1st SEMESTER 2012/2013

UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMMES: BSc ANIMAL SCIENCE II
BSc. ANIMAL SCIENCE (DAIRY OPTION) II
BSc AGRONOMY II
BSc HORTICULTURE II
BSc AGRICULTURAL EDUCATION II

COURSE CODE: AS 204

TITLE OF PAPER: PRINCIPLES OF GENETICS

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ANY 4 QUESTIONS

THIS PAPER MAY NOT BE OPENED UNTIL THE CHIEF INVIGILATOR HAS GRANTED PERMISSION

1.

a)

Explain each of the following terms (4 points each):

ii). Pedigree
iii). Incomplete dominance
iv). True breeding
v). Dihybrid
vi). Hemizygous

b) Illustrate nondisjunction in meiosis II and its outcome. (5)

2.

i). List five reasons why Mendel was successful when most scientists had failed (10)
ii). Drones (male bees) are haploid yet they produce viable sperm. Explain how this is possible. (4)
iii). In humans, red-green colour blindness occurs with a higher frequency in males than in females. What is the scientific explanation for this observation? (5)
iv). Define X linked recessive inheritance. In a pedigree, what signs would suggest that the inheritance of a trait may be X-linked. (6)

3.

a) The chart below lists the blood phenotypes of 8 (eight) individuals. Use the information in the chart to solve the genetics problems that follow.

Females	**Blood type**	**Males**	**Blood type**
Anne	O	Charlie	A
Wendy	B	Scott	AB
Susan	AB	Larry	O
Patricia	A	Keith	B

i). Scott and Susan's son, Paul, is willing to donate blood to a young girl with leukaemia. If the recipient has type O blood, will Paul be able to donate blood to the little girl. YES or NO? Briefly explain why. (3)

ii). Erin is the daughter of Patricia and Larry. She gets married and her husband who has type O blood gets involved in a serious car accident and needs a blood transfusion. Erin would like to donate her blood to her husband but the doctor tells her that she has type B blood. Based on this information, provide:

a) Erin's blood genotype (2)
b) Patricia's blood genotype (2)

iii). Susan and Scott have four children and all of them have type A blood. What is the probability that their next child will have type B blood? (2)

iv). Explain what you understand by the terms universal donor and universal acceptor. Give the genotype of a universal donor and that of universal acceptor. (6)

b) You are presented with a tall purple flower producing pea plant and a short white flower producing pea plant (Tall is dominant to short and purple is dominant to white). Using the two

plants, explain how you would determine the genotype of the tall purple flower producing pea plant. (10)

4.

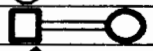
a) List <u>four</u> differences between mitosis and meiosis (Present your answer in table form). (8)

b) Name the anatomical part of a male goat in which meiosis takes place? (2)

c) What two processes in meiosis contribute to genetic variation in the gametes produced? (4)

d) List three functions of mitosis (6)

e) Complete the table below as shown by the example (1 point each)

	Symbol	**Symbol interpretation**
Example		Unaffected male
ii).		
iii).		
iv).		
v).		
vi).		

5.

a) In summer squash, white fruit colour (W) is dominant over yellow fruit colour (w) and disk-shaped fruit (D) is dominant over sphere-shaped fruit (d). If a squash plant true-breeding for white, sphere-shaped fruit is crossed with a plant true-breeding for yellow, disk-shaped fruit to produce F1 plants. The F1 plants are then test crossed to produce F2 plants.

i). What are the phenotypic and genotypic ratios for the F_1 generation? (2)

ii). List all the phenotypes expected in the F2 and give their ratio. (6)

iii). What fraction of the F2 plants would breed true for both fruit colour and fruit shape? (4)

iv). What fraction of the F2 plants would exhibit the dominant phenotype for both fruit colour and fruit shape? (5)

b) Most societies/countries have legal statutes/laws that criminalize consanguineous marriages. Briefly give a scientific explain justify such statutes/laws. (8)