MODEL ANSWER PAPER (Guideline for evaluation of answerbook)

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B.Sc.(Hons.) Agriculture

Semester : IV(New)	**Term: II**	**Academic year: 2023-24**
Course No. : AHDS-242	**Title: Livestock Breeding & Nutrition**	
Credits : 2 (1+1)		
Day & Date :	**Time: 2 hrs.**	**Total Marks : 40**

NOTE: 1.Solve **ANY EIGHT** questions from **SECTION "A"**.
2.All questions from **SECTION "B"** are compulsory.
3.All question carry equal marks.
4.Draw neat diagrams wherever necessary.

SECTION "A"

Q.1. What is mean by chromosomal aberration? Give the classification of chromosomal aberrations and describe in short translocation and deletion of chromosome. **(1+1+2=4)**

Answer: Chromosomal aberrations:

- We know that normally chromosomes occur in pairs in somatic cells and that one of each pair occurs in a gamete. In the course of genetic research numerous individuals, animals and plants have been studied and occasionally variations have been observed in the normal number, structure and arrangement of chromosome such chromosomal aberrations disturb the usual Mendelian ratios and cause the abnormality of the individual.
- Structural chromosome changes occur as a result of chromosome breakage and reunion of the broken ends in new ways. If the chromatids i.e. whole chromosomes are affected it is a chromosomal aberration.

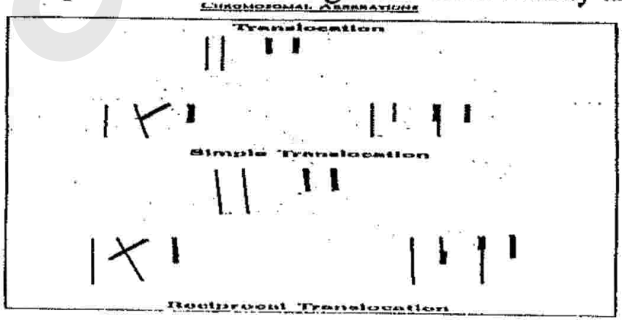
Classification of Chromosomal aberrations:

Two main types of chromosomal aberrations occur and they are as follows,

1)Variation in the normal structure and arrangement of chromosomes, this includes, Non- disjunction, b) Translocation, c) Deletion, d) Inversion & e) Duplication

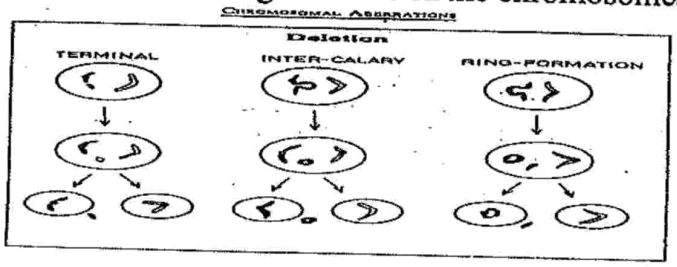
2)Variations in the normal number of chromosomes known as Ploidy. eg. Ploidy, Polyploidy, triploidy (auto and allopolyploids), Chimeras and mosaics, karyotyping.

Translocation: A piece of chromosome becomes broken and gets attached to another chromosome often of another pair, this process is known translocation. They produce detectable genetic abnormality and can also be confirmed cytologically.



Deletion:

It is common for a portion of a chromosome to break. When a broken piece is devoid of the centromere, it does not move towards the pole along with the spindle fibers and gets lost in the cytoplasm. The genes carried in the broken bit are also lost; this phenomenon is known as deletion. Two types of deletion are possible, a terminal deletion in which a portion is lost from the end of chromosome and an intercalary deletion in which a portion of the chromosome is lost from within leaving the ends of the chromosomes intact.



Q.2. Differentiate between Mitosis and Meiosis. (4)

Answer: Minimum four differences are expected from followings.

Sr.No.	Mitosis	Meiosis
1	An equal division separating sister chromatids.	A reduction division. The first stage is a reduction division which separates homologous chromosomes at first anaphase. Sister chromatids separate in an equational division at second anaphase.
2	Only one division per cycle that is, one cytoplasmic division (cytokinesis) per equational chromosomal division.	Two division per cycle i.e. two cytoplasic divisions, one following the reductional chromosomal division and the other following equational division.
3	Chromosomes fail to synapse and no chiasmata formation.	Chromosomes synapse and form chiasmata.
4	Genetic exchange between homologous chromosomes does not occur.	Genetic exchange occurs between homologous chromosomes.
5	Two daughter cells produced	Four daughter cells are produced.
6	Genetic contents of daughter cells are identical.	Genetic contents of daughter cells are different.
7	Chromosome number of daughter cells is the same as that of mother cell.	Chromosome number of daughter cells is the half as that of mother cell
8	Daughter cells are capable of undergoing additional mitotic division.	Daughter cells are not capable of undergoing additional meiotic division although they may undergo mitotic division.
9	Normally occurs in all somatic cells.	Occurs only in specialized germ cells.
10	Begins at the zygote stage and continuous throughout the life of the organism.	Occurs only after puberty, in higher organisms. But occurs in the zygote algae and fungi.

