

END OF TERM II EXAMINATIONS 2025

S.5 BIOLOGY

TIME 1 HOURS 30 MINUTES

Instructions:

- respond to all items
- responses to the items must be written in on the response sheets provided

Item 1

In order to increase food production in Uganda, two cereal crops A and B are to be imported into the country for farmers in different regions to plant them. The researchers have discovered that crop A grows well in areas of relatively low altitude and can withstand low amounts of carbon dioxide. However crop B is very sensitive to carbon dioxide levels and any slight decrease in carbon dioxide can lead to low productivity. The two crops are highly affected by extreme drought conditions.

Task.

- a) Analyse the internal structural features of the leaves of the two crops and photosynthetic reactions that are responsible for the differences in the productivity of the two crops as observed by the researchers.
- b) Explain how extreme drought reduce the photosynthetic efficiency of the two plants.
- c) Which environmental conditions can be availed to each crop by the farmers to increase the crop yields?

Item 2.

A drug developer is designing a drug that can used to control a pathogenic strain of bacteria that enters the human liver cell and feeds on mitochondria, ribosomes and Golgi body. The drug developed will bind in the active site of a bacterial enzyme that catalyses the formation of the bacterial cell wall from

a substance called murein. First trials of the drug showed low efficacy of the drug and this was attributed to the polar nature of the drug molecules reducing its entry into the liver and bacterial cells.

Task.

- a) Explain how the activities of bacteria affects the functioning of the liver cells in the patients.
- b) How will the interaction between the drug and bacterial enzymes lead to death of the bacteria
- c) Explain why the nature of the drug molecules reduced their ability to penetrate cells and how this can be improved.

Item 3. Two patients X and Y were brought to the hospital for examination. Patient X presenting signs of weakened fragile bones, reduced skin strength and elasticity was diagnosed with reduced amount of cysteine in his collagen fibres. This was due a gene mutation that leads to substitution of cysteine with alanine amino acid during collagen synthesis. Patient Y complaining of persistent body weakness and reduced heart beat rate was diagnosed with abnormal haemoglobin in his red blood cells which less soluble in the cytoplasm of the red blood cells making the cells sickle shaped. This was discovered to be caused by increased number of non-polar amino acid in the haemoglobin protein.

Task

- a) Explain how the change in the amino acid composition of each patient results into the health conditions of patient
 - i) X
 - ii) Y
- b) How can the health condition of patient Y be managed?

END