

231/2 -

BIOLOGY
(THEORY)

- Paper 2

Nov. 2018 - 2 hours

Name Marking Scheme Index Number

Candidate's Signature Date

Instructions to candidates

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- This paper consists of **two** sections; **A** and **B**.
- Answer **all** the questions in section **A** in the spaces provided.
- In section **B** answer question **6** (compulsory) and either question **7** or **8** in the spaces provided after question **8**.
- This paper consists of **12** printed pages.
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- Candidates should answer all the questions in **English**.



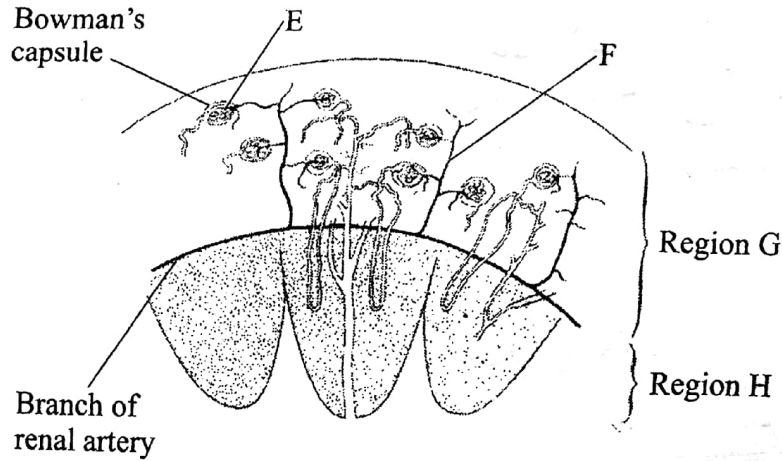
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Section	Question	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
		20	
Total Score			

SECTION A (40 marks)

Answer all the questions in this section in the spaces provided.

1. The diagram below illustrates a section of the mammalian kidney.



(a) Name the structures labelled E and F.

E Glomerulus; (1 mark)

F Blood vessel (interlobular artery) (Ar Branch of the renal artery/artery) (R; Renal artery/arteriole/capillary/vein/venule) (1 mark)

(b) Explain the processes that take place in the regions labelled G and H.

Region G

(3 marks)

(At the glomerulus) the afferent arteriole which brings blood to the glomerulus is wider than efferent arteriole; this creates high pressure leading to ultrafiltration;

At the PCT/DCI substances required by the body (a.a./glucose/vitamins) some H_2O are selectively reabsorbed (into blood stream/Selective reabsorption)

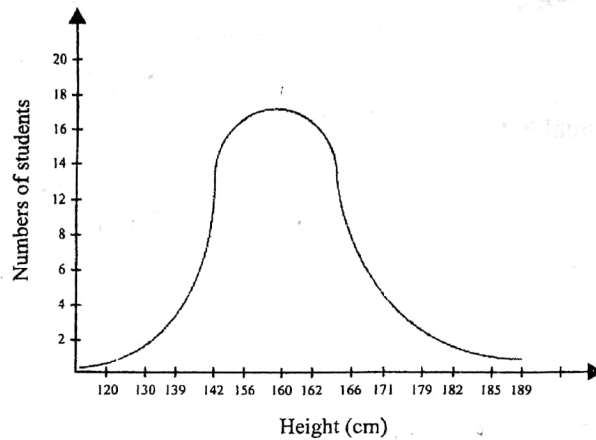
Region H

arm/Limb

(3 marks)

At the descending Loop of Henle water is (selectively) reabsorbed; At the ascending arm/limb of Loop of Henle Na^+ salts are actively reabsorbed; At the collecting duct water is selectively reabsorbed;

2. Below is a graphical representation of students' height in a classroom.



- (a) Name the type of curve illustrated. (1 mark)

Normal (distribution curve);

- (b) (i) State the type of variation represented by the curve. (1 mark)

Continuous variation;

- (ii) State two meiotic processes that lead to variation among organisms. (2 marks)

Independent assortment;

Crossing over; (r/cross over)

- (iii) Explain the role of variation in organisms. (2 marks)

- Organisms with advantageous traits/variations are favoured/selected by nature; and survive to reproduce/Pass on/Propagate the advantageous favourable traits to their offspring/individuals/organisms; **OR**
- Variations ensure Propagation of desirable/advantageous/favourable traits to future generation/off-spring, ensuring quality/improved Pop./SPP;

- (c) Explain the need for genetic counselling in present day health facilities. (2 mark)

- Provide ^{know} information/advise to individual/families/Community about a genetic disorder;
- Helps identify/test/^(instruct) advise families/individual/communities on possible risks of genetic disorders;
- Provide supportive services/Serves as a patient advocate / refer individuals/families to relevant health professionals;

3. The amount of blood flowing through certain parts in the mammalian body at different activity levels was measured and results tabulated as shown in the table below.

