

Syllabus for Jr. Grade OF MAH&VS (Agriculture & Allied Services) Examination

- 1) The Examination shall consist of Written Examination and Personal Interview.
- 2) Written Examination will consist of 5 (five) papers, namely –
 - (a) **Common Papers for all Services/Posts**
 - (i) *General English* - 100 Marks
 - (ii) *General Studies* - 100 Marks
 - (b) **Technical Papers**
 - (i) *Technical Paper I* - 200 Marks
 - (ii) *Technical Paper II* - 200 Marks
 - (iii) *Technical Paper III* - 200 Marks
 - Total** - **800 Marks**
 - (c) **Personal Interview** - **100 Marks**
 - Grand Total** - **900 Marks**
- 3) Written examination for each paper will be of 3 (three) hours duration. Compensatory time may be allowed for persons with benchmarked disabilities as prescribed by the Government from time to time.
- 4) Question papers for the written examination will be set in English.
- 5) Technical Papers shall have both MCQ and Conventional Essay Type Questions. MCQ shall carry 100 Marks (50 questions carrying 2 marks each) and Conventional Essay Type shall carry 100 Marks.
- 6) There will be more than one alternative for the answer to every MCQ.
- 7) For each question for which a wrong answer is given by the candidate, one-third of the marks assigned to that question will be deducted as penalty.
- 8) Personal interview will be conducted by the Commission and the same will carry 100 marks.

DETAILED SYLLABUS FOR WRITTEN EXAMINATION

1. **General English (Matriculation or equivalent standard) : 100 Marks**
 - (a) Précis Writing..... : 14 Marks
 - (b) Letter Writing..... : 10 Marks
 - (c) Comprehension of given passages : 10 Marks
 - (d) Grammar: Parts of Speech..... : 30 Marks
 - (e) Correct usage and Vocabularies..... : 16 Marks
 - (f) Formation of Sentence..... : 20 Marks
 - (i) Verbs
Tenses: Present/past forms, Simple/continuous forms, Perfect forms, Future time reference
 - (ii) Sentence Structure
Connectors
Types of sentences: Affirmative/interrogative sentences, Negation, Exclamations
Types of Phrases and Clauses: finite and non-finite subordinate clauses, noun clauses and phrases, adjective clauses and phrases, adverb clauses and phrases
Narration (Direct and Indirect speech)
2. **General Studies : 100 Marks**
 - (a) Current events of state, national and international importance..... : 12 Marks
 - (b) History of India and Indian National Movement..... : 12 Marks
 - (c) Indian and World Geography - Physical, Social, Economic Geography of India and the World..... : 12 Marks
 - (d) Indian Polity and Governance - Constitution, Political System, Public Policy, Duties & Rights Issues..... : 12 Marks
 - (e) Economic and Social Development Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, and other related issues..... : 12 Marks
 - (f) General issues on Environmental Ecology, Bio-diversity and Climate : 12 Marks
 - (g) General Science..... : 12 Marks

The topics listed above shall cover the State of Mizoram wherever applicable.

 - (h) General awareness on Mizo culture, its heritage and society..... : 16 Marks

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**TECHNICAL PAPERS FOR JUNIOR GRADE OF MIZORAM ANIMAL
HUSBANDRY & VETERINARY SERVICE**

AH & VETY Paper - I	200 Marks	3 hours with compensatory time of 20 minutes per hour for person with benched mark disabilities.
1) Livestock Production Management	40	
2) Animal Genetics and Breeding	40	
3) Animal Nutrition	40	
4) Veterinary and Animal Husbandry Extension Education	40	
5) Livestock Products Technology	40	
AH & VETY Paper - II	200 Marks	3 hours with compensatory time of 20 minutes per hour for person with benched mark disabilities.
1) Veterinary Microbiology	40	
2) Veterinary Pathology	40	
3) Veterinary Public Health and Epidemiology	40	
4) Veterinary Physiology and Biochemistry	40	
5) Veterinary Parasitology	40	
AH & VETY Paper - III	200 Marks	3 hours with compensatory time of 20 minutes per hour for person with benched mark disabilities.
1) Veterinary Anatomy	40	
2) Veterinary Surgery and Radiology	40	
3) Veterinary Medicine	40	
4) Veterinary Gynaecology and Obstetrics	40	
5) Veterinary Pharmacology and Toxicology	40	

AH&VETY PAPER-I

1. LIVESTOCK PRODUCTION MANAGEMENT (40 marks)

Demographic distribution of livestock and role in Indian economy. Common animal Husbandry (Glossary). Body conformation and identification. Common vices of animals. Selection and purchase of livestock. Judging and BCS for body parts of livestock. Selection of site, housing systems, layout and design of different buildings for various species, viz. cattle, buffalo, sheep, goat, pig and poultry. Breeds of domestic animals, pet animals and pet birds and their characteristics. Care and management of different domestic animals and birds. Principles of incubation and hatchery management practices. Selection and care of hatching eggs and hatchery hygiene. Candling, sexing, grading, packing and disposal of hatchery waste. Animal waste management, pollution and environmental issues. Breeds of cattle, buffalo, sheep, goat, pig and poultry and their characteristics. Care and management of cattle, buffalo, sheep, goat, pig and poultry including ducks and Japanese Quail. Common farm managemental practices for cattle, buffalo, sheep, goat, pig and poultry. Restraining of cattle, buffalo, pig. Importance and selection of laboratory animal, care and housing standards of mice, rats, hamster and guinea pigs. Status

and conservation practices of wild life in India. Restraining, handling, physical examination of captive animals.

