Animal Breeding and Biotechnology

1. **Animal Genetics:**
    - 1. 1. Animal cell and cell division
    - 1.2. Gametogenesis: spermatogenesis and oogenesis
    - 1.3. Chromosomal study: karyotyping, chromosomal variation and abbretation
    - 1.4. Mendalian genetics: experiment, principle and extension
    - 1.5. Gene interaction and epitasis
    - 1.6. Linkage, crossing over, recombination and gene mapping
    - 1.7. DNA and its structure, DNA replication, transcription, translation and expression
    - 1.8. Proteins and Gene regulation
    - 1.9. Population genetics: gene frequency, Hardy - Weinberg law, causes of changing gene and genotypic frequency in the population
    - 1.10. Quantitative genetics: Phenotypic variation, estimation of heritability and repeatability

2. **Principles of Animal Breeding**
    - 2.1. Introduction, history and importance of animal breeding
    - 2.2. Animal genetic resources and sustainable development
    - 2.3. Importance of indigenous breed and economic values.
    - 2.4. Rare breeds of different species of animals and their characteristics
    - 2.5. Reasons for being endangered, strategies for conservation.
    - 2.6. Variation and causes of variation
    - 2.7. Importance of heredity and environment
    - 2.8. Gene action (additive and non-additive)
    - 2.9. Concept of heritability and repeatability
    - 2.10. Selection (principle, basis, method, selection parameters)
    - 2.11. Mating system (inbreeding, out breeding)
    - 2.12. Important Economic traits of livestock and poultry
    - 2.13. Breeding values, dominance and epistasic values
    - 2.14 Inbreeding: coefficient of inbreeding and relationship, measure of inbreeding and relationship, resemblance among relatives.
    - 2.15 Development of breed, strain, lines and family.

3. Animal physiology and reproduction
3.1   Concept of growth and development
3.2   Growth and thermal environment
3.3   Hormonal mechanism in growth and lactation
3.4   Hormonal mechanism in reproduction
3.5   Male and female reproductive system
3.6   Estrus detection and estrus cycle
3.7   Estrus induction, estrus synchronization
3.8   Ovulation.
3.9   A.I. introduction, advantage and limitation of A.I.
3.10   Technique of A.I,.
3.11   Method of semen collection,
3.12   Dilution, preservation, thawing, transportation.
3.13   Embryo transfer, importance, techniques
3.14   Super ovulation, collection, synchronization
3.15   Transfer of embryo.

4. Molecular Biology
4.1   Introduction of basic molecular biology
4.2   Isolation of DNA and RNA, radiolabelling of nucleic acids
4.3   Nucleic acid hybridization, Gel electrophorosis,
4.4.   DNA sequencing
4.5.   Restriction enzymes, DNA modifying enzymes and DNA ligase
4.6.   Host cell types, plasmid, bacteriophage and other vectors,
4.7.   Cloning strategies: cloning from mRNA, genomic DNA
4.8.   Expression of cloned genes
4.9   The polymerase chain reaction
4.10.   Selection, screening and analysis of recombinants
4.11   Analysis of gene structure and function, making proteins
4.12.   Transformation of genes

5. Biotechnology
5.1   Transgenic animal production and its role in genetic improvement
5.2   Molecular breeding approaches in domestic animals
5.3   Recent advances in AI, ET, NT.
5.4   Genetic principle of diseases resistance and gene therapy
5.5   Animal biotechnology in Nepal
5.6   Genetic progress achieved through biotechnological approaches

6. Cattle and Buffalo Breeding:

6.1   Different mating systems for milk production of cattle and buffalo
6.2   Different mating systems for meat production in buffalo
6.3   Selection for genetic improvement of milk production from cattle and buffalo
6.4   Selection for genetic improvement of meat production in buffalo
6.5   Prepare of breeding plan for milk production in cattle and buffalo
6.6   Prepare of breeding plan for meat production in buffalo
6.7   Use of biotechnology for genetic improvement of cattle and buffalo for milk production
6.8   Use of biotechnology for meat production in buffalo.
6.9   A I and embryo transfer in cattle and buffaloes

7. Sheep and Goat Breeding:

7.1   Different mating systems for wool production in sheep
7.2   Different mating systems for quality pasmina production in changra goat
7.3   Different mating systems for meat production in goat
7.4   Selection for genetic improvement of wool production in sheep
7.5   Selection for genetic improvement of Pasmina production in changra goat
7.6   Selection for genetic improvement of meat production in goat
7.7   Use of biotechnology for genetic improvement of wool production
7.8   Use of biotechnology for genetic improvement of meat production
7.9   A I and embryo transfer in sheep and goat

8. Pig Breeding:

8.1   Genetic principles of pig breeding
8.2   Breeding plans based on selection and commercial breeding program in swine
8.3   Causes of evaluation; selection methods; breeding systems of pig
8.4   Genetic control population and inbred line development and maintain
8.5   Useful aids in selection; selection based on sib and own performance
8.6   Organized crossbreeding for commercial breeding
8.7   Meat production traits; body size and carcass traits
8.8   Inheritance of external traits; color and sex, inheritance in swine
8.9   Use of molecular genetics and biochemical polymorphisms in pig breeding
8.10 Genetic engineering in pig breeding and development of transgenic pig
8.11 Breeding pig for diseases and parasites resistance.

9. Poultry breeding:
9.1   Genetic principles of poultry breeding
9.2   Mating system and selection criteria breeding for chicken meat and egg production
9.3   Inbred lines are developed and maintained in poultry
9.4   Utilize *dw* (dwarf gene) for broiler production. The effect of dwarf gene on economic performance of poultry.
9.5   Intra population selection schemes in poultry
9.6   Diallel crossing
9.7   The egg production characters of laying poultry.
9.8   Random sample test and is important in poultry research.
9.9   Breeding plan for meat and egg production in poultry
9.10   Formation and maintenance of control population of poultry
9.11   The disease resistance mechanism in poultry

10. Lab animal breeding:
10.1   Lab animals and their breeding, handling and uses
10.2   Selection parameters, principles, methods, basis and genetic effect of selection.
10.3   Effective Selection procedure for genetic improvement of lab animals