2404/302
CYTOLOGY, HISTOLOGY
AND GENETICS
June/July 2022
Time: 3 Hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN APPLIED BIOLOGY

CYTOLOGY, HISTOLOGY AND GENETICS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **TWO** sections; **A** and **B**.*
*Answer **ALL** the questions in section **A** and any **THREE** questions from section **B** in the answer booklet provided.*
*Each question in section **A** carries **4** marks while each question in section **B** carries **20** marks.*
Maximum marks for each part of a question are indicated.
Candidates should answer the questions in English.

This paper consists of 3 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A (40 marks)

*Answer **ALL** the questions in this section.*

1. (a) State **two** roles of the diaphragm in a microscope. (1 mark)

   (b) Describe the **three** different types of filters in a microscope. (3 marks)

2. Describe **four** techniques for tissue isolation for microscopic examination. (4 marks)

3. State **two** similarities and **two** differences between mitochondria and chloroplast. (4 marks)

4. Differentiate between the following:

   (a) Genotype and phenotype; (2 marks)

   (b) Heterozygote and homozygote. (2 marks)

5. Name any **four** gene mutation. (4 marks)

6. (a) Distinguish between aneuploidy and euploidy in chromosome. (2 marks)

   (b) Define the term continuous variation. (2 marks)

7. Draw a labelled diagram of a DNA nucleotide. (4 marks)

8. Name **four** popular stones of various grades of fineness for sharpening of microtome knife. (4 marks)

9. Describe washing out of tissue after fixation. (4 marks)

10. (a) Name any **two** clearing agents in histological techniques. (2 marks)

    (b) Identify **two** faults associated with using a blunt microtome knife. (2 marks)

SECTION B (60 marks)

*Answer any **THREE** questions from this section.*

11. (a) Illustrate by use of a labelled diagram the essential components of fluorescent microscope. (8 marks)

    (b) Explain any **six** functions of a cell wall in plants. (12 marks)

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12. (a) Outline **two** hypothesis that explain DNA replication. (8 marks)

(b) Explain **four** causes of variation. (12 marks)

13. (a) (i) Define the term biopsy. (1 mark)

(ii) Describe the **four** types of biopsies. (4 marks)

(b) Describe the following terms as used in microtomy.

(i) tilt of the microtome knife; (2 marks)

(ii) compression; (2 marks)

(iii) orientation. (2 marks)

(c) Highlight **five** advantages and **three** disadvantages of using 10% formal saline. (9 marks)

14. (a) Describe telophase stage of mitosis. (6 marks)

(b) Name **four** enzymes that are found in plasma membrane. (4 marks)

(c) List any **four** characteristics of an ideal mounting media in histological techniques. (4 marks)

(d) Outline care and maintenance of microtome knife. (6 marks)

15. (a) Explain the advantages of using dissecting microscope over compound light microscope. (6 marks)

(b) Name **three** processes that are involved in the movement of molecules across cell membrane. (3 marks)

(c) Outline the production of:

(i) antibodies; (6 marks)

(ii) ethanol. (5 marks)

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