2. ANIMAL GENETICS AND BREEDING (40 marks)

Mitosis vrs Meiosis. Chromosome numbers and types in livestock and poultry. Overview of Mendelian principles. Modified Mendelian inheritance. Pleiotropy, Penetrance and expressivity. Multiple alleles; lethals; sex-linked, sex limited and sex influenced inheritance. Sex determination. Linkage, crossing over and construction of linkage map. Mutation, Chromosomal aberrations. Cytogenetics, Extra-chromosomal inheritance. Molecular genetics. Gene concept, DNA and its replication. Introduction to molecular techniques.

Population Genetics: Introduction to population genetics; individual vrs population. Genetic structure of population: Gene and genotypic frequency. Hardy-Weinberg law and its application. Forces changing gene and genotypic frequencies (eg. Mutation, migration, selection and drift). Quantitative vrs qualitative genetics; concept of average effect and breeding value. Components of Variance. Concept of correlation and interaction between Genotype and Environment. Heritability and Repeatability. Genetic and Phenotypic Correlations.

Livestock and Poultry Breeding: History of Animal Breeding. Classification of breeds. Economic characters of livestock and poultry and their importance. Selection, types of selection, response to selection and factors affecting it. Bases of selection. Method of selection. Classification of mating systems. Inbreeding, outbreeding, etc. Systems of utilization of heterosis; Selection for combining ability (RS and RRS). Breeding strategies for the improvement of dairy cattle, buffalo, sheep, goat, swine and poultry. Sire evaluation. Open nucleus breeding system (ONBS). Development of new breeds or strains. Current livestock and poultry breeding policies and programmes in the state and country. Methods of conservation-livestock and poultry conservation programmes in the state and country.

3. ANIMAL NUTRITION (40 marks)

Importance of nutrients in animal production and health. Composition of animal body and plants. Nutritional aspect of carbohydrates, protein and fats. Role and requirement of water, metabolic water. Importance of minerals (major and trace elements) and vitamins in health and production, their requirements and supplementation in feed. Common feeds and fodders, their classification, availability and importance for livestock and poultry production. Measures of food energy and their applications. Protein evaluation of feeds - Measures of protein quality in ruminants and non-ruminants, biological value of protein, digestible crude protein. Calorie protein ratio. Introduction to feed technology- Feed industry; Processing of concentrates and roughages. Various physical, chemical and biological methods for improving the nutritive value of inferior quality roughages. Preparation, storage and conservation of livestock feed through silage and hay and their uses in livestock feeding. Feed additives in the rations of livestock and poultry and their uses.

Importance of scientific feeding. Feeding experiments. Digestion and metabolism trial. Feeding standards, their uses and significance. Balanced ration and its characteristics. General principles of computation of rations. Formulation of rations and feeding of dairy cattle and buffaloes during different phases of growth and production (neonate, young, adult, pregnant, lactating and dry animals; breeding bull) and working animals. Formulation of ration and feeding of sheep and

goat during different phases of growth and production (milk, meat and wool). Feeding of high yielding animals and role of bypass nutrients. Metabolic disorders and nutritional interventions.

Nutrient requirements in poultry, swine - Energy and protein requirement for maintenance and production. Feeding standards for non-ruminants and poultry. Formulation of rations as per BIS and ICAR specifications. Feeding of swine and poultry with conventional and unconventional feed ingredients. Feeding of ducks. Nutrient requirements of mice, rat, rabbit and guinea pig. Nutrient requirement and feeding of different categories of dogs and cats; peculiarities of feeding cats.

4. VETERINARY AND ANIMAL HUSBANDRY EXTENSION EDUCATION (40 marks)

Classification of farming. Early extension efforts in India. Extension education: Concept, levels, objectives and dimensions. Principles, philosophy and functions of extension education. Teaching learning process and steps in extension teaching. Rural development and importance of rural development programmes for poverty alleviation. Panchayati Raj System. Rural society. Characteristics and differences among tribal, rural and urban communities. Social control. Social stratification. Social institutions in rural society. Social change and social groups. Salient features of recent livestock census, livestock insurance scheme, national livestock mission. Introduction to animal welfare, ethics and rights.

