

Name _____ Index No. _____ / _____

2404/302
CYTOLOGY, HISTOLOGY AND GENETICS
 Oct./Nov. 2014
 Time: 3 hours

Candidate's Signature _____

Date _____



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN APPLIED BIOLOGY

CYTOLOGY, HISTOLOGY AND GENETICS

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of the examination in the spaces provided above.

You should have scientific calculator(Non programmable) for this examination.

This paper consists of TWO sections; A and B.

Answer ALL questions in section A and THREE from section B in the spaces 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.

For Examiner's Use Only

Section A

Question	1	2	3	4	5	6	7	8	9	10	TOTAL SCORE
Candidate's Score											

Section B

Question	11	12	13	14	15	TOTAL SCORE
Candidate's Score						

GRAND TOTAL

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This paper consists of 16 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 in the spaces provided.

1. Outline the procedure for focussing a slide using the oil immersion objective. (4 marks)

2. Figure 1 below shows a generalized plant cell as seen under a light microscope. Identify parts labelled (i - viii). (4 marks)

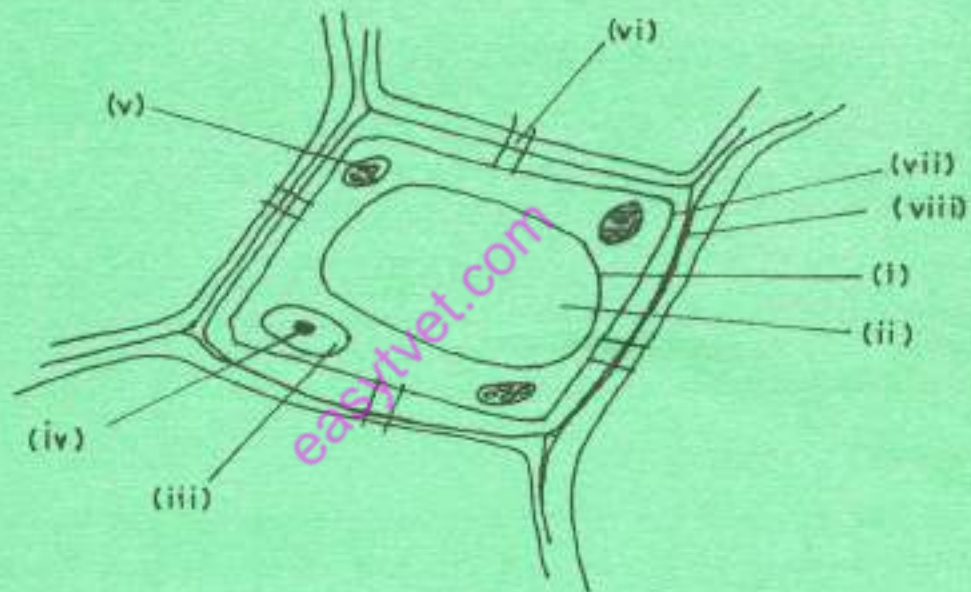


Fig.1

- (i) _____
- (ii) _____
- (iii) _____
- (iv) _____
- (v) _____
- (vi) _____
- (vii) _____
- (viii) _____

3. In an experiment to determine the rate of enzyme reaction in the presence of inhibitors, a technician made two set ups. In set up A, he noticed that increasing substrate concentration resulted in increased reaction rate. In set up B, he noticed, the rate of reaction did not increase despite increasing the amount of substrate. Explain. (4 marks)

4. Figure 2 below represents a stage in cell division.

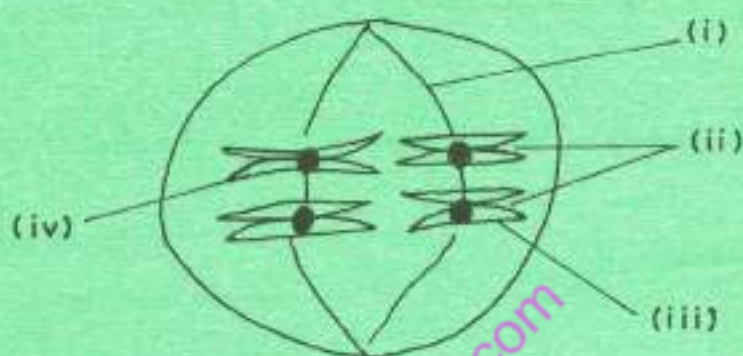


Fig 2

- (a) Identify the stage of cell division represented by figure 2. (1 mark)

- (b) Name part labelled (i) - (iii) (3 marks)

(i) _____

(ii) _____

(iii) _____

5. Differentiate the preparation of materials for light and electron microscopy in each of the following histological steps.

