Atika School
Free Online Academy

MARKING SCHEME

231/2

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
A	1	**8**	
	2	**8**	
	3	**8**	
	4	**8**	
	5	**8**	
B	6	**20**	
	6	**20**	
	8	**20**	
	TOTAL	**80**	

This paper consists of 8 printed pages. Confirm that all the pages are printed as indicated and no question is missing

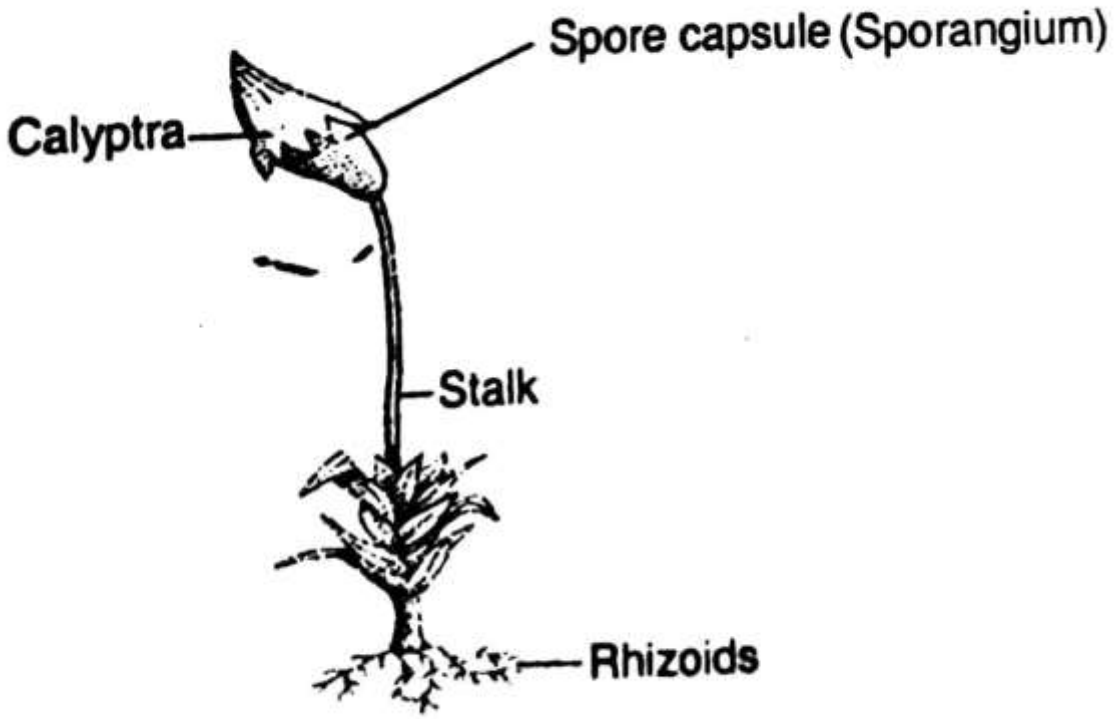
SECTION A: 40 MARKS
ANSWER ALL QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED

1.[a] [i] State two functions of erythrocytes. [2 marks]
Transport of oxygen from the lungs to body tissues; Transport of carbon[iv]oxide from body tissues to the lungs;
[ii] Apart from the nucleus, which organelle is absent in erythrocytes but present in other animal cells? [1 mark]
Mitochondria/Mitochondrion;
[b] In an investigation to determine the effect of exercise on pulse rate, students worked in pairs to determine their pulse rate before and after a vigorous exercise. Below is sample result obtained from one such pair:

Condition	Pulse rate[beats/min]	Average pulse rate
At rest	Student 1 = 62 beats/min Student 2 = 68 beats/min	
After exercise	Student 1 = 90 beats/min Student 2 = 86 beats/min	