Parts of the body	Blood flow (cm ³ /minute)		
	At rest	During light exercises	During strenuous exercise
Alimentary canal	1,100	780	350
Cardiac muscles	100	200	1,300
Skeletal muscles	900	4600	15,000

- (a) Account for:

- (i) the high blood-flow through the cardiac and skeletal muscles during strenuous exercises. (4 marks)

During strenuous exercise the heart beat/Pulse rate is increased/
more contraction and relaxation of cardiac muscles;
while rate of contraction and relaxation of skeletal muscles
is also increased;
Hence more blood flows to supply more O₂/nutrients;
and for removal of metabolic waste products;

- (ii) the results obtained for the alimentary canal at rest. (2 marks)

At rest more blood flows through the alimentary
canal/ Gastrointestinal tract (since digestion is at optimum);
to transport digested/absorbed food materials/eliminate
metabolic wastes;

- (b) Name two waste materials excreted by both the skin and the kidneys. (2 marks)

- Urea;

- Water (Ac. Excess water);

- Salts; (Ac. correctly named salt eg NaCl)
(Ac. Mineral salts Rj Mineral alone)

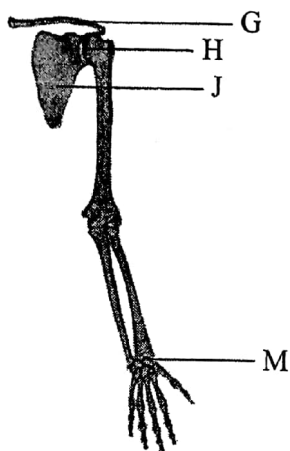
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Rj Lactic acid
in cardiac
muscles

Rj Oxygen
debt in
cardiac

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4. The diagram below illustrates the arrangement of bones in a human arm.



(a) Name:

(i) the type of joints formed at points H and M.

H Ball and Socket (joint); (rj inverse) (1 mark)

M Gliding (joint); Acc. Planar/Plane (joint) (1 mark)

(ii) bone G Clavicle; (rj Collar bone) (1 mark)

(b) Name bone J and state how it is adapted to its functions.

Name: Scapula; (1 mark)

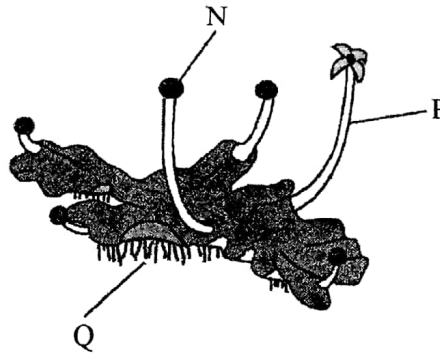
Adaptation - Has a spine to ↑ s.a for muscle attachment; (3 marks)

- Broad/flat to ↑ s.a for muscle attachment;
- Has ~~acromion~~ Process to ↑ SA for muscle attachment; (and ligament)
- Has Acromion for articulation with clavicle/for muscle attachment.
- Ossified/rigid/hard for support;
- Has glenoid (cavity)/depression for articulation with the humerus/ forming the ball and socket joint;

(c) State **one** functional difference between a tendon and a ligament. any 3. (1 mark)

- Ligaments hold (join bones together) (at a joint) while tendons attach muscle to bones

5. The photograph below represents a plant in a certain Division.



- (a) (i) Name the Division to which the plant belongs. (1 mark)

Bryophyta; (Rj: wrong spelling / bryophyta)

- Tied (ii) With reference to the photograph, state **three** observable features of the Division named in a(i) above. (3 marks)

- Has Capsules, (for enclosing spores)

- Has (long) Setae/Seta (for supporting the capsules / for effective propagation of spores)

- Rhizoids (for anchorage / absorption of water / mineral salts)

- Thalloid/Thallus undifferentiated; i.e. nature

- (b) Name the parts labelled N and P. (Rj Rhizoids for support) 4

N Capsule; (1 mark)

P Seta (Rj: setae) (1 mark) 2

- (c) Explain how the part labelled Q is adapted to its functions. (2 marks)

- Numerous / hair-like to ↑ SA for absorption / to enhance rate of absorption of Water / Nutrients / dissolved Mineral salts

- Numerous / Hair-like to hold firmly to the surface / not to be easily blown away / displaced / Anchorage (Rj: support for anchorage)