Q.3. Enlist various systems of breeding and differentiate important points between close breeding and line breeding. **(2+2=4)**

Answer :- The classification of systems of breeding is as fallows-

1) Inbreeding – a) Close breeding
   b) Line breeding
2) Out breeding – a) Out crossing
   b) Cross- breeding-
      i) Criss crossing, ii) Triple crossing, iii) back crossing
   c) Species hybridization
   d) Grading up.

Difference between close breeding and line breeding is as fallows.

Sr.No.	Close breeding	Line breeding
1	Mating of closely related animals	Mating of distantly related animals
2	eg. Full brother X Full sister	eg. Half brother X half sister.
3	It is intense form of inbreeding	It is mild form of inbreeding
4	In this method animals are selected for breeding on individual merits	Animals are selected for breeding on pedigree record.
5	Homozygosity reaches quickly.	Homozygisity reaches slowly.
6	Both desirable and undesirable characters develop rapidly	Both desirable and undesirable characters develop slowly
7	It is more risky.	It is less risky

Q.4. What is mean by selection? Enlist various basis and methods of selection and describe in short Tandem method of selection. **(1+1+1+1=4)**

Answer :

Selection: Selection is choosing the parents of next generation. In general selection of an individual from a large population on the basis of certain desirable characteristics for regeneration.

There are three basis of selection –

1) Individual selection, 2) Pedigree selection, 3) Progeny selection.

The different methods of selection are –

1) Tandem method, 2) Independence culling method, 3) Selection index method

Tandem method :-

In this method only one trait is selected at a time. The process of selection is continued until goal for selection trait is achieved. After achievement of first goal, selection is directed to another trait.

Advantage – Selection for one trait result in improvement in other traits also.

Disadvantage- This is highly inefficient method, if traits are not genetically related. Sometimes improvement made in the first trait is lost, when selection is directed to another trait. The rate of genetic improvement is very low.

Q.5. What is Hardy- Weinberg law? Enlist four steps of proof of Hardy- Weinberg law with constancy of gene frequency and give the properties of Hardy-Weinberg law. **(1+1+2=4)**

Answer –Hardy – a British scientist and Weinberg – German scientist proposed this principle independently in 1908. This law state that "In a large- random mating population, in the absence of migration, mutation and selection the gene and genotypic frequencies remain constant from generation to generation".

Proof of Hardy-

Weinberg law with constancy of gene frequency involves following four steps,

1)Production of Gametes,
2)Formation of Zygotes,
3)Viability of Zygotes to adults,
4)Gene frequency in Progeny.

Properties of Hardy- Weinberg laws :

1)A population of random mating in the absence of migration, mutation and selection will be under Hardy Weinberg equilibrium.
2)The genotypic frequencies of the progeny depend only on the gene frequencies of the parent ant not on the genotypic frequencies.
3)One generation of random mating will produce the population under Hardy Weinberg equilibrium.
4)The frequency of heterozygote's will not be greater than 0.5 i.e. 50%.
5)When the gene frequency of an allele is low, the rare allele occurs predominantly in the heterozygote and less in homozygotes.

Q.6. Give the classification of feed- stuffs with suitable examples and write down short note on unconventional feed stuffs? **(3+1=4)**

Answer :- The feed stuffs are classified as fallows-

A) Roughages – a) Dry Roughages – straw ,hay ,kadbi and kutar
b)Green / succulent Roughages- Pastures, cultivated fodders, tree leaves, root crops and silage
B) Concentrates- a) Energy rich – Cereal grains& by products, roots & tubers.
b) Protein rich – Oilseed cakes, pulse chuni, etc.
C) Feed supplements – vitamin and minerals like A,E,D,K,B, & I, Cu,P, etc.
D) Feed additives – like Terramycin , Flavomycin, Ziac bacitracin, etc.

Unconventional feed stuffs:-

Unconventional feeds are those, that are not commonly used for feeding of livestock but used during fodder scarcity or shortage when conventional fee stuff are not available to animal for feeding to maintain the animals and their production. Normally they have low /poor nutritive value, they may contain some toxic or undesirable anti-nutritional factors. Their level of inclusion in the ration is limited. Some processing or treatments is usually needed to make their use in livestock feeding.

eg. Babul tree leaves & pods, bagasse, sea weed, salseed cake, neemseed cake etc.

Q.7. Define Nutrition? Enlist various six major feed nutrients and important functions of Protein. **(1+1+2=4)**

Answer :-

Nutrient is a substance or any food constituent that nourishes the body and helps in maintains growth, production and reproduction of an animal.

