

2404/302

CYTOLOGY, HISTOLOGY AND GENETICS

Oct./Nov. 2010

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 4 printed pages.**

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

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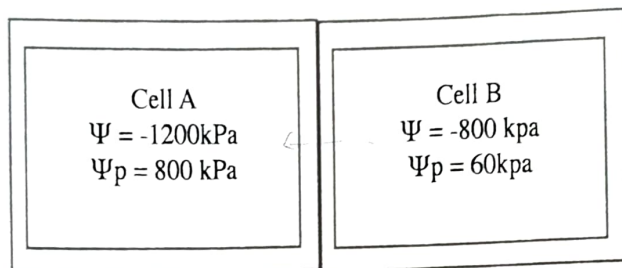
2010

**SECTION A (40 marks)**

*Answer ALL the questions from this section.*

1. (a) Define the term resolution as used in microscopy. (2 marks)
- (b) Distinguish between mechanical and optical tube length of a compound microscope. (2 marks)

2. Figure 1 represents two plant cells in contact.



- (a) With reasons, name the cell which has higher water potential. (2 marks)
- (b) (i) Explain the net direction in which the water will move by osmosis. (1 mark)
- (ii) Calculate the water potential of the two cells at equilibrium. (1 mark)
3. Describe the fluid mosaic model of the cell membrane structure. (4 marks)
4. Explain how carrier proteins conduct facilitated diffusion. (4 marks)
5. Outline embedding of specimen using paraffin wax. (4 marks)
6. State any **four** effects fixatives may have on cells. (4 marks)
7. On being put in an acidic solution for deccalcification, an animal tissue swell significantly. Explain this observation. (4 marks)
8. In maize, the genes for coloured seeds and full seeds are dominant to the genes for colourless and shrunken seeds. Pure breeding strains of the double dominant variety and a test cross of the  $F_1$  generation produced the following offsprings:
- coloured full seeds 380;  
colourless shrunken seeds 396;  
coloured shrunken seeds 14;  
colourless full seeds 10.
- Calculate the cross-over frequency (cross-over value). (4 marks)

9. State the;
- (a) functions of micro-organisms in bread making; (2 marks)
  - (b) purpose of boiling wort with hops in beer making. (2 marks)
10. Distinguish between an **enploidy** and **euploidy**. Explain how each of the condition can occur. (4 marks)

### SECTION B (60 marks)

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

11. (a) Correlate the similarities between the events that occur during sexual reproduction and Mendel's hypothesis on genetic inheritance. (10 marks)
- (b) – Differentiate between prokaryotic and eukaryotic cells. (10 marks)
12. (a) ✓ Describe the structure of chloroplasts. (6 marks)
- (b) Figure 2 represents a field of view being measured by use of a plastic ruler graduated in millimeters. Calculate the diameter of cell A.

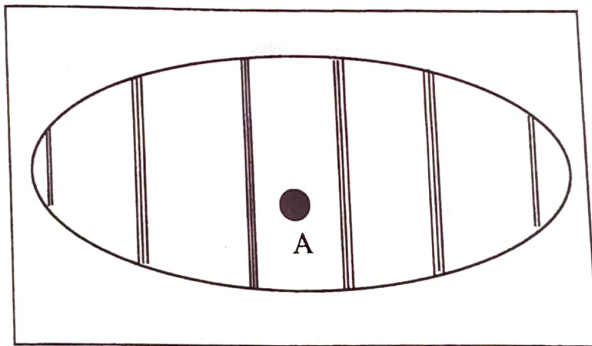


Figure 2

(4 marks)

- (c) Explain the significance of mitosis. ✓ (10 marks)
13. Explain the following gene transfer processes:
- (a) transformation; (10 marks)
  - (b) transduction. (10 marks)

14. (a) Discuss fixation using alcohols.

(15 marks)

(b) Explain accentuators as used in staining technique. Give examples.

(5 marks)

15. A homozygous purple - flowered short-stemmed plant was crossed with a homozygous red flowered long stemmed plant and the  $F_1$  phenotypes had purple flowers and short stems.

When the  $F_1$  generation was test-crossed with a double homozygous recessive plant, the following progeny were produced:

52 purple flower short stem

47 purple flower, long stem

47 red flower short stem

45 red flower long stem

Explain these results.

(20 marks)