

FEDERAL UNIVERSITY OF TECHNOLOGY, CANTERBURY
SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY
DEPARTMENT OF ANIMAL SCIENCE AND TECHNOLOGY

2012/2013 Hamilton Examination
 AS&R 2013 Agricultural Genetics
 Answer one question from each section
 3 Hour

20

✓ 1. Given three loci with alleles Aa, Bb, Cc, what are the possible (i) number of gametes (ii) number of genotypes (iii) phenotypic ratio of the alleles in the F_2 9:3:3:1

✓ 2. Describe with illustrations, three factors which can cause departures from classical Mendelian inheritance.

Glucosine.

✓ Q (a) State the similarities and differences between DNA and RNA.
in mRNA transcribed from DNA show the amino acid profile of the protein that will be formed.

Ans: The following base sequence:
ATGACGCGAAGCCGCTGGCCTTCCG

UAG/UUG/AUG/UUG/CGA/CCG/AGA CCC - Cysteine

$$g^9 = j^3 = 127$$

25

✓ (ii) Using a well labelled diagram describe the structure of nucleosome.

(iii) How many linkage groups can be found in (i) cattle (ii) sheep (iii) rat

✓ Q.1 Explain the forces that can change gene frequency.

migration
 mutation
 natural selection
 genetic drift

★ 7(a) What is Biotechnology? (b) Differentiate between recombinant DNA (Genetic Engineering) and molecular markers as a tool in Biotechnology.

It has drastically the development of Science of Genetics leading to the development of biotechnology in Agricultural production.

1) In what ways does Mendelian genetics differ from quantitative genetics? (a) Both require both an
 monogenic and polygenic traits. (b) First, all the statistical tools used in quantitative genetics.
 2) Describe selection as a breeding tool.

(i) Define selection as a breeding method. (ii) Write a short note on selection and its importance.

3:1 x 3

(3:1)⁴

81:27:27:27:27:3:3:3:3:1

AGR 303

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FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY
DEPARTMENT OF ANIMAL SCIENCE AND TECHNOLOGY

Session/semester: 2015/2016 / Harmattan Date: 26-04-2015
Course code / Title: AGR 303 / Agricultural genetics Time allowed 3 hours
Instructions: Answer five questions in all; at least one question from each section

Section A

Question No. 1

- a) Black and red skin colours in goats are governed by B and b alleles respectively. Suppose a mating between a black skinned buck and a red skinned doe results in at least one red skin colour offspring.
- What is the genotype of the buck?
 - What will be the appearance of the offspring of a cross of the F1 back to its red coloured doe?
- b) Write down a tetra-hybrid ratio? 81:27:27:27:27:3:3:3:3:1

Question No. 2

Describe with illustrative examples, factors which can cause departures from classical Mendelian inheritance.

Epistasis
Incomplete dominance

Section B

Question No. 3

Using a DNA base sequence of fifteen (15) bases, explain the process of protein synthesis in any named livestock

Question No. 4

- Explain the term 'Recombinants'.
- How many linkage group can be found in man? 29
- Define the term "Linkage analysis"
- Using examples, explain the term 'Backcross' mating. = Aa x aa
- List the three (3) kinds of RNA found in mammals.

Messenger RNA (mRNA), Transfer RNA (tRNA), and ribosomal RNA (rRNA)

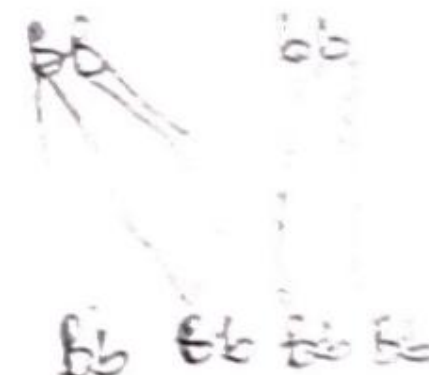
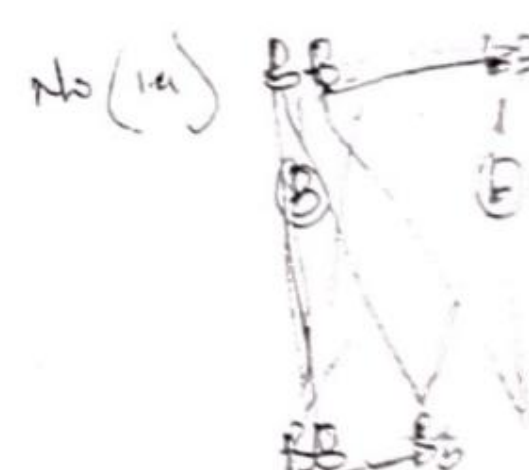
Section C, and ribosomal RNA (rRNA)

Question No. 5

With the aid of an equation, state and explain the Hardy-Weinberg's principle.

