



UNIVERSITY OF SWAZILAND

1st SEM. 2015/2016

FINAL EXAMINATION PAPER

PROGRAMMES: B.Sc. ANIMAL SCIENCE III
B.Sc. ANIMAL SCIENCE (DAIRY OPTION) III

COURSE CODE: AS 301

TITLE OF PAPER: ANIMAL BREEDING

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 (Round off all answers to **three** decimal places)

- A) Assume a cattle disease caused by a recessive gene “h” occurs in Mr. Zulu’s herd of cattle at a rate of 1 in 250 calves born. Calculate the following.
- i) The frequency of the recessive allele in the population. (2 Marks)
 - ii) The frequency of the dominant allele in the population. (2 Marks)
 - iii) The percentage of heterozygous calves expected (carriers) in the population. (2 Marks)
 - iv) You observe the following genotypic counts: 3 of “hh” genotype; 126 of “Hh” genotype and 571 of “HH” genotype giving a total of 700 animals. Test if this group of animals is in Hardy Weinberg equilibrium at this locus. Use $\alpha=0.01$.
NOTE: Chi-square Table is on page 4 of this exam paper. (14 Marks)
- B)
- Define the terms positive assortative mating and inbreeding. Briefly discuss the similarities and differences between these two. (5 Marks)

Question 2

Write brief notes on

- i) Objective/purpose of animal breeding (3 Marks)
- ii) Natural selection (2 Marks)
- iii) Random mating (2 Marks)
- iv) Inbreeding (3 Marks)
- v) Common ancestor (3 Marks)
- vi) Quantitative traits (6 Marks)
- vii) Qualitative traits (6 Marks)

Question 3

- a) What is grading up? What are the advantages of grading up? Describe the process of grading up and show the associated genetic changes for the first **three** generations. (10 Marks)
- b) Explain what you understand by selection response. (4 Marks)
- c) Explain the terms in the following equation: $R = h^2 S$ (5 Marks)
- a) State the Hardy Weinberg law (6 Marks)

Question 4

- A) Baloyi J.J. is a pig producer whose 100 herd of breeding sows average 22mm for back fat thickness whereas the boars in his herd have an average back fat thickness of 18mm. From 210 female replacements available he selects 30 which have a back fat thickness of 18mm. Heritability (h^2) for back fat thickness is reported to be 0.3
- i) What is the selection intensity? (2 Marks)
 - ii) What is the selection differential? (2 Marks)
 - iii) What is the expected selection response? (2 Marks)
 - iv) What is the expected back fat thickness in the progeny of the selected replacements (2 Marks)
 - v) Assuming selection differential and selection response remain constant, how many generation of selection will be required to achieve a back fat thickness of 18mm in the progeny? (2 Marks)
 - vi) In reality is it possible for selection response to remain constant from generation to generation? **YES** or **NO**. Briefly justify your answer. (3 marks)

- B) **TRUE OR FALSE** (Use the answer sheet provided. You must attach the answer sheet onto your answer book)

Example: Donkeys in some countries have horns

- i) Forces that change genotypic frequency will not always change gene frequencies (2 Marks)
- ii) The progeny of two inbred animals will always be inbred (2 Marks)
- iii) If the parents of animal X have a relationship covariance of 0.50 then the inbreeding coefficient of animal X is 0.25 (2 Marks)
- iv) It is possible for selection differential to have a negative value (2 Marks)
- v) Fitness is defined as an individual animal's ability to fight and evade predators (2 Marks)
- vi) In commercial poultry, heritability values range between 0 and 2 (2 Marks)

Question 5

A herd of 200 cows has allele frequency of "F" $=0.20$ and "f" $=0.80$ at the low fat locus. At the same locus, a herd of 50 cows imported into the herd has a gene frequency of F $=0.50$ and f $=0.50$.

- a) What is the change in "F" after the migration event? (2 Marks)
- b) What are the new allele frequencies after the migration event? (3 Marks)
- c) What is negative assortative mating and what is its effect on gene and genotypic frequencies (4 Marks)
- d) Discuss independent culling method of selection (8 Marks)
- e) Mr. Johnston is a pig producer. He selects replacement boars from his own herd. Currently his objective is to increase the litter size of his herd through selection. Can he select for litter size in boars? Briefly explain. (8 Marks)

IMPORTANT: Detach and insert this answer sheet **INSIDE** your answer book

Student ID			
Programme	Animal Science <input type="checkbox"/>	Animal Science Dairy <input type="checkbox"/>	Place a tick ✓ in the appropriate box
Year	3		

Question 4 B) Answer sheet. Write the word TRUE or FALSE in the box corresponding to the question number

Example	FALSE
i)	
ii)	
iii)	
iv)	
v)	
vi)	

Table A.3 Percentage points of the chi-square distribution

DF	$\alpha = 0.10$	$\alpha = 0.05$	$\alpha = 0.025$	$\alpha = 0.010$	$\alpha = 0.005$
1	2.70554	3.84146	5.02389	6.63490	7.87944
2	4.60517	5.99147	7.37776	9.21034	10.5966
3	6.25139	7.81473	9.34840	11.3449	12.8381
4	7.77944	9.48773	11.1433	13.2767	14.8602
5	9.23635	11.0705	12.8325	15.0863	16.7496
6	10.6446	12.5916	14.4494	16.8119	18.5476
7	12.0170	14.0671	16.0128	18.4753	20.2777
8	13.3616	15.5073	17.5346	20.0902	21.9550
9	14.6837	16.9190	19.0228	21.6660	23.5893
10	15.9871	18.3070	20.4831	23.2093	25.1882