NELSON MANDELA SECONDARY SCHOOL – MASAKA

END OF TERM I EXAMINATIONS 2025

S.5 BIOLOGY

2HOURS: 30MINUTES

Instructions

- The paper consists of two examination items.
- Attempt both the items on the answer booklet given.
- Response to each item must be shown on separate pages.

Item 1

On scientific investigation and analysis, it was found out that conjugated lipids are associated with less heart problems than the simple lipids. Due to the fact that there was little technical knowledge to prove whether a given fatty food product contains conjugated or simple lipids, the ministry of health announced a total ban on any industrial food product that contains fats. However, the ministry supported food industries to produce more carbohydrate foods. Two food samples X and Y from different industries were brought to the Uganda National Bureau of Standards (UNBS) for analysis and approval. Since simple laboratory methods of using reagents like benedict's and iodine solutions were inappropriate, the best method adopted was to subject each of the food samples to combustion so that the food sample that yields the heat energy greater than 30KJ was to be banned while the one that yields less than this was to be approved.

On complete combustion, product sample X heated $250cm^3$ of water from 24.5^oC to 68^oC while Sample Y heated the same amount of water at 68^oC to 89.5^oC.

(It is given that the Specific Heat Capacity and density of water are $4.2Jg^{-1o}C^{-1}$ and $1gcm^{-3}$ respectively.)

Task

a) i) With examples, distinguish between the two types of lipids talked about in the scenario. **3scores**
ii) Using the named examples, outline the role played by lipids in the life of organisms. **7scores**

b) i) Using appropriate computations from the data collected in the scenario, help the UNBS to identify which food substance was to be banned or approved. **7scores**
ii) Explain the cause of the variation in the energy yields between food products X and Y. **2scores**
iii) With a biological reason, why would you recommend an athlete to use the food product that was banned in the scenario? **2scores**
iv) With the aid of illustrations, where necessary describe how a simple organic substance in the banned food product is synthesized in organisms. **8scores**

c) i) Suppose, the simple laboratory methods of investigation were used, briefly describe how Iodine and Benedict's solutions would be used to either approve or ban the product(s). **6scores**

ii) Describe the synthesis of the approved food product according to the results in b)i) above in organisms. **8scores**

iii) Describe the physiological role of the approved food product in the body of organisms.**7scores.**

Item 2

Naluwooza's kidney was diagnosed through urinalysis. The test results showed that Naluwooza's urine was characterized with sugars and very low water content. It was said by the doctors that the epithelial cells lining the kidney tubules (nephrons) were unable to reabsorb glucose yet water was reabsorbed in excess. On microscopy, investigations showed that some features were missing in the epithelial cell membranes of the kidney tubules and the cell content was highly hypertonic to the urine received in the kidney tubules. Everybody is puzzled with what to do next.

Task

a) Briefly, describe the procedures that were followed by the doctors to diagnose the kidney by

i) Urinalysis **5scores**

ii) Microscopy **5scores**

b) i) Describe, with appropriate diagram, the structure of a single epithelial cell as seen under the microscope. **10scores**

ii) Identify any two major important features among which you have labeled, describe their structure and use in the cell. **10scores**

c) i) Describe the structure of the epithelial cell membranes as revealed by microscopy **10scores**

iii) Describe the mechanism of movement of water, glucose and other substance molecules into blood from the kidney tubules across the epithelial cell membrane. **6scores**

iv) Describe the role of plasma membranes in living organisms **4scores.**

END