[i] Calculate the average pulse rate before and after the exercise. Show your working. [2 marks]
At rest *After exercise*
62 + 68 /2 *90 + 86/2*
Ans: 65 beats/min; *Ans: 88 beats/min;*
[ii] What is the effect of exercise on pulse rate? Explain [3 marks]
Exercise increases pulse rate; to supply more oxygen[and glucose]to the muscle cells; to produce more energy needed for the exercise;[OR]Pulse rate increases after exercise; to supply more oxygen to the muscle cells;to remove lactic acid that accumulated due to anaerobic respiration[during the exercise];

2. The diagram below shows a plant specimen obtained from moist rock surface.



[a] [i] State the division to which the specimen belongs [1 mark]
Bryophyta; Reject bryophyta/Bryophyte
[ii] Give two reasons[from the diagram] to support your answer in [i] above [2 marks]
Has rhizoids instead of roots; Has a capsule[for spore production];
[iii] What is the function of the Calyptra? [1 mark]
Protects the capsule[from mechanical damage];
[b] Give two reasons why the plant does not grow beyond 1cm tall [2 marks] *Lacks vascular transport system/lacks vascular bundles; Has only rhizoids[which cannot offer firm anchorage]*
[c] [i] What is alternation of generations? [1 mark]
Existence of a plant in two alternating forms,the gametophyte and sporophyte;
[ii] Name the dominant generation for this plant [1 mark]
Sporophyte;

3. [a] Sickle cell anaemia is a genetic condition in which the patient's red blood cells carry a defective haemoglobin called Haemoglobin S. Such red blood cells are sickle – shaped hence the name of the condition.
[i] Name the type of gene mutation that causes sickle cell anaemia [1 mark] *Substitution*
[ii] Give three reasons why persons carrying haemoglobin S in their red blood cells may die easily under conditions of low oxygen levels. [3 marks]
Haemoglobin S has very low oxygen carrying capacity; It crystallises easily under low oxygen concentration; The red blood cells are sickle shaped/s – shaped hence providing little space for oxygen transport; [iii]
Apart from sickle cell anaemia, give one disorder resulting from gene mutation [1 mark]
Albinism/Colour blindness/Haemophilia;
[b] State three key principles of Lamarck's theory of evolution [3 marks]

If a particular body part is used more frequently, it develops more/becomes more efficient; If a particular body part is less frequently used, it becomes less developed/less efficient/reduced in size; The environmentally acquired[phenotypic] characteristics are passed from parents to offspring[during reproduction];

4. [a] [i] Describe a simple laboratory test one would perform to confirm from a urine sample, if a person is suffering from ***Diabetes mellitus.*** ***[3 marks]***

