



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

DECEMBER SESSION EXAMINATION FOR

BACHELOR OF EDUCATION SCIENCE

SBT 300: CELL BIOLOGY AND GENETICS

DATE: SCHOOLBASED

TIME :

INSTRUCTIONS

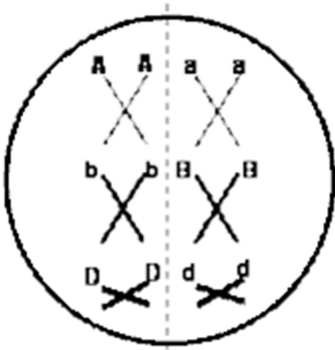
1. Answer Question 1 (compulsory) and **any two** questions in Section B.
2. Use clean well labelled diagrams wherever appropriate.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Identify the role of the following cellular components in storage, expression or transmission of genetic information (3 marks)
- i) Nucleolus
 - ii) Centromere
 - iii) Ribosome
- b) i) If a mutation occurs and sister chromatids fail to separate during cell division. Identify the mitotic stage that the scientist should target in order to correct this condition. (1 mark)
- ii) You are observing a dividing cell under a microscope and you the following. (3 marks)
- Cell 1: Disappearance of ribosome synthesis site
Cell 2: Spilling of nuclear content into the cytoplasm
Cell 3: Sister Chromatids are invisible

Name the stage of mitosis of each cell.

- iii) The diagram below is a cell which at meiosis metaphase I. Assuming that there is no crossing over. Identify the gametes that would be formed after second meiotic division (2 marks)



- c) A geneticist identifies a species of plant whose pink colored flowers are dominant over white flowers. How would he identify the genotype of the pink flowered plant. (3 marks)
- d) Explain the concept of chromosomal theory of inheritance (3 marks)
- e) Red-green colorblindness is an X-linked recessive disorder. If your mother is homozygous for the trait and your father and paternal grandfather are both colorblind. Explain the probability of you being red-green colorblind. (3 marks)
- f) i) In Meselson-Stahl experiment on DNA replication what was the role of ^{14}N medium (1 mark)
- ii) Indicate the significance of the following in DNA replication (2 marks)
- Okazaki fragments
 - Primer RNA
- g) For each of the following pairs of phases of the cell cycle, indicate how you could tell which of the two phases a specific cell is in: (2 marks)
- G₂ and S
 - Mitosis and Cytokinesis
- h) Explain the role of complementarity of DNA bases in an organism (2 marks)
- i) Distinguish between the following as used in transfer of genetic materials (3 marks)
- Transformation and transduction
 - lytic cycle and the lysogenic cycle
- j) Below is a sequence of mRNA from a bacterial cell. In the protein formed identify the number of tRNA required to bind ribosome to form the protein and the number of amino acids formed (2 marks)
- 5' ACUAGCAGGAGACGUAAGCGAUGUGCCAGAUAGCGCAGUCACACAUA A 3'

SECTION B: ANSWER ANY TWO (2) QUESTIONS (TOTAL 40MARKS)

QUESTION TWO (20 MARKS)

A certain gram negative bacteria susceptible to most antibiotics becomes resistance to several of them. After analysis it is found to spread the resistance to other bacteria of its kind. Discuss the mechanism responsible for this.

QUESTION THREE (20 MARKS)

Discuss the determination of the sex of various organisms using chromosomes and hormones

QUESTION FOUR (20 MARKS)

Describe the semi conservative replication of the DNA Strand below (20 marks)

5' ATCGGCTACGTTTAC 3'

3' TAGCCGATGCAAGTG 5'

QUESTION FIVE (20 MARKS)

Polypeptide chain elongation in a named bacterium occur by three repetition steps. Discuss.