Question No. 6

Briefly describe four types of gene action and give an example in each case



$$\text{freq (A)} = p$$

$$\text{freq (a)} = q$$

$$p + q = 1$$

3:1

$$\text{freq (AA)} = p^2 \text{ homozygote (AA)}$$

$$\text{freq (aa)} = q^2 \text{ homozygote (aa)}$$

$$\text{freq (Aa)} = 2pq \text{ heterozygote}$$

using binomial expansion

$$(p+q) \times (p+q) = p^2 + 2pq + q^2 = 1$$

$$\therefore H-N = p^2 + 2pq + q^2 = 1$$

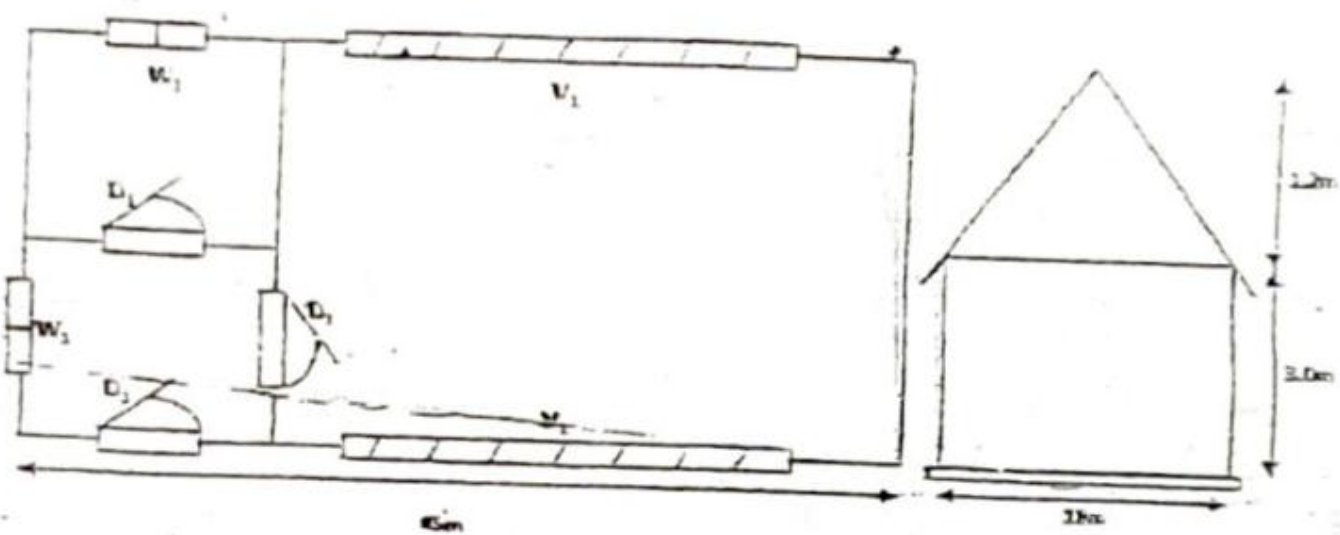
Recombination is the crossing over or exchange of genetic material between homologous chromosomes producing new genetic combination

Linkage analysis is a method of determining the genes that are found on the same chromosome and their physical distance from each other