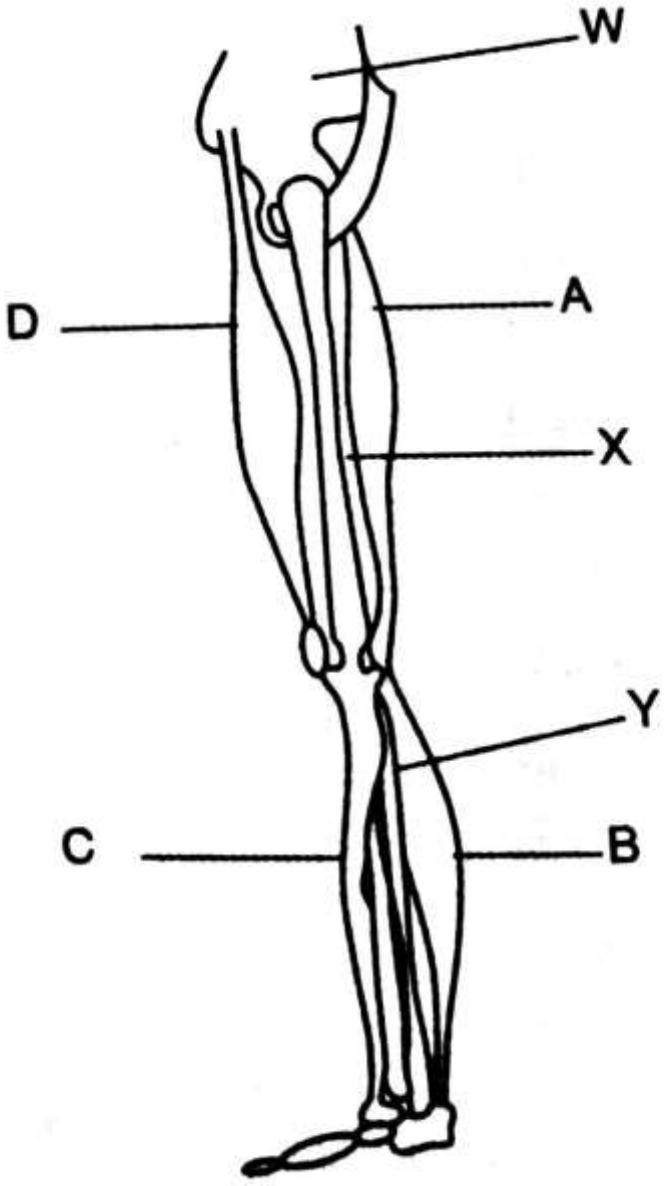
Put about 2cm3 of the urine sample into a clean test tube and add the same amount of benedict solution, then heat the mixture till it boils; if the mixture/benedict solution changes from blue to orange/yellow/green, then glucose is present in the urine sample; Presence of glucose/sugar in urine confirms diabetes mellitus;

[ii] Which part of the nephron becomes defective in proteinuria patients? [1 mark] *Glomerulus*

[b] State any four physiological mechanisms used by homoeothermic mammals to regulate their body temperatures on a hot sunny day [4 marks]

Vasodilation; Hair lies flat against the skin; Sweating; Reduced rate of metabolic activity/respiration/Energy production; Panting;

5. The diagram below represents the structure of the human hind limb


W
D
A
X
Y
C
B

[a] Name the bones marked: [3 Marks]

W..pelvic girdle; X..Femur; Y…Tibia;

[b] Which of the muscles A to D: [2 marks]

[i] Must contract to raise the heel from the ground …….A;

[ii] Is antagonistic to the muscle named in [i] above……..D;

[c]Name the type of joint formed between [2 marks]

[i] Bone X and Y……Hinge joint;

[ii] Bone X and W……Ball and socket joint;

[d] Name the structure that attaches muscles to bones in mammals [1 mark]

Tendon;

