



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2022/2023

SECOND YEAR SECOND SEMESTER SPECIAL/SUPPLEMENTARY EXAMINATION  
FOR THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURAL EXTENSION  
AND EDUCATION AND BACHELOR OF SCIENCE IN AGRICULTURE

### SBT 3252: GENETICS AND CYTOGENETICS

DATE: AUGUST 2023

TIME: 2 HOURS

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INSTRUCTIONS: Answer question *one* and any other *two* questions

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#### QUESTION ONE (30 MARKS)

- a) Distinguish between the following;
- Penetrance and expressivity
  - Linkage and Crossing over
  - Genotype and Phenotype (6 marks)
- b) Explain briefly three ways in which variation can be introduced in a population through meiosis (3 marks)
- c) Define the term polyploidy (1 mark)
- State any two commercial applications of polyploidy in plants (2 marks)
- d) State the Hardy- Weinberg equilibrium theory (2 marks)
- e) List the conditions a population must meet in order to maintain the Hardy-
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MUST is ISO 9001:2015 and



ISO/IEC 27001:2013 CERTIFIED

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Weinberg equilibrium (3 marks)

f) Freckles (F) are dominant to no freckles (f), brown (B) eyes are dominant to blue (b) eyes. Both traits exhibit complete dominance. Two individuals are heterozygous for both genes. Show possible allele combinations that each individual can produce in their gametes. If these two procreate, state the likely phenotypic ratio of their offsprings

(5 marks)

g) Name the syndrome associated with the following conditions (3 marks)

i. Trisomy 13

ii. Trisomy 18

iii. Trisomy 21

II. State the chromosome involved in each case (3 marks)

g) State the significance of crossing over in plant breeding (2 marks)

### QUESTION TWO (20 MARKS)

Give a detailed account of any five gene interactions and exceptions to Mendelian inheritance

### QUESTION THREE (20 MARKS)

Discuss factors that cause changes in allele frequencies in a population

### QUESTION FOUR (20 MARKS)

Discuss the various systems of sex determination giving specific examples

