

CHUKA UNIVERSITY

ANSC 00141: BASIC ANIMAL GENETICS AND BREEDING

RE-SIT/SPECIAL EXAMINATION

Instructions:

- i. This examination has two sections i.e. A and B
 - ii. Attempt ALL questions in Section A and any TWO questions in Section B
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Section A: Attempt ALL questions. 40 marks

1. The Table below relates a population with a locus A. The locus has the alleles A and a.

Genotype	AA	Aa	aa
Number of individuals	400	320	280

- a. Determine the gene and genotype frequencies for this population [6 marks]
 - b. State the Hardy-Weinberg law [1 mark]
 - c. Explain the any four factors causing changes in gene frequencies in a population [8 marks]
2. Inbreeding results due to mating of genetic related individuals.
- a. Discuss any two detrimental consequences of inbreeding [4 marks]
 - b. Discuss any two reasons for crossbreeding [4 marks]
 - c. Distinguish between the term's coefficient of kinship and additive genetic relationship [4 marks]
 - d. Define the term mating [3 marks]
3. In garden peas the traits seed shape and seed color are determined by two different loci. For the locus determining seed shape plants with genotypes RR and Rr have round seeds and those with genotype rr have wrinkled seeds. For seed color locus plant that with genotypes YY and Yy have yellow seeds and those with genotype yy have green seeds. Use a Punnet square to determine the genotypic and phenotypic ratios in the F1 generation for the following cross.

[10 marks]

RrGg x rrgg

Section B: Attempt ANY TWO questions. 30 marks

4. The heritability, h^2 , for 1st lactation milk yield in dairy cattle is 0.30.
- If the additive genetic variance i.e. σ_A^2 for this trait is 12,000 determine the phenotypic variance, σ_P^2 [5 marks]
 - The mean 1st lactation milk production for dairy cattle in Kenya is 3000 kg. What is the breeding value for a cow that produced 2000 kg in its 1st lactation? [5 marks]
 - A breeding program is designed to improve 1st lactation milk yield. The intensity of selection for sires is 0.714 and in dams is 0.640. Use the parameters given in this question to determine the selection differential for sires and dams. [5 marks]
 - List the factors that cause changes in gene frequencies in a population [5 marks]
5. The additive genetic and phenotypic variances for weaning weight in sheep are estimated to be 5.04 kg² and 18.33 kg², respectively. The mean weaning weight is 19.38 kg.
- Calculate the heritability for this trait. [3 marks]
 - A farmer wishes to use his ram for breeding. He recorded the rams weaning weight to be 30 kg. Use this information to estimate the rams breeding value. [5 marks]
 - What is the accuracy of the above breeding value estimate? [2 marks]
 - Distinguish between the term's selection differential and response to selection. [5 marks]
6. Selection is the process that determines which animals become parents of the next generation.
- Differentiate between mating and inbreeding [4 marks]
 - Discuss two consequences of inbreeding [4 marks]
 - Discuss two advantages of cross-breeding [4 marks]
 - Distinguish between natural and artificial selection [3 marks]