A'LEVEL BIOLOGY SEMINAR AT MBARARA UNIVERSITY SCHEDULED ON 17TH. JUNE.2023.

1. **Fig 2.0 A,** shows the relative rate at which fluid flows through each part of a nephron. **Fig 2.0B, shows concentration of different substances along the nephron. Study both figures carefully and answer questions that follow.**

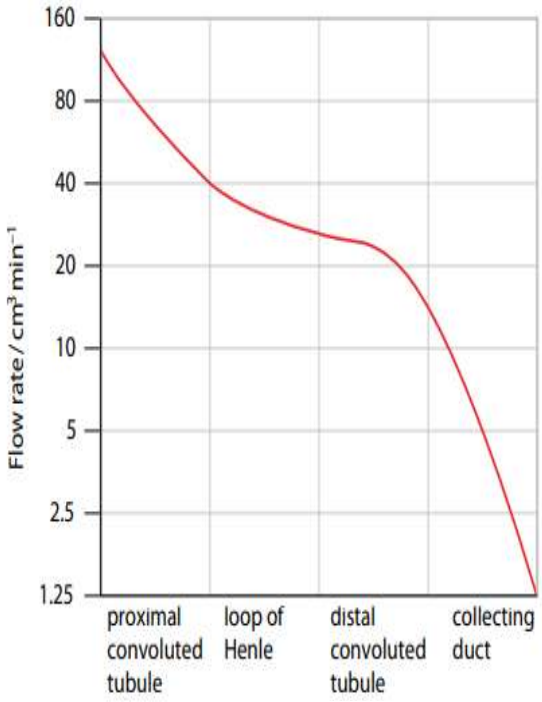

Fig 2.0 A

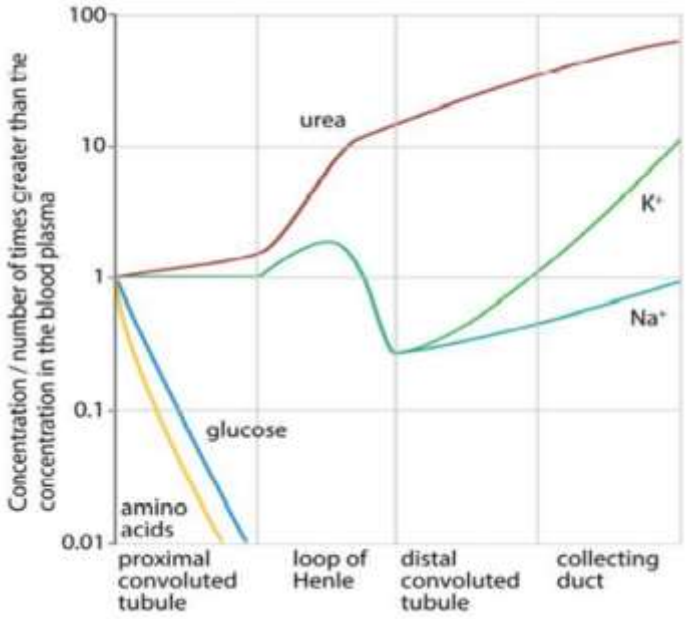

Fig 2.0B

a) From **Fig 2.0B** above**.** Explain the shapes of the curves for: (i) **glucose**.(ii) **urea**. (iii) **Sodium ions.** (iv) **Potassium ions.**

b) From **Fig. 2.0** A. Account for the shape of the curve for the flow rate.

2. (a) Explain how population of a species is regulated by negative feedback in an ecosystem. (07 marks)

(b) Describe flow of energy in terrestrial ecosystem. (07 marks)

(c) Explain how plants are adapted to survive in aquatic habitat. (06 marks)

3. In Uganda, Lake Nabugabo separated from Lake Victoria thousands of years ago.

There are five species of cichlid fish of the genus Haplochromis in Lake Nabugabo, each descended from a different species in the main lake, Lake Victoria.

(a) Suggest how analysis of DNA or proteins might be used to supply additional evidence that the Lake Nabugabo fish have descended from ancestors in Lake Victoria. (02 marks)

(b) Explain how the splitting of the fish population into Lake Nabugabo and Lake Victoria populations has led to the formation of the separate species. (06 marks)

(c). Predatory Nile perch were recently introduced to lake Nabugabo. Give possible evolutionary effects on the five species of Cichlids. (02 marks)

4. You are provided with specimen **K** which is freshly killed.(Cockroach)

a) Examine the body of the specimen and state the significance of:
   i. Its shape (02 marks)
   ii. Length of the antennae (02 marks)
   iii. Structure of hind legs. (06 marks)

b) Place specimen K with its dorsal side uppermost. Cutoff the right and left inner wings from as close their bases as possible. Proceed and cut off the right outer wing. Deflect the left outer wing to your left. Examine all the visible structures anterior to the fifth abdominal segment on the dorsal side. Draw and label.

(14 marks)

c) Without changing the position of the specimen proceed, using forceps lift the 10^{th} abdominal tergum, carefully observe the structures associated with it. Basing on your observation:
   i. Draw and label exposed structures, the 10^{th} tergum and the structures associated with the 10^{th} tergum. (06 marks)
   ii. State the sex of the specimen. (01 mark)

d) Now cutoff the left fore wing, pin the specimen with its dorsal side upper side and dissect to display structures for food digestion and reproduction. Draw and label your dissection.
(15 marks)

5. You are provided with specimen **B** (Toad)

(a) Examine the structure of the hind feet and explain how it adapts the specimen for survival in its habitat. (04 marks)

(b) Measure and record the thickness and width of the head of the specimen. State the significance of the shape and proportions of the head. (03 marks)

(c) Pin the specimen with its back lying on the dissecting board. Cut along the right jaw to expose structures on the floor of the buccal cavity and explain how the main structure is adapted to its functions. (06 marks)

(d) Dissect specimen B to display:

(i) Blood vessels supplying and those draining the left visceral structures in the thorax.

(ii) Urinal genital structures in the right half of the body of the specimen. Draw and label your dissection. (28 marks)

6.You are provided with specimen **P** (Rat)

(a) Examine the fore limbs of the specimen P and explain how they are adapt the specimen to its environment. (04 marks)

(b) Open up the specimen to display superficial structures posterior to the rib cage. Draw and label the visible structures in left half. (09 marks)

(c) Dissect the specimen further to display blood vessels draining:

(i) Structures on the left side of the thorax and head of the specimen.

(ii) Excretory structures and right hind limb.

With the heart displaced to your right, draw and label your dissection. (23 marks)