The feed nutrients are divided into six classes as –

1. Water, 2. Proteins, 3. Carbohydrates, 4. Fats, 5. Vitamins, 6. Minerals.

Importance of Protein:-

- Synthesis of cell protoplasm
- Synthesis of bite acids
- Synthesis of hormones – Insulin
- Synthesis of enzymes

- Synthesis of Milk Protein
- Formation of rhodopsin
- Supply of energy
- Digestion of cellulose portion of carbohydrates
- Protein forms muscles and tissues of body.
- Essential for growth and development of body.
- Essential for formation of eggs and development of fetus in animal body.
- It is important for growth and development of wool and hairs of the animals.

Q.8. Describe in short functions of various organs of cattle digestive system. (4)

Answer :-

Various organs of cattle digestive system are-

1. Mouth, 2. Oesophagus, 3. Stomach (Reticulum, Rumen, Omasum, Abomasum), 4. Small intestine, 5. Large intestine 6. Liver 7. Pancreas.

Functions of various organs: answer is expected as below,

1.Mouth : is a organ of prehension, mastication, insalivations and regurgitation. Saliva assists mastication and swallowing by acting lubricants.

2.Oesophagus:

Oesophagus has diameter 1 to 2 inches, it act as passage for food and is stretchable.

3. Stomach : In ruminant stomach is divided into 04 parts as

a. Reticulum - 5 to 10 % area of stomach, Reticulum and rumen joined by reticulo, rumen - folds of tissues, capacity is about 10 lits. , helps in regurgitation of food bolus to mouth for rechewing and secondary eruction of digestive gases in rumen.

b. Rumen – occupy 70 to 80% area of stomach, capacity 40 to 50 gallons or 250 to 300 lbs., it act as storage place, reduce size of food, efficient action of microorganisms and digestive saliva, muscular contraction, mixing of food, rumination and eruction, provide place for microbial activity.

c. Omasum – occupy 10 to 15% space of stomach, absorption of water and further grinding of feed particles for appropriate action of digestive enzymes in the abomasums and small intestine.

d. Abomasums- occupy 13% space, secretes gastric juices which contains HCL and enzymes like pepsin and rennin, HCL reduces pH of the digesta 6 to 2.3 to enhance activity of pepsin because it can act only in acid medium.

4. Small intestine- 1 to 2 in diameter and 135 ft in length in adult cows. Consist three parts as Duodenum, Jesunum, Ileum. The wall of this are covered with finger like projections called villi.Digestion of various nutrients takes place with pancreatic & intestinal juices.

5. Large intestine- it divided into three parts i.e. Cacum, Colon and the rectum. Digestion, secretion and absorption of various nutrients is major function.

a.Cocum -is a blind sac analogues to human appendix, loaded near the juncture of small and large intestine it has capacity 1 to 2 gallons in mature animal.

b.Colon is a tube approximately 3 to 5 inches in diameter and 35 to 40 ft. long.

c.Rectum is the last part which several feet length and passes undigested material out of the body.

6. Liver: Liver is a large functional glands situated on the left side in the abdominal cavity, at its center gall bladder with bile acid is present. Digestion with various juices secretion is main function.

7. Pancreas: Long and flat in shape pancreas is a branched, glandular structure. It is yellow in colour, situated between the curvature of duodenum and stomach. Secretion of various juices for digestion.

Q.9. What you know about enrichment of low quality roughages? Describe in short about Urea Molasses Mineral Block (UMMB). **(2+2=4)**

Answer:

Enrichment of Low quality forages: The crop byproducts like wheat / paddy straw are generally not used by the farmers in the feed of the animals because it is more hard, dry and coarse in nature due to high lignin content. Roughages are also containing more crude fiber and less digestible nutrients, they have less nutritional quality. But roughages are bulky in nature; they are available at cheap cost and also useful to satisfy the hunger by fulfilling the appetite. But considering the non availability of conventional nutritious roughages and high cost of concentrates enrichment of low quality roughages to improve its palatability, digestibility and nutrition status enrichment of roughages is the need of present situation. Some examples of enrichment of low quality roughages can be made with following sources

a. Salt treatment
b. Urea treatment
c. Molasses treatment
d. Soaking
e. Chaffing of fodder.
f. Silage
g. UMMB , etc

Urea Molasses Mineral Block (UMMB) licks -

The UMMS licks supply most of the nutrients generally deficient in the straw based diet, These are Urea, molasses, mineral supplements, common salt and barns/cakes, Guar gum powder, sodium bentonite and lime are used as binding agents. The level of binding agents is adjusted to obtain the blocks of good texture under different climatic conditions. The range of different ingredients which can be used in the UMMB formulation under various climatic condition is as follows.