- (a) Fixation (1 mark)

- (b) Embedding (1 mark)

(c) Sectioning (1 mark)

(d) Staining (1 mark)

6. The following are stains used in histology:

- (a) Iodine solution
- (b) Safranin
- (c) Methylene blue
- (d) Haematoxylin

Identify:

(i) their observed colour in tissue staining. (2 marks)

(ii) their suitable uses (2 marks)

7. Distinguish between fibres and sclereids of sclerenchyma tissue of plants in terms of

(a) cell shape (2 marks)

(b) distribution (2 marks)

8. (a) The deposition of starch in pollen grains of maize is controlled by the presence of one allele of a certain gene. The other allele of that gene results in no starch being deposited. Explain in terms of meiosis why half the pollen grains produced by a heterozygous maize plant contain starch.

(2 marks)

- (b) Calculate the number of different combinations of chromosomes in the pollen grains of the *crocus balansaa* which has diploid number of six.

(2 marks)

9. Explain using appropriate genetic symbols the possible blood groups of children whose parents are both heterozygote with the father being blood group A and mother blood group B.

(4 marks)

10. State the purpose of the boiling phase during the process of beer making.

(4 marks)

SECTION B (60 marks)

Answer any **THREE** questions from this section in the spaces provided after question 15.

11. (a) The red colour of beetroot is contained in the cell vacuoles. Design an experiment to investigate the effects of heat on the partial permeability of beetroot cell membrane. (10 marks)
- (b) Suggest the most likely results of the above experiment. (4 marks)
- (c) Figure 3 below is a summary of respiration. Study the diagram and answer the questions that follows.

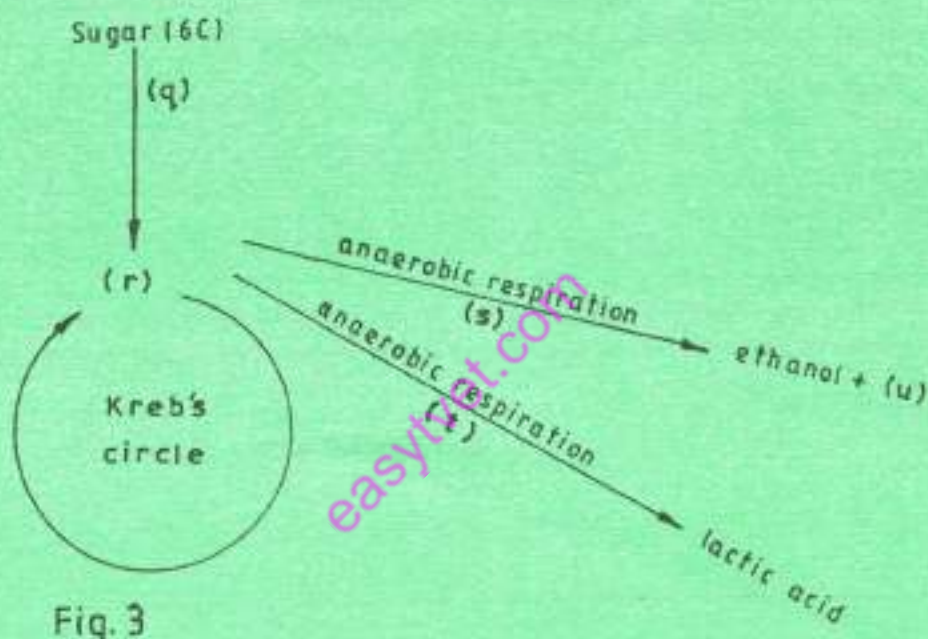


Fig. 3

- (i) Name the process labelled **q**. (1/2 mark)
- (ii) Name the products labelled **r** and **u**. (1 mark)
- (iii) State the likely living organisms represented by **s** and **t**. (1 mark)
- (iv) Name the total outputs of the process **q**. (3 1/2 marks)
12. (a) Differentiate between mitosis in plant and animal cells. (4 marks)
- (b) Explaining the significance of Mitosis. (10 marks)
- (c) Compare and contrast prophase and anaphase stages of mitosis and meiosis. (6 marks)

13. (a) Outline the procedure of attaching celloidin blocks to the holder. (7 marks)
- (b) Outline decalcification by use of chelating agent. (7 marks)
- (c) Name any **three**:
- (i) dehydrating agents used in histological technique. (3 marks)
- (ii) clearing agents. (3 marks)
14. (a) Describe the faults observed in sections due to incorrect tilt of the microtome knife. Explain how they can be rectified. (15 marks)
- (b) Outline de-waxing procedure of paraffin wax sections. (5 marks)
15. (a) Explain three categories of genes in humans that may have different effects depending on individuals gender. Give specific examples. (12 marks)
- (b) Draw a labelled diagram of a t-RNA. (8 marks)

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