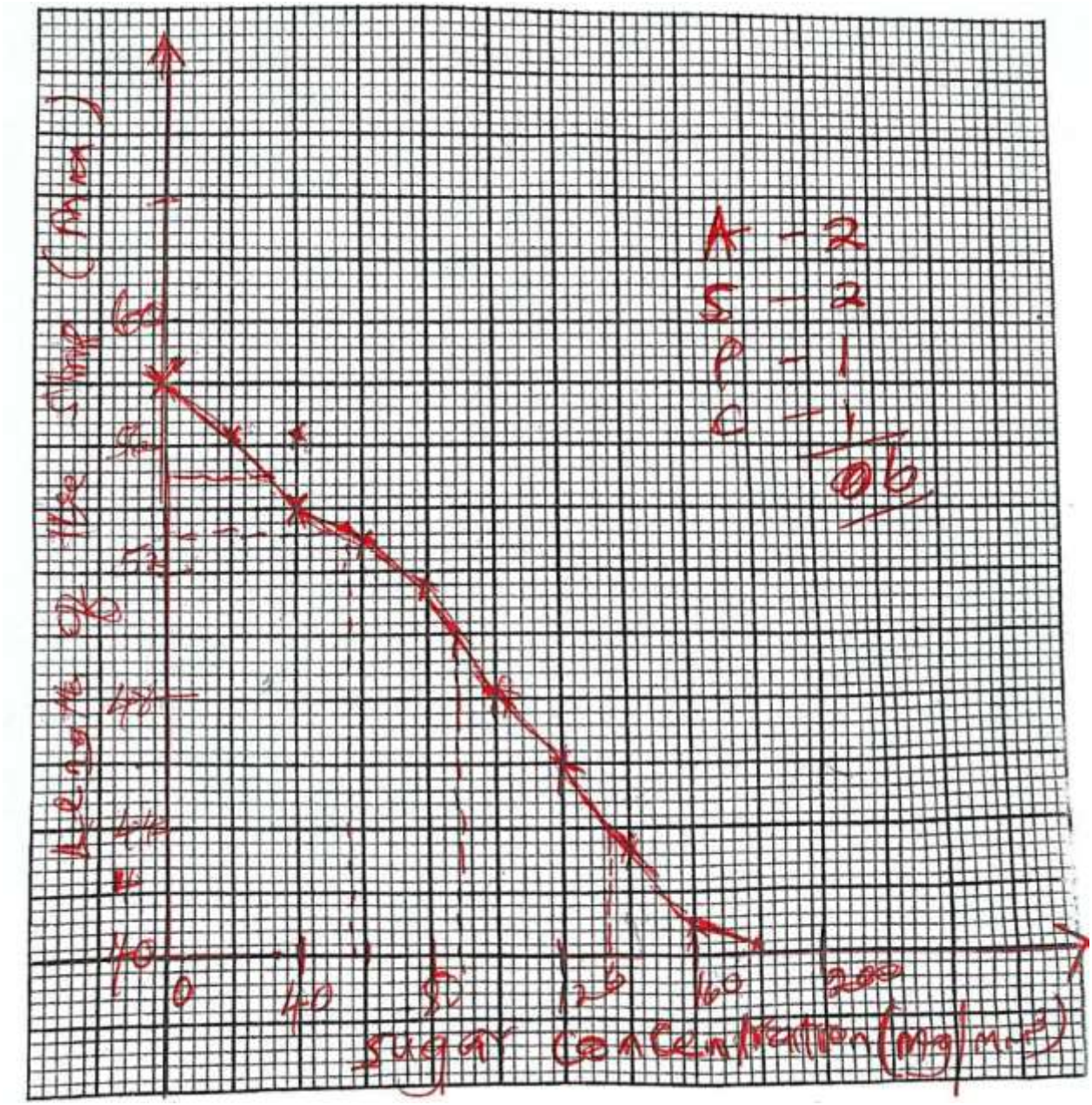
SECCTIO B: 40 MARKS.

ANSWER QUESTION 6[COMPULSORY] AND EITHER 7 OR 8 IN THE SPACES PROVIDED AFTER QUESTION 8.

1. In an experiment,10 different strips of dandelion plant stems were placed into sugar solutions of different concentrations for about 30 minutes. Their lengths were determined before and after the treatment. All the strips were 50mm long before the experiment. The table below shows length of the strips in different sugar concentrations after the experiment.
2.

Sugar concentration [mg/mm3]	0	20	40	60	80	100	120	140	160	180
Length of strip[mm]	58	56.5	54	53	51.5	48	46	43	41	40

[a] On the graph paper provided, plot a graph of length of strip against concentration of sugar solution. [6 marks]



Axes[A] [2 marks];

- *Both axes must be correctly labeled with correct units - Both axes must start from the origin N/B: The graph is scored zero if :*
- *the origin is missing on one or both axes*
- *The axes are inverted*

Scale[S] [2marks];

- *The curve should cover at least ¾ of the grid.*
- *The scale must be uniform on either axes*
- *The scale must accommodate the highest and the lowest value in the table, on both axes - The scale must be plottable*

N/B:Don't award plotting and curve marks if the scale is wrong on one or both axes

Plotting[p] [1mark];

- *All points in the table plotted*

- *Large plotting points that are visible*

Curve[C][1 mark];

- *Smooth curve that passes through all the plotted points*

[b] At what concentration would the length of the strip be: [2 marks]

[i] 55mm

32mg/mm3 [+ or – 2]

[ii] 44mm

134mg/mm3[+ or-2]

[c] From your graph, determine the cell sap concentration of the dandelion strip cells. Explain.