Sr.No.	Name of ingredient	Proportions(%)
1.	Urea	10
2.	Mineral mixture	40-50
3.	Common salt	4-8
4.	Calcium oxide	3-5
5.	Sodium bentonite	3-5
6.	Rice Polish fine	20-30
7.	Phosphoric acid	1-1
8.	Guar gum powder	2-3

The UMMB licks are manufactured in different state under the co-operative and private sectors. It has been observed that the UMMB licks increased straw intake by 53% and reduce the concentrate requirement by 40% and successfully proved the economic gains by feeding the lick to lactating and growing cattle's.

Q.10. Write down short notes on (Any two). **(2+2=4)**

1) Variance 2) Feeding Standards 3) Silage 4) Spermatogenesis

1)Variance:

Variance is refers to the observable or measurable differences in the individual for particular traits. The individuals differ in their metric characters. The amount of variation is measured and expressed as the variance. Corresponding to the partition of phenotypic value into genotypic value and environmental deviation, P=G=E, the phenotypic variance (V_P) is partitioned into genotypic (V_G) and environmental variances (V_E).

$$V_P=V_G+V_E$$

The genotypic variance is the variance of genotypic value and the environmental variance is the variance of environmental deviations. The total variance is the phenotypic variance. The components of variance and the values whose variance they measure are listed below,

Variance components	symbol	Value whose variance is measured
Phenotypic	V_P	Phenotypic value
Genotypic	V_G	Genotypic value
Additive	V_A	Additive value
Dominance	V_D	Dominance deviation
Interaction	V_I	Interaction deviation
Environmental	V_E	Environmental deviation.

The total variance is then sum of these components.

2) Feeding Standards:

Feeding standards are the table values indicating the quantities of nutrients to be fed to various classes of livestock for different physiological functions.

Advantages of feeding standards :-

1. They serve as best general guide for feeding of livestock & poultry.
2. They are useful for practical feeding purpose.
3. They give an idea about total feed and nutrients requirements of every species for specific physiological functions.
4. They are useful in planning the experiments and interpreting the results depending on the nature and objective of the investigation.
5. They are useful for calculations of total feed requirement of herd and thus helps in planning of feeding schedule for future.
6. They are flexible and can be modified as per demand, availability and cost of feedstuffs.

3) Silage

Silage Preparation:

This is the method of preservation of green fodder in which anaerobic decomposition is followed. Ins this method the green fodder is cut at the maximum moisture stage (70-08 %) in the morning hours and chaffing into 1-1.5 inch pieces with chaff cutter in afternoon hours can reduce the moisture to 60-70 %. The chaffed fodder is then filled in silo pit, silo tower, or plastic bags with due care to remove all the air by pressing it. The incorporation of 2 per cent urea and 4 per cent jaggery or molasses can serve the purpose of value addition. The airtight condition can be maintained for 60-90 day for good quality silage, which is the need of the time.

Advantages of silage making-

1) Green fodder can be kept in a succulent condition for a long time.
2) Grass silage preserve 85% or more of the feed value of the crop.
3) It is most economical form in which the whole stalk of maize and jowar can be processed and stored.
4) Weeding crops which tend to make poor hay may produce silage of good quality silage.
5) It is a very palatable and slightly laxative in nature.
6) During the monsoon months, hay making is difficult but silage making is done in such conditions.
7) Less wastage and entire plant can be utilized.
8) Stored in less space than dry fodder of the same quantity

4) Spermatogenesis:

During the period of sexual maturity in animals, the spermatozoa are formed in the testis from reproductive cells, the spermatogonia. The final spermatogonial division results in cells known as primary spermatocytes. Which in preparation for meiosis enter upon a period of growth.

In short it is a process of cytoplasmic differentiation to become sperm through various phases as below.

Spermatogorium→ Primary spermoatocyte → I Division of Meiosis → Secondary Spermatocytes→ II Division of Meiosis→ Spermatid →Metamorphosis → Sperms.

SECTION "B"

Q.11 Define the term. (1 Mark each, Total 04)

a) Individuals with one common parent are known as **Half sib.**

b) **Balance Ration** is the allowance of feed (ration) provided to the animal which fulfill the nutritional requirement of animal not in excess or not in deficit.

c) **Repeatability** refers to the expression of the same traits at different times in the life cycle of same individual.

d) **Digestible energy**: Entire gross energy is not available to the body of animal, some energy is lost through faeces. When loss of energy is measured and subtracted from gross energy then remaining energy is known as digestible energy. i.e. Energy retained by body.

Q.12. Select proper answer (1 Mark each, Total 04)

1)Sudden change in the structure of gene is known as **mutation.** (b)

2)**Molasses** is the byproduct obtained from sugar industry. (b)

3)**Mendel** is known as father of genetics. (a)

4) Milk fever is cause due to deficiency of **calcium.** (a)

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