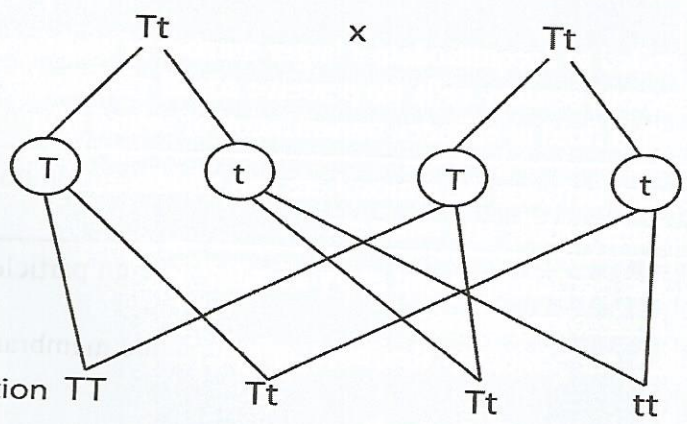


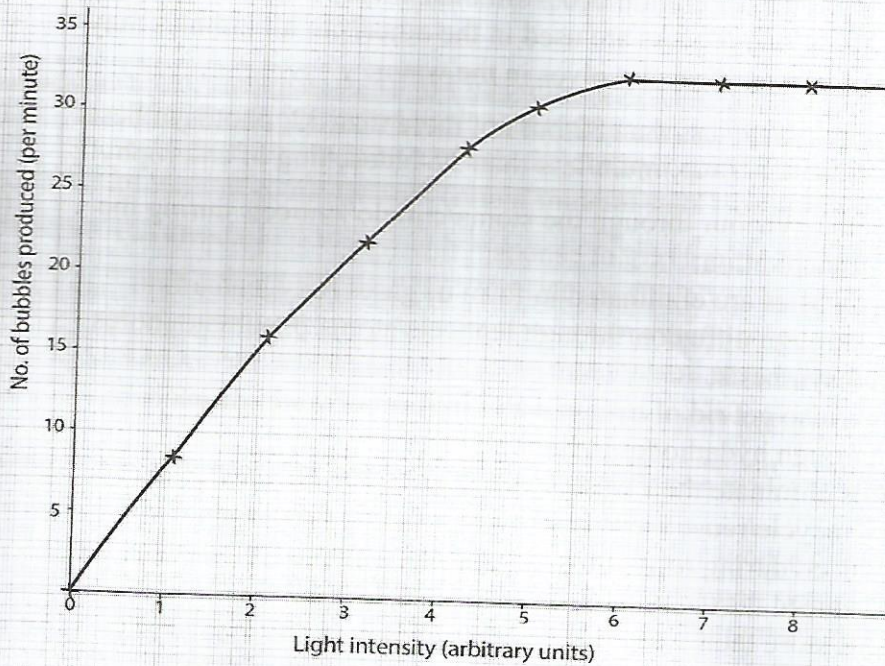
**KCSE PAPER 2022****4.5.2 Biology Paper 2 (231/2)**

1. (a)	(i)	Oxygen (is necessary for seed germination);	(1 mark)
	(ii)	Presence/inclusion of pyrogallic acid (in set-up E) absorbs oxygen in experimental set-ups);	(1 mark)
(b)	(i)	(35°C) is the optimum temperature required for functioning of (most) enzymes;	(1 mark)
	(ii)	To soften the seed coat/testa (for ease of emergence of the radicle)/ water activates germination enzymes/hydrolyses stored food/enhancing the rate of germination/solvent/medium of transport;	(1 mark)
(c)	(i)	Set-up E- germination will not occur due to lack of energy/ oxygen;	(1 mark)
		Set-up F-germination will take place since the seed coat/testa is softened/there is oxygen (that was initially in the apparatus)/ temperature is optimum;	(1 mark)
	(ii)	Germination/growth process stagnates/slows down then seedlings wither/die/dry up; the oxygen/moisture in the test tube will be depleted;	(2 marks)
2. (a)	(i)	Hippopotamus exhale carbon (IV) oxide which is used up by the algae/reeds to photosynthesize; their dung released into the water enriches it, favouring the growth of algae/ phytoplanktons/reeds; the dung is also fed on by fish;	(2 marks)
	(ii)	Algae are the primary producers for the lake ecosystem; release oxygen for use by organisms (in the lake ecosystem); purifies the ecosystem by using up the carbon (IV) oxide (produced by the fish/hippopotamus/other animals; regulates the pH of the water-by using up the carbon (IV) oxide; provide breeding grounds for fish; algae is fed on by fish/hippopotamus;	(2 marks)

