

MARKING GUIDE

Uganda Advanced Certificate of Education

UACE August 2023

BIOLOGY P530/1

SECTION A (40 Marks)

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|-------|----------|-------|-------|
| 1. C | 11. B | 21. C | 31. B |
| 2. C | 12. D | 22. A | 32. C |
| 3. B | 13. A | 23. C | 33. A |
| 4. A | 14. D | 24. C | 34. D |
| 5. A | 15. C | 25. C | 35. B |
| 6. A | 16. B | 26. B | 36. B |
| 7. A | 17. A | 27. D | 37. C |
| 8. C | 18. A | 28. D | 38. A |
| 9. C | 19. D | 29. D | 39. D |
| 10. D | 20. free | 30. B | 40. C |

1 mark @ 40 x 1 = 40 marks
Sub-Total = 40 marks

SECTION B (60 Marks)

41. (a) Compensation point is that time of day where photosynthesis and respiration proceed at the same rate; and there is no net gain or loss in carbohydrate/CO₂ or O₂; 1 mark @ (1 x 2 = 2) (02 marks)
- (b) Single CO₂ fixation occurs in mesophyll cells in C₃ plants; whereas C₄ plants have double CO₂ fixation both in mesophyll cells and bundle sheath cells; increasing the CO₂ concentration; consequently the photosynthetic rate; (04 marks)
- (c) (i) 1 - Triose phosphate/ phosphorylated 3 carbon sugar;
2 - Acetyl CoA/ Acetyl co-enzyme A;
3 - Krebs cycle/ Tricarboxylic acid cycle; 1/2 mark @ 1/2 x 3 = 1 1/2 (1 1/2 marks)
- (ii) The Krebs cycle is important in the synthesis of ATP; and hydrogen carrier molecules; like the NADH and FADH; which will be feed into the Electron transport system; to generate more ATP molecules; Accept: oxidative decarboxylation leading to ATP production; 1/2 mark @ 1/2 x 5 = 2 1/2 (2 1/2 marks)

42. (a) (i) Is made of two polynucleotide chains; held together by hydrogen bonds through organic bases; and twisted along an axis to form a double helix; **1 mark @ 3 x 1 = 3**

Accept: polynucleotide strands.

(03 marks)

- (ii) Parent DNA double helix separates into two polynucleotide stands; free DNA nucleolides pair with each other on the polynucleolide strands; forming two daughter double helices; in which one strand is exactly the same as that of the parent DNA molecule; **½ mark @ 4 x ½ = 2**

(02 marks)

- (b) % A = % T % C = % G let % of G = x
 $38 + 38 + x + x = 100\%$ where x % of guanine
 $76 + 2x = 100$
 $2x = 24$
 $x = 12$ % of Guanine = 12%;

1mark @ method and answer

2x1=(02 marks)

- (c) Linked alleles tend to be passed from generation to generation as an inseparable unit; that they fail to assort independently during prophase II of meiosis ; denying genetic recombination of alleles / genes hence no variation;

1mark @ 3x1=(03 marks)

TOTAL = 10 MARKS

43. (a) (i) After ripening period is the period allowed for mature viable dormant seeds to undergo physical and chemical changes; so as to be able to germinate; after harvest / shedding off / falling of the parent plant;

Reject if after harvest/shedding off is missing.

1 mark @ Total marks = 2

- (ii) - The activity of a number of enzymes rises especially catalase, peroxidase, hydrolases;
 - Protein digestion and level of soluble nitrogen compounds increases;
 - The rate of respiration rises to increase the amount of ATP;
 - Reserve lipids are used up;
 - The levels of gibberillic acid and cytokinin increases;
 - The levels of abscissic acid and growth inhibitors decrease;

1 mark @ Any 4

4 x 1 = 04 marks

- (b) The seed have alight receptor pigment called phytochrome; that exists in two interconvertible forms ; / PR and PFR when they receive light PR is converted into PFR; which promotes germination;

Accept: photochrome red / pr & phytochrome for red / pfr

1 mark @ 4 x 1 = 4 (04 marks)

44. (a) (i) Sick cell haemoglobin differs from normal haemoglobin only in the sixth amino acid of the beta (β) chain; whereas normal haemoglobin has glutamic acid, sick cell haemoglobin has valine;

1 mark @ (02 marks)

- (ii) Sick cell haemoglobin does not bind with O_2 very well, at low O_2 concentration it becomes deoxygenated; polymerizes causing the red blood cells to become elongated and pointed at the ends;

1 mark @ 2x1 = (02 marks)

- (iii) Symptoms

- Intense pain in muscles;
- Kidney & heart failure;
- Paralysis/ stroke
- Fatigue/tiredness
- General body weakness;
- Enlarged chest;

$\frac{1}{2}$ mark @ 2 x $\frac{1}{2}$ = 1 (01 marks)

- (b) (i) Haemoglobin molecule consists of 4 protein chains called globins; 2 are alpha (α) and 2 are beta (β) chains; each conjugated with a non-protein molecule called haem groups which bind O_2 to a ferrous ion;

Accept: A correctly labeled diagram of haemoglobin if drawn
(03 marks)

- (ii) When one haem group of the 4 combine with O_2 , the result is a change in the conformation structure of the haemoglobin molecules; exposing the remaining 3 haem groups the result is an increased affinity for these haem groups to combine with more O_2 molecules;

1 mark @ 2 x 1 = 2 (02 marks)

45. (a) (i) Water potential is the average kinetic energy of water molecules in a system; while solute potential is the lowering of water potential due to presence of solute molecules in a system;

TOTAL = 10 MARKS

- (b) (i) Water potential increases rapidly; from flaccid to turgidity;
Reject: decreases

1 mark @ 2 x 1 = 2 (02 marks)

(02 marks)

- (ii) As pressure potential increases; solute potential also increases;

1 mark @ (02 marks)

- (c) As water potential rapidly increases solute potential also increases; because the cell absorbs water by osmosis; thus there will be more water molecules than solute molecules; causing the solute potential to become less negative;

1 mark @ 4 x 1 = 4 (04 marks)

TOTAL = 10 MARKS

46. (a) When a sensory neurone is stimulated by the arrival of a nerve impulse, it results into the movement of Sodium ions into the axoplasm and potassium ions out of the axoplasm; A point is reached when the outside becomes negatively charged and inside is positively charged, this is called the action potential; **Accept: An action potential is aware of depolarization that travels a long an axon of a neurone / nerve cell;**
1 mark @ 2x1= 2(02 marks)

(b)

Somatic Nervous system	Autonomic Nervous system
- Involves skeletal muscles	Involves glands, smooth muscles, cardiac/heart muscles
- One nerve fibre from CNS to effector is involved	Two nerve fibres are involved.
- No ganglia	Nerves synapse at ganglia
- Neurotransmitter Acetylcholine (ACh)	ACh and norepinephrine (NE)
- Always excitatory	Excitatory and inhibitory
- Voluntary/consciously controlled	Involuntary/Not consciously controlled
- Cranial & spinal nerves are involved	Sympathetic and parasympathetic nerves

(04 marks)

- (c) (i) Parasympathetic nerves terminal ganglia is near or with in target organs which result into direct stimulation of the target organs thus more selective; as compared to the sympathetic nerves whose ganglia are located further away from the target organs;
1mark @ 2x1= 2 (02 marks)

- (ii) Somatic nerves are thicker / big and are myelinated, the end result is faster impulse conduction speed; whereas autonomic post ganglionic nerve fibres are thin / small and or are unmyelinated thus have low conduction speeds;

1 mark @ (02 marks)

TOTAL = 10 MARKS

END