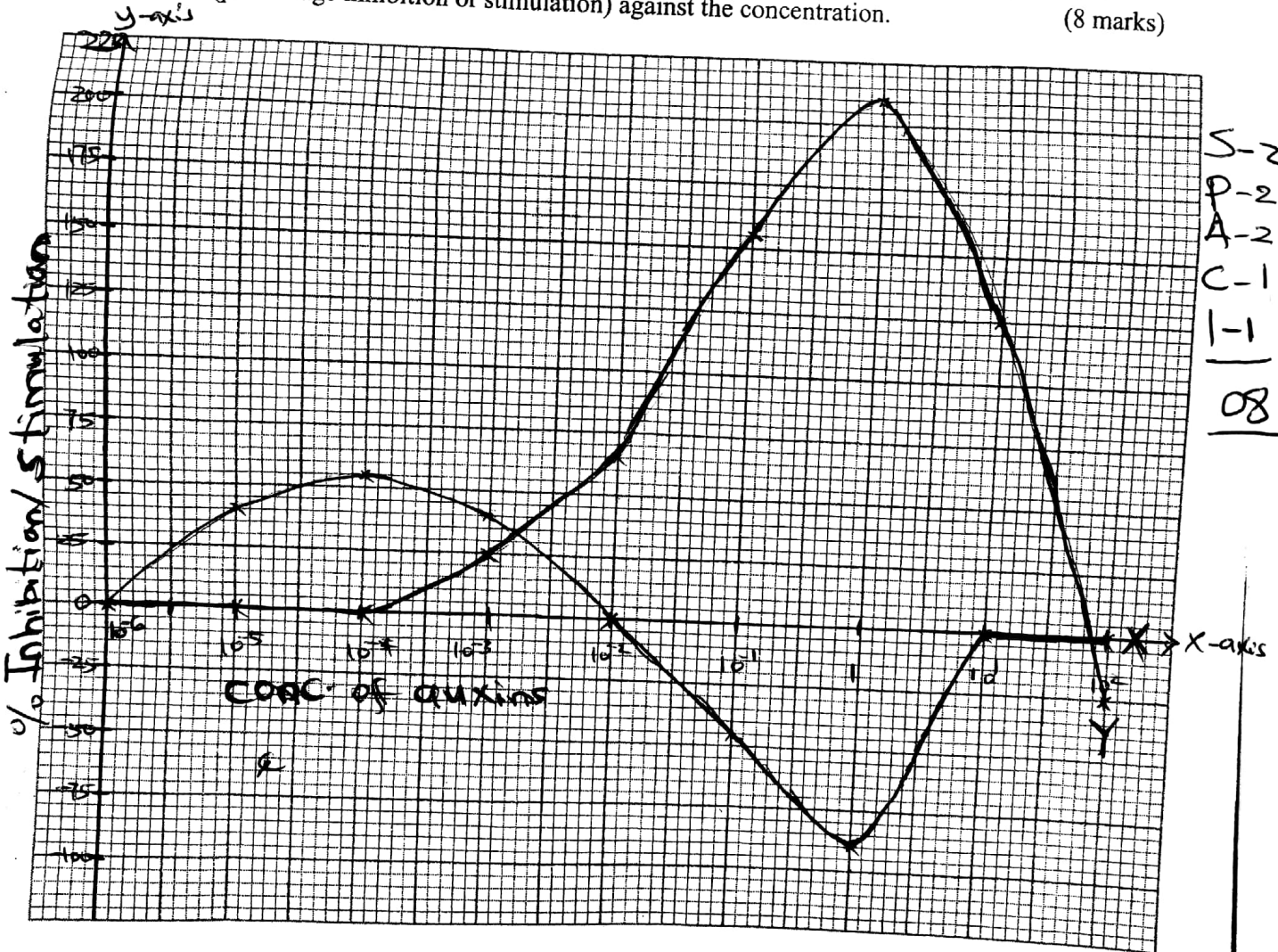
SECTION B (40 marks)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. The effect of auxin concentration on growth response of two parts of a plant, X and Y was investigated over a period of time. The results were tabulated as shown in the table below.

Concentration of Auxin (in parts per million)	10^{-6}	10^{-5}	10^{-4}	10^{-3}	10^{-2}	10^{-1}	1	10^1	10^2
Percentage inhibition /stimulation on part X	0	40	55	40	0	-45	-90	0	0
Percentage inhibition /stimulation on part Y	0	0	0	25	65	155	210	125	-25

- (a) On the same axis, draw line graphs of the effect on growth of the two parts, X and Y (percentage inhibition or stimulation) against the concentration. (8 marks)



- (b) With reasons, name the two parts of the plant, X and Y.

X Root; (Ac. Root tip) (1 mark)
 - Low auxin conc. stimulates (rapid/fast) cell division
 Reason and elongation/growth in roots (1 mark)
 R: reduced growth for inhibitory
 - High conc. of auxins inhibit growth in roots;
 Y Shoot; (Ac. Shoot tip / Terminal bud) (Rej: stem) (1 mark)
 - Low auxin conc. has little effect on the growth of shoots /
 Reason Shoots are stimulated to grow with high auxin conc. (up to a given optimum) (1 mark)

- x (c) From the graph identify:

- (i) the point at which the percentage stimulation was the same for both X and Y.

