2404/302
CYTOLOGY, HISTOLOGY AND
GENETICS
Oct./Nov. 2017
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 (non-programmable, battery operated).
*This paper consists of **TWO** sections; **A** and **B**.*
*Answer **ALL** the 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.*
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.

SECTION A (40 marks)

Answer ALL the questions in this section.

1. (a) An objective with numerical aperture (NA) 1.2, is combined with a condenser with NA, 0.4. Calculate the working NA of the objective - condenser system of that microscope. (2 marks)

   (b) State any **two** uses of light filters in microscopy. (2 marks)

2. Identify any **four** functions of the cell surface membranes. (4 marks)

3. (a) List the factors that affect the rate of diffusion of molecules into a cell. (2 marks)

   (b) Describe the exocytosis. (2 marks)

4. Differentiate between prophase in mitosis and prophase I in meiosis. (4 marks)

5. Draw labelled sketch diagrams of the **four** types of microtome knife profiles. (4 marks)

6. (a) Outline the procedure for staining of slides. (2 marks)

   (b) Name any **two** stains used in gram staining. (2 marks)

7. Explain the constituents of an aqueous mounting media. (4 marks)

8. (a) Suggest any **three** possible causes of chromosome mutations. (3 marks)

   (b) Cite **one** viable chromosome deletion mutation that occurs in human beings. (1 mark)

9. (a) Distinguish between transcription and translation in protein synthesis. (2 marks)

   (b) Name the enzyme that:

   (i) cut DNA at specific points;
   (ii) join together cut end of DNA; during DNA replication. (2 marks)

10. (a) State Mendel's law of independent assortment. (2 marks)

    (b) Explain why most lethal genes are recessive. (2 marks)

SECTION B (60 marks)

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

11. (a) (i) Explain the chromosomal mutation that causes Down's Syndrome. (2 marks)

(ii) Outline the symptoms of Down's Syndrome. (8 marks)

(b) (i) Explain the features of the genetic code. (8 marks)

(ii) Name the bases of a DNA strand. (2 marks)

12. (a) Consider the following cross over values as determined by a series of breeding experiments involving four genes P, Q, R and S.
P - Q = 24%; R - P = 14%, R - S = 8% and S - P = 6%.
Construct a genetic map for the four genes. Explain the method used. (10 marks)

(b) Explain Mendel's hypothesis based on the present knowledge on genes. (10 marks)

13. (a) (i) Explain the effect of temperature on enzyme-catalysed reaction. (6 marks)

(ii) Draw a diagram to illustrate a (i) above. (4 marks)

(b) (i) Distinguish between a cofactor and a coenzyme. (2 marks)

(ii) List the different types of enzyme inhibitors. (4 marks)

(iii) Describe the end-product inhibition phenomenon. (4 marks)

14. (a) Outline the process of bread making. (12 marks)

(b) Outline the procedure of preparing yoghurt. (8 marks)

15. (a) List the characteristics of an ideal fixative. (10 marks)

(b) (i) Name any **five** moulds for embedding tissues. (5 marks)

(ii) List the advantages and disadvantages of vacuum embedding. (5 marks)

THIS IS THE LAST PRINTED PAGE.