flask to change the colour of cobalt (II) chloride paper;</p> <p>b. (More) ants were attracted/ moved into the flask; due to the presence of moisture/water vapour; (evidenced by the change of cobalt (II) chloride paper to pink)</p>	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(2 marks)</p>



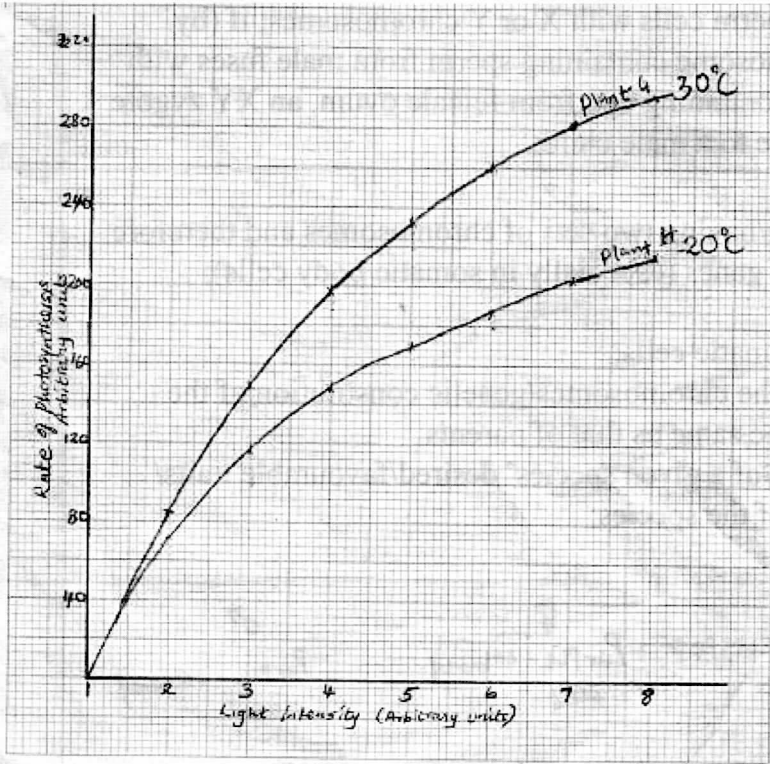
4.5.2 Biology Paper 2 (231/2)

1. (a)	i. E – Nucleolus; F – Nuclear pore/nucleopore;	(1 mark) (1 mark)
	ii. Facilitates movement of materials in and out of the nucleus;	(1 mark)
	iii. Nuclear material in the bacterial cell is not enclosed within a membrane /prokaryotic, while in animal cell it is enclosed/ eukaryotic;	(1 mark)
(b)	i. Chloroplast;	(1 mark)
	ii. Lysosome;	(1 mark)
(c)	i. Feeding (food vacuole); ii. Osmoregulation (contractile vacuole); iii. Excretion/removal of wastes;	(2 marks)
2. (a)	Presence of carbonic anhydrase enzyme; which speeds up the conversion of carbon (IV) oxide to weak carbonic acid; which dissociates into hydrogen carbonate ion/ (HCO_3^-) (that diffuses out of the red blood cells into the blood plasma);	(2 marks)
(b)	The body needs high amount of energy; (for the exercise/muscle activity) hence high respiration rate (more oxygen intake); releasing more carbon (IV) oxide (in the blood plasma);	(3 marks)
(c)	The high rate of respiration (during physical exercises coupled with normal cellular metabolism) results in the production of more carbon (IV) oxide/faster accumulation of lactic acid; lowering the blood plasma pH/making it more acidic (compared to when one is at rest);	(2 marks)
(d)	Haemoglobin;	(1 mark)
3. (a)	The cell is turgid; its cell sap was hypertonic (compared to the solution in which it was placed); by osmosis, water moved into the cell across its cell semi-permeable membrane, (swelling and becoming turgid);	(3 marks)
(b)	The red blood cell lacks the cell wall; water molecules move across its semi-permeable membrane by osmosis; into its hypertonic medium (inside the cell), cell contents/cytoplasm swelling and bursting/ haemolyses;	(3 marks)
(c)	Would haemolyse; due to lowering of the osmotic pressure of the blood below normal;	(2 marks)



4.	a) Male produces sperm cells with X or Y chromosomes; if (by chance), Y chromosome containing sperm from male fuses with X chromosome containing egg from female ovum, an XY zygote results, giving rise to a male child;	(2 marks)
	b) <ol style="list-style-type: none"> State of being/having two sets of chromosomes and therefore two copies of genes (especially in somatic/body cells); Mitosis; Body cells/somatic cells; Ensures that the chromosomes/genetic constitution of the offspring is the same as that of parents; Ensures perpetuation of a given species' desired/favourable traits/qualities/continuity of the species;	(1 mark) (1 mark) (1 mark) (2 marks)
5.	<p>Parental phenotype: ♀ Purple-coloured seed ♂ Purple-coloured seed</p> <p>Parental genotype: PP Pp ;</p> <p>Gametes: (P) (P) (P) (P) ;</p> <p>Crossings: </p> <p>F₁ offspring: PP Pp PP Pp ;</p> <p>Genotypic ratio: 2PP : 2Pp ; 1 : 1</p> <p>(5 marks)</p>	(5 marks)
	b) <ul style="list-style-type: none"> Higher yields; Enhanced resistance to diseases/pests; Early/faster maturity; Enhanced resistance to harsh climatic conditions (drought/extremes in temperature); Any two	(2 marks)
	c) Chances of recessive/defective genes being combined increase, hence weaker offspring;	(1 mark)



