

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**SECOND YEAR EXAMINATION FOR THE AWARD OF DIPLOMA IN
ANIMAL HEALTH AND PRODUCTION**

ANSC 0241: ANIMAL BREEDING AND GENETICS

STREAMS: DIP (ANHP)Y2S1

TIME: 2 HOURS

DAY/DATE: FRIDAY 12/4/2024

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS

- Attempt ALL Questions in Section A and TWO Questions in Section B
- Do not write on the question paper
- Use illustrations where necessary

SECTION A (30 MARKS)**QUESTION ONE**

- (a) Outline the partitioning of genotype variance giving their mathematical representation. (2 marks)
- (b) List two critical things which cause variation among individuals. (2 marks)
- (c) Give the composition of the nucleotides. (2 marks)
- (d) State the Mendelian principles (2 marks)
- (e) Outline factors that changes gene frequencies in populations. (3 marks)
- (f) Given that a farmer decided to breed a zebu and a Fresian cow to improve milk production in his farm, give the type of breeding system and the reasons of practicing the breeding system? (2 marks)
- (g) Milk production is very important trait for dairy cows, how will this trait be evaluated in bulls. (1 mark)
- (h) Name any two mating strategies that can be utilized to improve animals within a population. (2 marks)
- (i) Differentiate between quantitative and qualitative traits giving examples. (2 marks)

- (j) Using a diagram describe the Double helix of DNA structure. (3 marks)
- (k) Define inbreeding giving its consequences as sued in animal breeding. (2 marks)
- (l) Meiosis is a process of cell division which is responsible for reproduction and results from haploid gamete cells. Outline the different phases of this process. (3 marks)
- (m) Enumerate the different types of nitrogenous bases, citing examples. (2 marks)
- (n) Briefly describe the role of genetics in animal improvement. (2 marks)

SECTION B: (40 MARKS)

QUESTION TWO

- (a) Discuss the breeding strategies to be adopted for improvement of milk production of cattle in the country. (10 marks)
- (b) Describe in detail the important traits considered for selection of pigs in Kenya. (10 marks)

QUESTION THREE

There exists a simple relationship between gene and genotype frequency in a population as a proof by Hardy and Weinberg.

- (a) Giving its assumptions, state the Hardy-Weinberg principle. (3 marks)
- (b) If a particular locus A has two alleles A_1 and A_2 . We denote the frequency of A_1 as p and frequency of A_2 as q . Proof that after one generation of random mating the frequencies of the genotypes will be p^2 , $2pq$ and q^2 . (4 marks)
- (c) Consider the rabbit population in Chuka University farm to be 1000. Suppose coat colour in rabbits is determined by a locus with alleles **BB** and **bb**, while the body weight is influenced by a locus with allele **A** and **a**. Of the rabbits, 450 have black coat colour (**BB**), 250 have white coat colour (**bb**) and 300 have grey coat colour (**Bb**). Upon maturity, rabbits of genotype **aa** attained 4kg, rabbits with genotype **Aa** attained 4.5 kg and rabbits of genotype **AA** attained 5.5kg
- Calculate the origion (o), additive effect (a) and dominance effect (d) for body weight of the rabbits. (3 marks)
 - Suppose body weight trait have an allele frequency $p(A)=0.4$ and $q(a)=0.6$. Calculate the average genotypic value for body weight in the rabbit population. (2 marks)
 - Calculate the allelic and gnotypic frequencies for coat colour. (5 marks)

iv) Determine whether this population is in Hardy-Weinberg Equilibrium (3 marks)

QUESTION FOUR

(a) Describe the different methods of selection used for livestock improvement. (10 marks)

(b) Briefly describe the characteristics of a breeding goal. (5 marks)

(c) In a population of broilers, the mean body weight at 2 months of age is 2.5kgs. The σ_p and σ_A for the trait are 3.5 and 1.5, respectively.

i) Determine the heritability for the trait. (1 mark)

ii) Calculate the breeding value for a broiler whose body weight at 2 months is 4.5 kg
(1 mark)

iii) If a cock weighing 3.5 kg is mated to a hen weighing 2.3kgs at 2 months, what is the expected weight of their chicks?
(3 marks)

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