BB X BB



- 3a. You are to advise two farmers on how best to orient their cattle houses. One of the farmers is financially buoyant to pave the floor of his cattle shade but the other isn't. what advice would you give each farmer and why?
- 3b. Briefly discuss how dairy cattle are affected by heat stress.
- 3c. What features of the zebu and European-type cattle make them suited temperature variation to hot and cold regions respectively?
- 4a. With the aid of a diagram, briefly discuss deep layer dryers.
- 4b. List the factors that affect the size and type of a farmer's storage facility.
- 4c. Outline Five factors a farmer has to consider before choosing either the hand milking system or machine milking system.
- Bricks are classified according to their variety, quality and type. Discuss.
- 5b. The plan and side elevation of a poultry house is given above. The building has 3 doors (1.2 x 3.0m), 2 windows (1.0 x 1.4m) each and cross ventilation aperture (1.2 x 2.5m) for free ventilation. Calculate the total number of blocks required for the building. Estimate the total cost of blocks if a unit cost ₦130 each. Assume that the total number of 300 blocks are laid per day at a cost of ₦3500. Specify any block dimension and thickness of mortar used.
- 6a. What are the qualities of concrete?
- 6b. Outline the correct sequence for a farm building construction: (i) sandcrete block work laid in mortar for foundations (ii) site cleaning (iii) plain insitu concrete in floor slab (iv) provision and placing of laterite (v) excavation for foundation trench not exceeding 1.0m (vi) plain insitu concrete (1:2 ½: 4-20mm aggregate) in foundation to receive sub-structural block work (vii) back fill, level and compact to receive foundation concrete (viii) block work laid in mortar (ix) roofing and carpentry works (x) internal and external finishing (xi) electrical connections.
- 6c. Determine the materials required for the concrete floor in question one (5) using a 5 gallon water-cement ratio (specify the thickness of concrete used).
- 6d. Where are the two forms of concrete and earth application used?
- 7a. Draw a typical layout that place the following buildings (i) Processing structures (ii) production structures (iii) dweller residential structures (iv) storage structures (v) fences, bridges, gates, etc. (vi) miscellaneous structures in proper relation to house, prevailing winds and access roads.
- 7b. Briefly explain how the following physical factors affect settlement planning (i) topography (ii) precipitation (iii) soil type and drainage facilities (iv) technical factors
- 7c. What are the steps involved in a detailed cost estimation?
- 7d. What ways can you prevent moisture loss in lumber.



steps involved in protein synthesis

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DEPARTMENT OF ANIMAL SCIENCE AND TECHNOLOGY

AGR 303

Session/semester: 2016/2017 Harattan Examination

Course code / Title: AGR 303 - Agricultural Genetics

Date: 13-06-2017

Time allowed: 3 hours

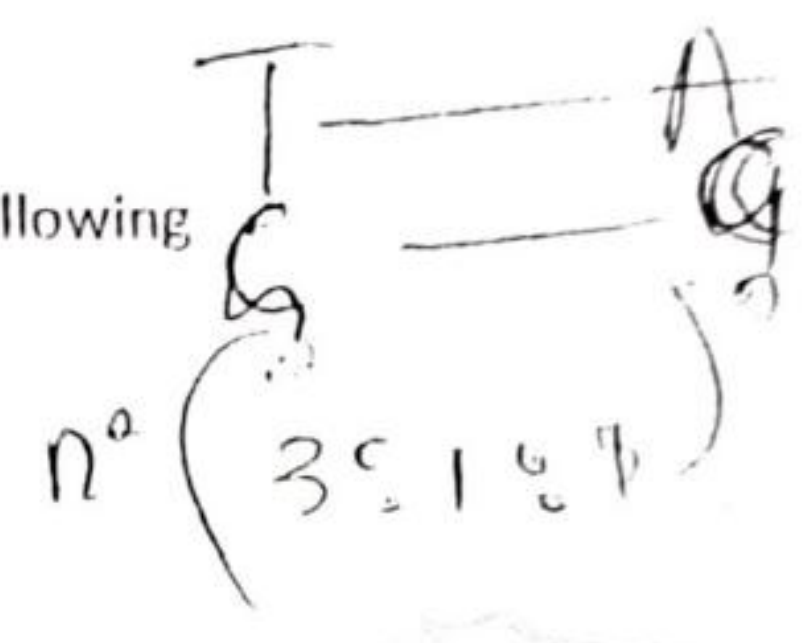
Instructions: Answer four (4) questions in all, one from each section

SECTION A

✓ Question No. 1

Using illustrative examples, write briefly on any four (4) of the following

- a) Lethacithy *Lethality*
- b) Incomplete dominance ✓
- c) Epistasis
- d) Cross over ✓
- e) Sex linkage ✓