6.	 <p>The graph plots the rate of photosynthesis against light intensity for two plants at different temperatures. The y-axis represents the rate of photosynthesis in arbitrary units, ranging from 0 to 32. The x-axis represents light intensity in arbitrary units, ranging from 0 to 8. Plant G, at 30°C, shows a higher rate of photosynthesis than Plant H, at 20°C, across all measured light intensities. Both curves exhibit a characteristic shape where the rate increases rapidly at low light intensities and then levels off as light intensity increases further.</p> <p>a) Plotting, all points- (2 marks) Labeling axis, X and Y, - (2marks) Scale, X and Y, - (2 marks) Smooth curves - (2 marks)</p> <p>b) To investigate/compare the effect of (varying) light intensity/temperature on the rate of photosynthesis; (1 mark)</p> <p>c) Rate of photosynthesis is higher in plant G (than H); (Photosynthesis being an enzymatic process), enzymes were subjected to favourable/optimal temperatures (of 30°C); hence more activated, unlike in plant H where temperatures were lower (20°C); (3 marks)</p> <p>d) (i) 1- 4 units Rapid increase in rate of photosynthesis increases with the increase in light intensity; due to increase in light energy for photosynthesis/formation of more ATP molecules; (2 marks) (ii) 4 – 8 units Slower/gradual increase in the rate of photosynthesis as the light intensity increases; because other factors become limiting/some chlorophyll molecules start bleaching; (2 marks)</p> <p>e) (1 mark) i) Slight increase/no significant increase/remains constant; (1 mark) ii) The optimum light intensity has been exceeded/some chlorophyll could be destroyed; (1 mark)</p> <p>f) Internal factor – Chlorophyll/enzyme concentration; (1 mark) External factor – Carbon (IV) oxide concentration/amount of water; (1 mark)</p>	(8 marks)
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7.	a) Climate change <ul style="list-style-type: none"> – Promote(regular) rainfall/precipitation/prevent desertification; – Act as wind breakers; – Keep earth temperatures cool/reduce global warming; – Keeps biogeochemical cycles going e.g. hydrological, carbon, nitrogen, phosphorous, sulphur cycles; 	(3 marks)
	b) Biodiversity <ul style="list-style-type: none"> – Conserve diverse flora/ fauna; – Conserve genetic variety; – Prevent extinction of rare species; – Source of research/employment; – Aesthetic/attracting tourism in foreign exchange; – Have impact on culture/religion/politics; – Food and shelter for other organisms and man; – Source of oxygen; 	(6 marks)
	c) Biotechnology <ul style="list-style-type: none"> – Manufacture of medicines/directly used as medicinal; – Source of food/food products; – Provide fuel (when regulated); – Provide paper and related by-products (when regulated); – Provide timber (when regulated); – Products used in other industries e.g. tannin, wax, rubber, oil, honey; 	(4 marks)
	d) Water conservation <ul style="list-style-type: none"> – Increased ground water/high water tables; – Adds into rivers/lakes/permanency in existing water bodies/ reservoirs; – Water towers/water catchment; 	(3 marks)
	e) Pollution <ul style="list-style-type: none"> – Minimize soil pollution/ensuring cover against surface run-off/ wind erosion/denudation; – Trees/vegetation clean the soil surface by absorbing nutrients from decomposed matter e.g. sewage; – Large scale clean-up of polluted air/dust; – Muffle noise pollution; 	(4 marks)



