2404/302
CYTOLOGY, HISTOLOGY AND GENETICS
Oct./Nov. 2005
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN APPLIED BIOLOGY

CYTOLOGY, HISTOLOGY AND GENETICS

3 hours

INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

Answer booklet
Scientific calculator

This paper consists of **TWO** sections; **A** and **B**.
Answer **ALL** questions in section **A** and any **THREE** questions from section **B**.
Each question in section **A** carries 4 marks while each question in section **B** carries 20 marks.

This paper consists of 3 printed pages

SECTION A

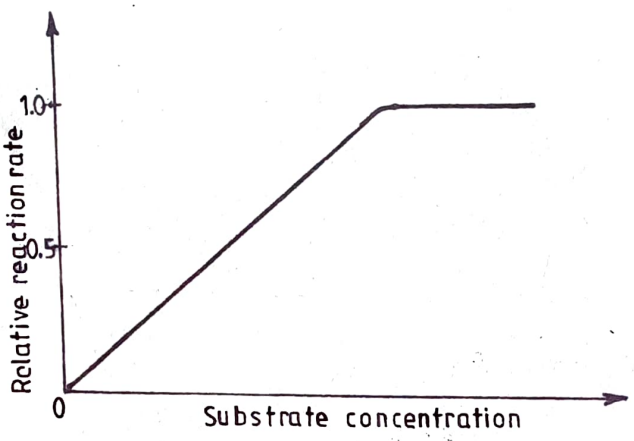
*Answer **ALL** questions.*

1. (a) Distinguish the mechanical tube length from the optical tube length of a microscope. (2 marks)

   (b) Calculate the total magnification of a microscope with eye piece x 10, objective focal length 4 mm and working tube length of 160 mm. (2 marks)

2. Explain 4 factors that affect the rate of diffusion in tissues. (4 marks)

3. Figure 1 below shows the effect of substrate concentration on the rate of an enzyme - catalysed reaction when the amount of enzyme is limited.



   Explain the result shown on the graph. (4 marks)

4. Describe the semi-conservative theory of DNA molecule replication. (4 marks)

5. State the possible causes of the following faults in tissue microtomy.

   (a) Sections fail to ribbon

   (b) Sections crumble on cutting. (4 marks)

6. Describe the vacuum-impregnation technique. (4 marks)

7. (a) Define the term recombinant DNA. (2 marks)

   (b) Explain Mendel's Second Law of Inheritance. (2 marks)

8. (a) List four advantages of using *Drosophila* species in the study of genetics. (2 marks)

(b) Differentiate between the terms chromatid and chromatin. (2 marks)

9. In a normal population, dark colour is dominant over albino and short hair is dominant over long hair.
If these effects are caused by two independent segregating genes, work out the most probable phenotypes of the offspring when a dark short haired individual is mated with an albino long haired individual. (4 marks)

10. Draw a well labelled diagram of the chloroplast. (4 marks)

SECTION B

*Answer any **THREE** questions*

11. Describe

(a) Four techniques involved in isolation of tissues. (8 marks)

(b) the working of an electron microscope. (12 marks)

12. (a) Write short notes on the messenger RNA (mRNA). (8 marks)

(b) Explain how the conditions Klinefelter's syndrome and Turner's syndrome may occur and describe the characteristics of the individuals. (12 marks)

13. Describe the production of:

(a) Cheese (10 marks)

(b) Various types of wines. (10 marks)

14. Discuss the procedure of permanent slide preparations. (20 marks)

15. Discuss the different types of chromosome mutations in man. (20 marks)