(b)	<p>(i) Portions of fertilizers/organic manure applied on the farms find themselves deposited in the lake (due to surface run-off/siltation); enriching the lake ecosystem, favouring growth of plants/algae/ phytoplanktons (in the lake ecosystem);</p> <p>(ii) Excessive use of fertilizers/organic manure on the farms and their eventual deposition into the lake ecosystem into the lake ecosystem results in the overgrowth of phytoplanktons/leads to eutrophication; Some agrochemicals (pesticides/herbicides) used in the farms may be toxic/poisonous to the aquatic organisms; Extensive surface run-off/soil erosion and deposition into the lake blocks/clogs gaseous exchange surfaces of aquatic life; it increases turbidity, reducing visibility/ light penetration in the water;</p>	(2 marks)
3. (a)	<p>Parental Phenotypes Tall pea plant Tall pea plant ;</p> <p>Parental Genotypes Tt Tt ;</p> <p>Gametes  ;</p> <p>F<sub>1</sub> Generation TT Tt Tt tt ;</p> <p>Genotypic Ratio: 1TT:2Tt:1tt ;</p> <p>Accept correctly done Punnet square</p>	(5 marks)
(b)	<ul style="list-style-type: none"> <li>• Texture (of seed coat);</li> <li>• Colour (of seed coat/ cotyledon/ testa);</li> <li>• Form/shape of the seed;</li> </ul>	(2 marks)
(c)	Artificial selection/ cross breeding/ polyploidy/genetic engineering (resulting in varieties with desirable traits);	(1 mark)



6. (a)



Plotting (P) - 1 mark

Labelling axes (L) - 2 marks

Smooth curve (SC) - 1 mark

Scale (S) - 2 marks

**Total 6 marks**

(b) (Using a glowing splint) it relights a glowing splint; (1 mark)

(c) Photometre/light metre/exposure metre/photographic light metre; (1 mark)

(d) Aquatic plants are adapted to photosynthesizing under the water/in low light intensity; it can utilize carbon (IV) oxide in solution form; it is easier to collect the gas produced by aquatic plants under the water; **OWTTE** (1 mark)