8.	<ul style="list-style-type: none"> – Has the eyelid; which protects the cornea from mechanical/physical/chemical damage; – Eye lid; protects the eye from bright light by reflex action; – Sclera/Sclerotic layer; – which contains (inelastic) collagen fibres which protects/maintains shape of the eyeball; – Cornea; – transparent to allow light pass through/has convex shape to refract light towards the retina; – Conjunctiva – (thin) epithelium for protection of cornea/has goblet cells for secretion of mucus for lubrication/ transparent to allow light pass through; – Choroid/choroid layer; – rich in blood vessels/highly vascularised, supplying the retina with nutrients/oxygen/ remove metabolic wastes/covered with (black) pigment cells to prevent reflection of light within the eye; – Ciliary muscles; have (contractile) muscles that contract/relax to alter the shape of the lens during accommodation; – Lens;- transparent to allow light pass through/elastic to allow adjustment of the shape of lens/ biconvex to refract light/focus light onto retina; – Iris; – has radial and circular muscles to alter diameter/size of the pupil, hence controlling the amount of light entering the eye/contain pigments that absorb light and stop it getting through to the retina; – Vitreous humour; – clear/transparent to allow light pass through/is a fluid that refracts light rays onto the retina/ maintain shape of the eye balls supports the eye; – Retina; contains cones, rods/photoreceptors to perceive light; – Optic nerve;- has sensory neurons/nerve cells that transmit impulses to the brain; – Fovea (centralis); – (most sensitive part of retina) contains numerous/high concentration of cones for visual acuity/ accurate vision; – Pupil ;– a hole/an aperture/opening in the iris, lets in light; – Suspensory ligaments;-are fibrous/inelastic fibres that hold lens in position; – Aqueous humour – is clear/transparent to allow light to pass through/is a fluid/liquid (exerting hydrostatic pressure) to maintain the shape of the eyeball/refract light rays onto the lens/cornea/contain glucose for nourishment; – Blind spot – a point where the optic nerve leaves the eye to the brain/passage of blood vessels since has no photoreceptors; 	(20 marks)
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4.5.3 Biology Paper 3 (231/3)

1a)	<p>i) E – strips curved outwards; (1 mark) F – strips curved inwards; (1 mark)</p> <p>ii) E – Liquid E/water entered inner cells/mesocarp of banana peels by osmosis; the inner cells expanded faster/enlarged more/became longer/became turgid than the outer cells; (leading to the curvature outwards/outer cells did not expand); (3 marks)</p> <p>F – (More) water left inner cells/moved out (of banana peels) into liquid F (by osmosis); inner cells shrunk/became flaccid/shorter (causing inward curvature); (2 marks)</p>	13 marks
b)	Liquid E has more solvent molecules/fewer solute molecules/hypotonic(compared to the sap in the banana peel); while liquid F is hypertonic/has more solute molecules/fewer solvent molecules/more concentrated/highly concentrated. (2 marks)	
c)	Outer surface(of the banana peel) is impermeable/less permeable/water-proof hence water enters or leaves only from the inner surface/while inner surface is permeable/more permeable; (1 mark)	
d)	<p>i) Cell membrane/plasma membrane/plasmalemma; (1 mark)</p> <p>ii) It is semi-permeable/selectively permeable; thus allowing (selective) movement of materials in and out of the cell/has pores which allow small molecules to pass through; (2 marks)</p>	
2 (a)	<p>i) Contents of test tube A are clearer/colourless/form a solution; (1 mark)</p> <p>Contents of test tube B are cloudy/turbid/form a white precipitate/suspension/milk/colloidal suspension; (1 mark)</p> <p>ii) NaOH provided an alkaline medium/condition/optimum/best/suitable (in test tube A); suitable for action/working of enzyme P (on egg albumen); effectively digesting the egg albumen/protein; (3 marks)</p>	14 marks
	(Contents of test tube B remained cloudy) Hydrochloric acid provided unsuitable/acidic/unfavourable medium; for the working of enzyme P, hence no break down/digestion of albumen occurred; (2 marks)	
b)	To provide suitable/optimum/favourable/best temperature for the working/action of enzyme P; (1 mark)	
d)	Control experiment; (1 mark)	
e)	<p>i) Solution P is an enzyme/trypsin; protein-digesting enzyme/in the egg albumen in the alkaline medium; (2 marks)</p> <p>ii) In the duodenum; (1 mark)</p> <p>iii) It has alkaline medium/condition; (1 mark)</p>	



3

13 marks

(a)

Plant H leaves	Plant K leaves
Broad/broad lamina Short leaves Net-veined/network veins/reticulate; Leaflets ovate; Compound and simple; Petiole present/compact petiole	Narrow lamina; Long leaves; Parallel-veined; Leaves linear; Simple leaves only; Leaf sheath/ petiole absent/petiole modified into sheath;

Any (3 marks)

b)

i) - Upright/firm stem that exposes leaves to light/ needed for photosynthesis;
- Green stem that contains chlorophyll to trap sunlight/light (for photosynthesis);
- Stem has phloem to transport the products of photosynthesis;
- Stem has xylem vessels for transport of water/mineral salts needed for photosynthesis;

Any 3

ii) - (Many/numerous) nodes to allow for growing/propagation of the plant;
- Extensive/shallow/many fibrous adventitious roots (on each node) to exploit surface water/anchorage/support;
- Swollen stem/internode that store food;
- Green leaves for photosynthesis;
- Scaly leaves that protect the lateral buds from mechanical damage;

(3 marks)

c)

Liquid F being hypertonic (compared to the plant's cell sap) would lose water to the soil by osmosis; eventually being dehydrated, wilt/dry up and die;

(2 marks)

d)

- Food for herbivores/producers/food for primary consumers;
- Ground cover/roots bind soil;
- Offers camouflage/home for small animals/habitat;
- Recycling of nutrients (upon decomposition);
- Reduce carbon (IV) oxide in the atmosphere/ carbon (IV) oxide sink;
Reduces green house effect;

Any 2 (2 marks)

