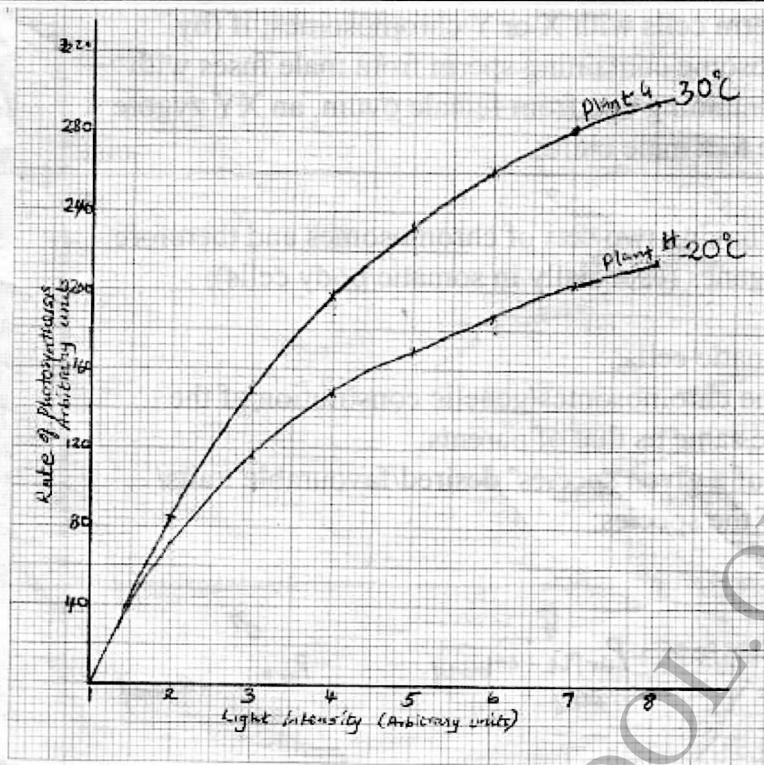


4.5.2 Biology Paper 2 (231/2)

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.	<p>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;</p>	(2 marks)
	<p>b)</p> <ol style="list-style-type: none"> <li>State of being/having two sets of chromosomes and therefore two copies of genes (especially in somatic/body cells);</li> <li>Mitosis;</li> <li>Body cells/somatic cells;</li> <li>Ensures that the chromosomes/genetic constitution of the offspring is the same as that of parents;</li> </ol> <p>Ensures perpetuation of a given species' desired/favourable traits/qualities/continuity of the species;</p> <p>c) Testosterone;</p>	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(2 marks)</p> <p>(1 mark)</p>
5.	<p>Parental phenotype: <math>\text{♀}</math> Purple-coloured seed <math>\text{♂}</math> Purple-coloured seed</p> <p>Parental genotype: PP Pp ;</p> <p>Gametes: (P) (P) (P) (P) ;</p> <p>Crossings:</p> <p>F<sub>1</sub> offspring: PP Pp PP Pp ;</p> <p>Genotypic ratio: 2PP : 2Pp ;</p> <p style="text-align: right;">(5 marks)</p>	(5 marks)
	<p>b)</p> <ul style="list-style-type: none"> <li>- Higher yields;</li> <li>- Enhanced resistance to diseases/pests;</li> <li>- Early/faster maturity;</li> <li>- Enhanced resistance to harsh climatic conditions (drought/extremes in temperature);</li> </ul> <p>Any two</p>	(2 marks)
	<p>c) Chances of recessive/defective genes being combined increase, hence weaker offspring;</p>	(1 mark)

6. (8 marks)



- a) Plotting, all points- (2 marks)  
 Labeling axis, X and Y, - (2marks)  
 Scale, X and Y, - (2 marks)  
 Smooth curves - (2 marks)

b) To investigate/compare the effect of (varying) light intensity/temperature on the rate of photosynthesis; (1 mark)

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)

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)

e) 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)

f) Internal factor – Chlorophyll/enzyme concentration; (1 mark)  
 External factor – Carbon (IV) oxide concentration/amount of water; (1 mark)

7.	<p><b>a) Climate change</b></p> <ul style="list-style-type: none"> <li>- Promote(regular) rainfall/precipitation/prevent desertification;</li> <li>- Act as wind breakers;</li> <li>- Keep earth temperatures cool/reduce global warming;</li> <li>- Keeps biogeochemical cycles going e.g. hydrological, carbon, nitrogen, phosphorous, sulphur cycles;</li> </ul>	(3 marks)
	<p><b>b) Biodiversity</b></p> <ul style="list-style-type: none"> <li>- Conserve diverse flora/ fauna;</li> <li>- Conserve genetic variety;</li> <li>- Prevent extinction of rare species;</li> <li>- Source of research/employment;</li> <li>- Aesthetic/attracting tourism in foreign exchange;</li> <li>- Have impact on culture/religion/politics;</li> <li>- Food and shelter for other organisms and man;</li> <li>- Source of oxygen;</li> </ul>	(6 marks)
	<p><b>c) Biotechnology</b></p> <ul style="list-style-type: none"> <li>- Manufacture of medicines/directly used as medicinal;</li> <li>- Source of food/food products;</li> <li>- Provide fuel (when regulated);</li> <li>- Provide paper and related by-products (when regulated);</li> <li>- Provide timber (when regulated);</li> <li>- Products used in other industries e.g. tannin, wax, rubber, oil, honey;</li> </ul>	(4 marks)
	<p><b>d) Water conservation</b></p> <ul style="list-style-type: none"> <li>- Increased ground water/high water tables;</li> <li>- Adds into rivers/lakes/permanency in existing water bodies/ reservoirs;</li> <li>- Water towers/water catchment;</li> </ul>	(3 marks)
	<p><b>e) Pollution</b></p> <ul style="list-style-type: none"> <li>- Minimize soil pollution/ensuring cover against surface run-off/wind erosion/denudation;</li> <li>- Trees/vegetation clean the soil surface by absorbing nutrients from decomposed matter e.g. sewage;</li> <li>- Large scale clean-up of polluted air/dust;</li> <li>- Muffle noise pollution;</li> </ul>	(4 marks)

8.

- 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)