UNIVERSITY OF ESWATINI

1ST SEM, 2020/2021

SPECIAL PAPER

PROGRAMMES: BSc ANIMAL SCIENCE (DAIRY OPTION) YEAR 2
BSc. AGRONOMY YEAR 2
BSc. ANIMAL SCIENCE YEAR 2
BSc. HORTICULTURE YEAR 2
BSc. AGRICULTURAL EXTENSION YEAR 2
BSc. AGRICULTURAL EDUCATION YEAR 2

COURSE CODE: ASC205

TITLE OF PAPER: PRINCIPLES OF GENETICS

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ANY FOUR QUESTIONS

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

Question 1

Compare the processes of meiosis and mitosis in EUKARYOTIC cells. Your comparison should, where necessary, include illustrations and examples. **(25 marks)**

Question 2

Coat colour in European Simmentals is determined by a pair of single locus alleles (E and e). Animals can either be red or black, both with white face and markings. Red animals are all homozygous recessive whilst black cattle could either be heterozygous or homozygous dominant. Another pair of single locus alleles (D and d) influences the expression of coat colour alleles. Black animals with the dominant D allele appear grey whilst the red cattle with the dominant D allele will be yellowish or light red.

i. List the phenotypes of animals with the genotypes shown in table below: **(4 marks)**

Genotype	**Phenotype of animals**
E_dd	
E_D_	
Eedd	
eeD_	

ii. Name the type of gene interaction exhibited by the trait in the Simmentals. **(1 mark)**

iii. What would be the expected Mendelian phenotypic ratios from a dihybrid cross of the heterozygotes? (i.e., EeDd X EeDd). Use a punnet square in your answer **(20 marks)**

Question 3

The development of comb in chicken is controlled by two independently assorting non- allelic gene pairs R and P. Gene R gives rise to rose comb and gene P produces pea comb. Genes R and P for rose and pea combs together produce a new phenotype i.e., walnut comb while single comb is produced when both R and P genes are in recessive condition.

i. A rose combed chicken was crossed with a walnut. The progeny consisted of three walnut, three rose, one pea and one single. What were the genotypes of the parents? **(13 marks)**

ii. Four hens with walnut combs were each mated with a single combed cock. One mating produced only walnut comb; the second produced both walnut and pea comb; the third produced rose and walnuts and the fourth produced walnut, rose, pea and single combs. What were the genotypes of the four walnut hens used as parents? **(12 marks)**

Question 4

Using **appropriate examples**, write short notes on each of the following

i. Lethal genotypes **(5 marks)**

ii. Variable expressivity **(5 marks)**

iii. Sex-influenced traits **(5 marks)**

iv. Sex-limited traits **(5 marks)**

v. Sex linked traits **(5 marks)**

Question 5

Using **appropriate examples**, explain each of the following gene interactions:

i. Dominance **(5 marks)**
ii. Co-dominance **(5 marks)**
iii. Recessive epistasis **(5 marks)**
iv. Dominant epistasis **(5 marks)**
v. Overdominance **(5 marks)**

THE END