(e)	(i)	Rapid increase in the number of bubbles produced; due to increased light intensity which increased the rate of photosynthesis;	(3 marks)
	(ii)	Number of bubbles produced remain constant; since the rate of photosynthesis had reached the maximum; due to optimum light intensity; other factors (such as carbon (IV) had oxide concentration) became limiting;	(3 marks)
(f)	<ul style="list-style-type: none"> <li>• Supply sodium hydrogen carbonates in the set-up/ any other source of carbon (IV) oxide;</li> <li>• Increase the number of shoots of aquatic plants;</li> <li>• Increase temperature to optimum;</li> </ul>	(2 marks)	
(g)	Photosynthesis and respiration occur simultaneously in plants/gases produced during one process are used in the other; not all bubbles may be accounted for/some gas dissolves in the water;	(2 marks)	
(h)	32 or any other value less than 32 but not more than 32, photosynthesis had reached the peak/maximum/less than 32-bleaching of chlorophyll;	(1 mark)	
7. (a)	<p>Plants eliminate vapour through the stoma/cuticle/lenticels during the process of transpiration;</p> <p>Some other wastes are eliminated in form of gases (oxygen/carbon (IV) oxide through diffusion/through lenticels/stoma/pneumatophores during photosynthesis;</p> <p>Some plants also get rid of excess water in form of water droplets/guttation through hydathodes in their leaves;</p> <p>Some plants eliminate their wastes by shedding their leaves;</p> <p>Plants also recycle/reuse their wastes, for instance the carbon (IV) oxide produced during respiration being used in photosynthesis; as the oxygen produced during photosynthesis is used up during respiration;</p> <p>Other plants store their wastes in vacuoles; while others deposit them in stems/roots;</p> <p>Some waste products like gum, resins, oils are removed by exudation through the bark;</p> <p style="text-align: center;"><b>Max - 8 marks</b></p>	(8 marks)	
(b)	<p>It has kidney/renal tubule; and glomerulus/ a network of blood capillaries;</p> <p>Bowman's capsule; (with a capsular space between inner and outer wall); and a glomerulus where ultrafiltration occurs; due to the difference in diameters of the blood vessels serving it; afferent vessel (wider lumen); and efferent vessel (narrower lumen);</p> <p>The proximal convoluted tubule; extend from the Bowman's capsule. The filtrate flows through the proximal convoluted tubule where useful substances/ glucose, amino acids, some water and mineral salts/ ions are selectively reabsorbed into the bloodstream; by diffusion/active transport;</p>	(12 marks)	

	<p>Ascending and descending/The Loop of Henle has a descending arm for water reabsorption; and an ascending arm where salts are reabsorbed;</p> <p>The (filtrate empties into the) distal convoluted tubule; where (more) water is reabsorbed into the blood by osmosis/under the influence of Antidiuretic Hormone (ADH) and (more) mineral salts are reabsorbed by diffusion/active transport under the influence of aldosterone;</p> <p style="text-align: center;"><b>Max-12 marks</b></p>	
8(a)	<ul style="list-style-type: none"> <li>• Phototropism; growth curvature in response to direction/ unidirectional light; shoots are positively phototropic while roots are negative; phototropism enables plant shoots reach light for photosynthesis;</li> <li>• Chemotropism; is growth response to a gradient of chemical substance/mineral ions/salts concentration; for instance, the growth of pollen tube towards the embryo sac for fertilization/ growth of roots towards certain mineral salts (for absorption);</li> <li>• Geotropism; is the growth response to gravity; shoots are negatively geotropic while roots are positively geotropic; geotropism enables the roots reach water/mineral ions for absorption/enables roots to grow into the soil for anchorage;</li> <li>• Hydrotropism; is the growth response to water/ moisture; roots are positively hydrotropic, enabling roots reach water for absorption;</li> <li>• Thigmotropism/haptotropism; is the growth response due to contact with solid objects; observed in climbing stems/ tendrils/plants with weaker stems to enable them reach light for photosynthesis/exposing flowers for pollination/fruit dispersal;</li> </ul> <p style="text-align: center;"><b>Max-15 marks</b></p>	(15 marks)
(b)	<p>Mammalian heartbeat is controlled in two ways, non-nervous; and through nervous control;</p> <p>During the non-nervous control, the cardiac muscles are myogenic/ initiate their own contractions/relaxations;(stimulation/electrical charges/excitations originate from within, in the Sino Atrial Node (SAN), stimulus/ excitation spreads through auricles leading to their contraction, stimulus/ excitation proceeds to the atrioventricular node into the Purkinje tissue to all ventricles (right/ left) which contract;</p> <p>During the nervous control, the blood pressure and chemical composition of blood is monitored by the cardiovascular centre of the brain;/the heartbeat rate can be increased through sympathetic nerve; heartbeat rate lowered through vagus nerve/parasympathetic nerve;</p>	(5 marks)