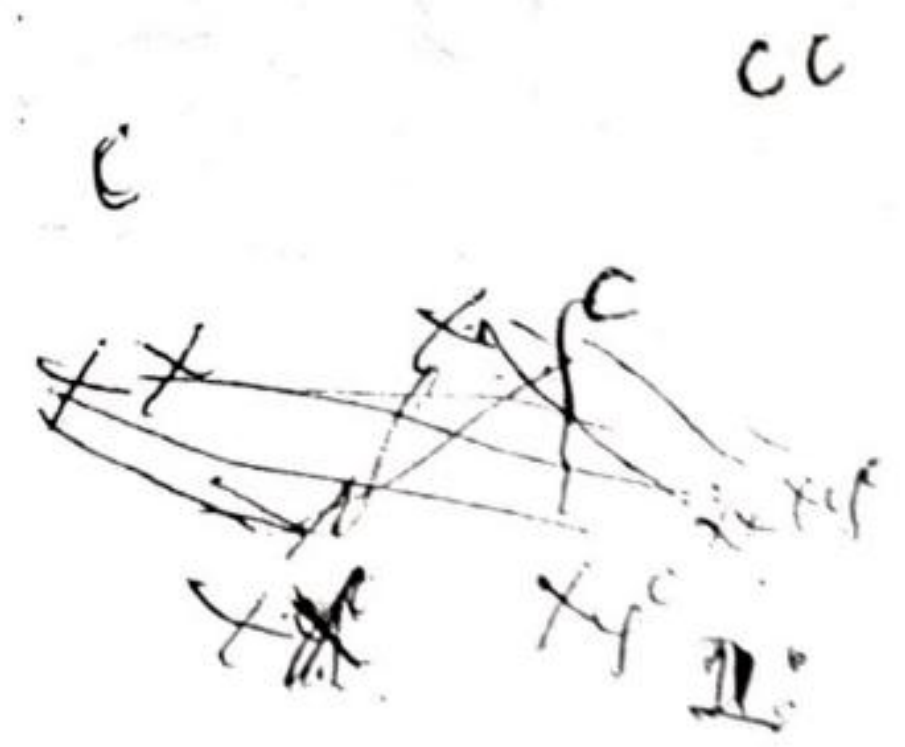
Question No. 2

A sex-linked recessive allele (c) produces red-green colour blindness in humans. A normal woman whose father was colour-blind marries a colour-blind man.

- i. What genotypes are possible for the colour-blind man? X^cY^c
- ii. What proportion of the males produced from this marriage will be colour-blind? 2
- iii. Of the girls produced by these parents, what proportion can be expected to be colour-blind? none
- iv. Of all the children (sex unspecified) of these parents, what proportion can be expected to have normal colour vision? 2

Question No. 3

- a) What is biotechnology?
- b) Discuss briefly the different areas of interest



SECTION B

Question No. 4.

A certain segment of the DNA has the following nucleotide sequence in one strand

ATTGGTGCATTACTTCAGGCTCT
UAA C C A C G U A A U G A A G U C C G G A

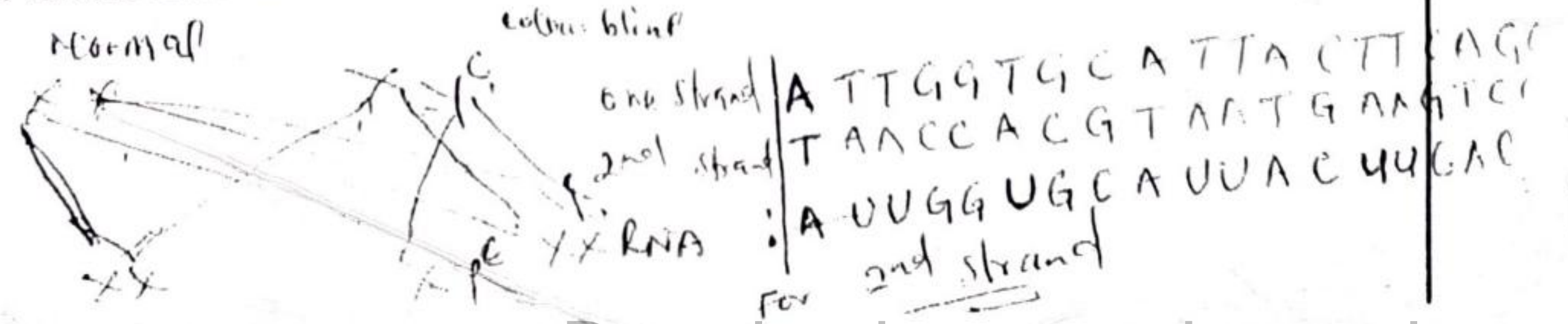
- i. What must the sequence of the other strand be?
- ii. Assuming the sequence acts as a template for the production of RNA, what will be the likely sequence of the RNA transcript?

