

2404/302

CYTOLOGY, HISTOLOGY AND GENETICS

Oct./Nov. 2009

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;

Mathematical tables/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.

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. State the role of the following organelles in a cell:
 - (a) Cytosol; (2 marks)
 - (b) Microtubules. (2 marks)
2. Explain any **two** adaptations of Mitochondria to carrying out its functions. (4 marks)
3. Cells at interphase were treated with respiratory poison. Some cells continued to undertake the cell division while others stopped. Suggest the likely reasons for the observation. (4 marks)
4. Explain the role of Anaphase I and Anaphase II during cell division. (4 marks)
5. Outline how to mount a wax block on a microtome chuck. (4 marks)
6. State any **four** characteristics of a good fixative. (4 marks)
7. Distinguish between progressive and retrogressive staining. (4 marks)
8. Describe a lac operon. (4 marks)
9. Using an example, explain how multiple allele inheritance works. (4 marks)
10. Distinguish between sex limited genes and sex linked genes. (4 marks)

SECTION B (60 marks)

Answer any THREE questions from this section.

11. Outline meiosis stating the significance of each phase. (20 marks)
12. Describe the process of DNA replication. (20 marks)
13. Discuss the following processes in tissue processing:
 - (a) Infiltration; (7 marks)

- (b) Dehydration; (8 marks)
- (c) Mounting. (5 marks)
14. (a) State the functions of RNA. (4 marks)
- (b) Describe the following:
- (i) Lethal gene; (3 marks)
 - (ii) Test cross; (3 marks)
 - (iii) Hybridization. (3 marks)
- (c) Explain sex determination mechanisms in animals. (7 marks)
15. (a) Explain the law of independent assortment. (6 marks)
- (b) In an experiment, the stigma of tall broad bean plant was artificially pollinated with pollen from short broad bean, the stigma was covered to avoid pollination. 25 seeds were harvested, where 16 germinated into tall plants, and nine as short plants.
- Suggest with an explanation:
- (i) the genotype of the parents and respective gametes; (8 marks)
 - (ii) further experiments that can be conducted to verify the parents genotype. (6 marks)