CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF DIPLOMA IN AGRICULTURAL EDUCATION AND EXTENSION

ANSC 0241: ANIMAL BREEDING AND GENETICS

STREAMS: DIP (AGED) Y2S2 **TIME: 2 HOURS**

DAY/DATE: FRIDAY 14/04/2023 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS:

- **Answer 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

Choose the most appropriate answer from the options given below [10 marks]

(i) Which one of the following is not a common factor in mitosis and meiosis?

(a) Condensation of chromosomes

(b) Chromatid formation

(c) Spindle formation

(d) Pairing of analogous chromosomes

(ii) Coefficient of correlation between different records of same animals is……

(a) Heritability

(b) Genetic correlation

(c) Repeatability

(d) None of these

(iii) The ABO blood group system in man is example of……

(a) Dominance

(b) Partial dominance

(c) Overdominant

(d) Codominance

(iv) Which one of the following is sex linked trait……

(a) Haemophilia in dogs

(b) Barred condition in poultry

(c) Baldness in man

(d) Colour pattern in rabbits

(v) When performance records of dams are used to estimate individuals true breeding values for selection purposes, the method is called……

(a) Family selection

(b) Pedigree selection

(c) Progeny selection

(d) Mass selection

(vi) The pedigree of relationship between individual and grandparent is…….

(a) 0.50

(b) 0.125

(c) 0.25

(d) 0.0625

(vii) The concept of genetics was coined by…..

(a) William Bateson

(b) Gregor Mendel

(c) Robert Bakewell

(d) Charles Darwin

(viii) The h^2 can be increased by reducing the……

(a) Genetic variation

(b) Environmental variation

(c) Both a and b

(d) None of the these

(ix) Individual selection can't be done on the following trait……..

(a) Milk yield

(b) Dressing percentage

(c) Body weight

(d) Body length

(x) Inter locus interactions of alleles is……..

(a) Pleiotropy

(b) Epistasis

(b) Dominance

(c) Overdominance

QUESTION TWO

State if the following statements are true or false. If false, rewrite the statement after making necessary corrections without altering the underlined part. [5 marks]

(a) Ideal lactation period of cattle is 279 days

(b) Individual selection is best for traits having high heritability

(c) Individuals with one parent in common are called half sibs

(d) Homozygosity increases with crossbreeding

(e) Line breeding is a form of outbreeding

QUESTION THREE

State gene action/genetic term in one or two words [5 marks]

(i) Genes that only occurs in Y-chromosome

(ii) Full form of DNA

(iii) Partitioning of environmental variance

(iv) Two main causes of genetic shuffling

(v) Phenomenon in which a gene influences several traits

QUESTION FOUR

Give one word to the following [5 marks]

(i) The process of RNA synthesis from DNA is called

(ii) The nitrogenous base pair present in DNA but not in RNA molecule is

(iii) Sum total of genes in a population is

(iv) When the cell are not dividing the cell cycle phase is called

(vi) Selection on basis of individual ancestors performance is called

QUESTION FIVE

Differentiate the following as used in animal breeding [5 marks]

(i) Quantitative and qualitative traits

(ii) *In situ* and *ex situ* conservation

(iii) Karyotype and karyotyping

(iv) Meiosis and Mitosis

(v) Codominance and partial dominance

SECTION B (40 MARKS)

QUESTION SIX

(a) What is inbreeding? Give the consequences of inbreeding in livestock. [5 marks]

(b) Describe the double helical structure of DNA [5 marks]

(c) Describe in detail the important traits considered for selection of pigs [10 marks]

QUESTION SEVEN

(a) State Hardy-Weinberg law and discuss factors affecting Hardy-Weinberg equilibrium. [10 marks]

(b) Consider the rabbit population in Chuka University farm to be 500 animals. 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 75 have black coat colour (BB), 375 have white coat colour (bb) and 50 have grey coat colour (Aa). Upon maturity, rabbits of genotype aa attained 3kg, rabbit of genotype Aa attain 5kg and rabbits of genotype AA attain 6kgs.

(i) Calculate the gene frequency and genotypic frequency of this population [5 marks]

(ii) Calculate the origin (o), additive effect (a) and dominance effect (d) for body weight [3 marks]

(iii) Use the allele frequencies of this population to calculate the average genotypic value for body weight in the rabbit population. [2 marks]

QUESTION EIGHT

(a) In indigenous goat breeding program bucks are selected based on 100 progeny performance records and nannies are selected based on their own first lactation performance. The heritability of milk production trait is 0.3. The generation interval, L, for bucks is 3 years and for the nannied is 2.5 years. The additive standard deviation for milk production is 100kg. Each generation 50 bucks and 100 nannies are evaluated, out of which 10 bucks and 80 nannies are selected.

(i) Determine the intensity of selection for bucks and nannies [2 marks]

(ii) Calculate the selection differential [3 marks]

(iii) Calculate the expected selection response per year [2 marks]

(b) Briefly discuss TWO reproductive technologies for livestock improvement. [8 marks]

(c) Define crossbreeding and state the reasons for applying crossbreeding system in animal breeding to improve population. [5 marks]