Question No. 5

Briefly outline the steps that are involved in protein synthesis

Question No. 6
List the various tools and techniques available for the study of protein and nucleic acids.

Transcription of DNA base sequences into mRNA sequence
Translation of the latter into amino acids
Linkage of amino acids by peptide bonds



Question No. 7

Write briefly explaining the following terms:

- Genome ✓
- Gene flow ✓
- Homologous chromosome ✓
- Monohybrid cross ✓
- Gene pool ✓
- Heritability ✓
- Recessive allele ✓
- Linkage ✓

Question No. 8

Outline and briefly discuss the four (4) major forces that can change the frequency of gene.

- ① Mutation: is the ultimate source of genetic variation in the form of new allele ✓

SECTION D

Question No. 9

Using the set of data in the table below:

Class values (observation)	Frequency (f)	fx
50	32	1,600
54	52	2,808
52	75	3,900
56	28	1,568
		<u>10,876</u>

- Calculate the standard deviation of the mean
- Discuss the essence of calculating standard deviation in a set of observation.

positive variance → the 2 variables tend to move in the same direction
negative variance → the 2 variables tend to move in inverse directions

Question No. 10

- Explain 'Correlation' and 'Covariance'.
- Differentiate between Natural and Artificial Insemination.
- In a set of data with 80 observations/variates, if the standard deviation is 2.5, calculate the standard error of the mean.

$$SEM = \sigma_x = \frac{\sigma}{\sqrt{n}} = \frac{2.5}{\sqrt{80}} = 0.28$$

(Variance) or Covariance is the measure of the relationship between 2 random variables measured in units

Hardy Weinberg's principle states that the frequency of an allele will remain constant in the absence of mutation, migration, selection & genetic drift in a large random mating population.

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TIME ALLOWED: 3 HRS

SESSION/SEMESTER: 2019/2020 Harmattan

COURSE CODE/TITLE: AGR 303 – Agricultural Genetics

INSTRUCTIONS: Answer five questions in all, at least two from each section. All questions carry equal mark.

SECTION A

1. (a) State and explain using illustrative examples the laws of inheritance
(b) How many different genotypes are possible with four loci? Each having two alleles.
2. Consider a mating between dominant white leghorn (IIBB) and recessive white Plymouth Rock (iibb) to produce white feathered F_1 individuals. Show with a punnet square method; (a) The F_2 individuals (b) Genotype ratio of the F_2 progenies and phenotypic ratio of the F_2 progenies.
3. (a) Define and explain the term, Genetic linkage.
(b) List two of its effect in Animal Breeding and state the number of linkage groups that is found in chicken and goats.

SECTION B

4. (a) Tabulate the differences between the qualitative traits and quantitative traits.
(b) Outline some of the statistic used to measure quantitative characters.
5. (a) List the basic molecular techniques used in molecular studies. — standard deviation, coefficient of variation
(b) Using specific examples, describe three (3) applications of Genetic Engineering in Agriculture.
6. (a) Define the following genetic concepts;
(i) Genome and DNA — Genome
(ii) Gene cloning — ISOL
(iii) Plasmid
(b) Mention two crops each that has been genetically engineered for;
(i) Nutritional improvement
(ii) Herbicide tolerance
7. Briefly discuss the following types of genes;
(i) Dominance
(ii) Additivity
(iii) Pleiotropy
(iv) Epistasis

Quan
usually under control of
many genes

Shows continuous variation

controlled by a single gene
dominant/recessive
the phenotype
falls into category rather
than a continuous