88mg/mm3[+ or-2]; There is no net change in length of the strips at this concentration; showing that the sugar concentration was same/isotonic to the cell sap concentration; [3 marks] [d] Account for the length of the strips at:

[i] 0 mg/mm3 [3 marks]

The solution is less concentrated/hypotonic to the cell sap of the plant cells; water moves from the solution to the plant cells by osmosis and enlarge; hence increase in size/length of the strips;

[ii] 180 mg/mm3 [3 marks]

The solution is more concentrated/hypertonic to the cell sap of the plant cells; water moves out of the cells[into the solution] by osmosis hence the cells shrink/reduce in size; leading to decrease in size/length of the strips;

[e] State and explain what would happen if an animal cell was subjected to a similar treatment at a concentration of 0 mg/mm3. [3 marks]

It would burst/haemolysed; A lot of water would get into the cell from the less concentrated/hypotonic solution by osmosis; but since the cell lacks a cell wall/only has a cell membrane,it will not be able to resist the [turgor] pressure hence it bursts;

7. [a] Explain how a nerve impulse is transmitted across the synapse [12 marks]

When an impulse reaches the pre – synaptic knob, it causes the synaptic vesicles to move towards the pre – synaptic membrane;where they burst;to release neurotransmitters/acetyl choline;the neurotransmitter/acetyl choline make the pre-synaptic membrane permeable; The neurotransmitter/acetyl choline diffuses across the synaptic cleft to the post synaptic membrane; making it to become depolarized;sodium ions from the synaptic cleft flow through the post synaptic membrane into the post synaptic knob;causing an action potential at this point;Theaction potential is transmitted as a nerve impulse along the post synaptic neurone; Acetyl choline remaining in the synaptic cleft is then destroyed by choline esterase enzyme; to form inactive end products/choline and acetic acid; The end products are reabsorbed into the pre – synaptic membrane and reconstituted into acetyl choline; so as to repolarize the pre – synaptic membrane[in readiness for the next impulse propagation];

MAXIMUM = 12 MARKS.

[b] Describe conditioned reflex action [8 marks]

This is an automatic response in animals where the animal responds to an unrelated stimulus substituted for the one which normally causes the response; The primary sensory component is replaced by a secondary sensory component but the motor component remains the same;it is based on past experience; and involves modification of behavior through learning;Example, adog salivating at the sound of a bell instead of food;It is reinforced by repeating the original experience/reapeated stimuli;it weakens with time if not reinforced; It forms the basis of learned behavior such as driving, cycling etc; It is practically applied in areas like animal training/advertisements etc;

MAXIMUM = 8 MARKS.

8. Explain how secondary thickening occurs in woody plants [20 marks]

This is the increase in width/girth of the stem; It occurs in the lateral meristems; The tissues responsible for secondary growth are vascular cambium; and cork cambium; IT occurs in dicotyledonous plants only; Cells of the vascular cambium divide to form secondary xylem on the inner part; and secondary phloem on the outer part; The secondary xylem pushes the primary xylem towards the centre of the stem;while secondary phloem pushes the primary phloem outwards towards the periphery of the stem; Narrow rows of parenchyma cells develop between them to form medullar rays;which connect the cortex with the pith; and transport food to the cortex and vascular tissues; The secondary xylem forms the bulk of both the stem and root;while the phloem is smaller and surrounds the xylem; The cork cambium/phellogen forms a thin layer below the epidermis; It differentiates to form cork cells on the outer part; The cork cells near the surface form spongy cork tissue; which trap air into the intracellular air space; A fatty substance called suberin is deposited on the cell wall of cork cells; Making them impermiable to water and gases; The cork layer is perforated by pores called lenticels; which are used for gaseous exchange; The phloem and cork cells form the bark; MAXIMUM = 20 MARKS.