33% ± 2 (31-35%) (Acc. without %) (1 mark)

- (ii) the optimum concentration of auxins required for part Y (1 mark)

1 Part per million (Rej. if no unit)

- (d) State three ways in which the effects of auxins on plants is applied in flower farming.

- Stimulates formation/development of adventitious roots. (3 marks)
 - Faster maturity of flowers / Earlier flower formation / flowering.
 - Keeping flowers fresh.
 - Pruning/decapitating shoot tips to allow sprouting of lateral buds hence more yields.

- (e) Distinguish between simple and conditioned reflex action (3 marks)

- Not learned (over time) inborn	- Learned (over time)
- 1 ^o stimulus involved	- 2 ^o stimulus involved
- Single stimulus brings about desired response	- Repeated stimulus needed to bring about a response
- Impulse follows appropriate sensory & motor neurone	- Impulse follows inappropriate motor neurone / 1 ^o sensory component is replaced by 2 ^o sensory component but the motor component remain unchanged
- Sensory & motor components are the same at all times	

7. (a) Describe the mode of reproduction in a named fungus. (5 marks)
- (b) Describe the role of hormones in the human menstrual cycle. (15 marks)

8. Describe what happens to a meal rich in proteins along the alimentary canal from ingestion to egestion. (20 marks)

7 a) Rhizopus/Mucor/Moulds; reproduce asexually; by sporulation; spores develop from a single cell in the sporangium; which bursts on maturity releasing spores; which are dispersed by air currents/wind; germinating to form new generation/ form mycelium (if it lands on suitable medium);

OR Yeast/Saccharomyces/Schizosaccharomyces; reproduce asexually; by budding; parent cell forms an outgrowth/ projection/bud; followed by division of nucleus into two; one of the nuclei moves into the new bud; which grows and develops into a new cell; 7 max 5

7 b) After/at the onset of menstruation (the anterior lobe) of the pituitary gland; secretes follicle stimulating hormone (FSH); The FSH causes the Graafian follicle; to develop in the ovary; and stimulate the ovary tissues to secrete oestrogen hormone;

Oestrogen hormone brings about repair/healing of the endometrium; Its concentration increases to a level which stimulates the (anterior) pituitary gland; to secrete Luteinizing hormone (LH); and stops further secretion of FSH;

The LH stimulates maturation of the Graafian follicle; LH also stimulates the Graafian follicle to release an ovum (into the funnel of the fallopian tube)/causes ovulation;

It also stimulates the remains of the Graafian to form a yellow body/Corpus luteum; (in the ovary)

The Corpus luteum; (in the ovary) is stimulated by the LH to produce Progesterone; Progesterone then stimulates the thickening of the endometrium/inner uterine wall; in readiness for implantation;

As Progesterone level increases it inhibits the Pituitary gland from secreting FSH; Further increase in Progesterone level inhibits Pituitary gland from secreting LH; It causes the Corpus luteum to degenerate; (i.e. disintegrate) This reduces the amount of Progesterone; The sudden drop in secretion of Progesterone causes endometrium to slough off/ Menstruation occurs; and the cycle is repeated;

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- Source of ~~enzyme~~ ^{hormone} must be mentioned to score

8) The meal is ingested through the mouth;
 (in the mouth) it is chewed (masticated (by teeth));
 to reduce/break it into smaller particles;
 mixed with saliva (from salivary gland);
 The food is then rolled (by the tongue) into
 boluses; and pushed down (swallowed); the
 boluses move by peristalsis (in to the stomach);
 Constant contraction and relaxation of the
 stomach walls mix food (giving rise to chyme);
 Presence of food in the stomach further
 stimulates production of gastric juice
 which contains Pepsinogen and Rennin
 (Chymosin);
 Pepsinogen is activated to Pepsin by
 Hydrochloric acid; (contained in gastric juice)
 Pepsin breaks down proteins to peptides;
 Rennin converts/coagulates the protein (caseinogen)
 in milk to casein; (which is abundant in young
 children). It is then pushed into the duodenum
 (through the pyloric sphincter); Pancreatic
 juice in the duodenum contains trypsin; which
 digests proteins into peptides; (secreted
 in an inactive form, trypsinogen)
 In the ileum, intestinal juice/succus
 entericus is secreted; It contains Peptidase

enzymes; which breaks down Peptides into amino acids; It also contains Polypeptidase enzymes, which breaks down Polypeptides to amino acids; completing the process of digestion of Proteins;

The amino acids (molecules) pass through the epithelium of the villi, and the capillary walls into the blood-stream/absorbed; by active transport

The undigested / indigestible Proteins / food substances pass through to the colon / Large intestine; where water is absorbed; leaving a semi-solid waste material being passed onto the ^{rectum}; then out through the anus (as faeces);

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