Communication and its functions. Types of communication. Elements of communication. Barriers of communication. Individual contact methods, Group contact methods, Mass contact methods. Selection and use of extension teaching methods. Information kiosk, E-learning, CAD, virtual class room, virtual reality, multi-media etc. Cyber extension- problems and prospects in livestock extension. Computer networking. Technology-Concept, generation process, application, merits and de-merits. Adoption and diffusion of innovations . Programme planning. Dairy development programmes. Concept of cooperation, Rochdale principles of cooperation, objectives of cooperative, Amul pattern of dairy cooperative system and Operation Flood. Transfer of technology projects of ICAR, KVK, ATIC, ATMA, NAIP, RKVY, etc. Different on-going central and state government animal husbandry development programmes being run related to sheep, goat, poultry, piggery, fodder production etc.

Introduction to Economics and Livestock Economics: definition and scope. Important features of land, labour, capital and organization. Theories of demand, supply and cost. Theories of production. Concept of market. Market price and normal price, price determination under perfect competition in short and long run. Definition of entrepreneur, entrepreneurship, enterprise and manager. Types, characteristics and functions of an entrepreneur. Business plan for enterprise. Institutions promoting entrepreneurship in India

5. LIVESTOCK PRODUCTS TECHNOLOGY (40 marks)

Milk industry in India. Layout of milk processing plant and its management. Composition and nutritive value of milk and factors affecting composition of milk. Physico-chemical properties of milk. Microbiological deterioration of milk and milk products. Collection, chilling, standardization, pasteurization, UHT treatment, homogenization, bacto-fugation. Dried, dehydrated and fermented milk. Preparation of cream, butter, paneer or chhanna, ghee, khoa, lassi, dahi, ice-cream. Common defects of milk products and their remedial measures. Packaging of milk and milk

products. Good manufacturing practices and implementation of Food safety standards for milk and milk products.

Layout and management of rural, urban and modern abattoirs. FSSAI standards on organization and layout of abattoirs. Animal welfare and pre-slaughter care, handling and transport of meat animals including poultry. Procedures of Ante-mortem and post mortem examination of meat animals. Slaughtering and dressing of meat animals and birds. Evaluation, grading and fabrication of dressed carcasses including poultry. Abattoir by-products. Skin and hides. Treatment of condemned meat and carcasses. Management of effluent emanating from abattoir.

Prospect of meat industry in India. Structure and composition of muscle (including poultry muscle). Conversion of muscle to meat. Nutritive value of meat. Fraudulent substitution of meat. Preservation of meat and poultry; drying, salting, curing, smoking, chilling, freezing, canning, irradiation and chemicals. Ageing of meat. Modern processing technologies of meat and meat products. Packaging of meat and meat products. Fermentation of meat products. Basics of sensory evaluation of meat products. Nutritive value, preservation, packaging of egg and egg products. Laws governing national or international trade in meat and meat products. Organic and genetically modified meat and poultry products.

AH & VET PAPER- II

1. VETERINARY MICROBIOLOGY (40 marks)

Introduction and history of Microbiology ; Classification and nomenclature of bacteria; Microscopy; Bacterial stains and techniques; Structure and morphology of bacteria; Growth and nutritional requirement of aerobic and anaerobic bacteria; Types and sources of infection, method of transmission of infection. Pathogenicity, virulence, determinants of virulence, Epizootic and enzootic diseases, bacteremia, septicaemia and toxemia, endotoxins, exotoxins, antitoxins, toxoids; Bacterial genetics (Mutation, Transformation, Transduction and Conjugation), plasmids and antibiotic resistance. Study of important pathogenic bacteria epidemiology, pathogenicity, diagnosis, prevention and control of bacterial diseases such as Staphylococcus, streptococci, corynebacterium, actinomycetes, Listeria, Erysipelotrix, Bacillus, Clostridium, Mycobacterium, Enterobacteriaceae (*E.coli*, Klebsiella, Salmonella, Yersinia, Proteus), Pseudomonas and Burkholderia, Vibrio, Actinobacillus, Pasteurella, Mannheimia, Haemophilus, Brucella, Campylobacter, Bordetella, Moraxella. Leptospira, Coxiella, Rickettsia (Indian Tick Typhus and Scrub typhus), Chlamydia and chlamydia.

History of Virology; Introduction to viruses; Structure of Viruses; Classification of Viruses; Genetic viral interactions; Viral Pathogenesis, Oncogenesis, latency and immunopathology. Studies of important Viruses such as Poxviridae (Cowpox virus, Lumpy skin disease), Asfaviridae- African swine fever, Herpesviridae - human herpes virus 1&2, bovine mammillitis, IBR, Marek's disease, ILT, Adenoviridae- Bovine adenovirus, porcine adenovirus, Fowl adenovirus, Egg drop syndrome, Papillomaviridae - Human, bovine, canine papilloma virus, Parvoviridae- FPV, Canine parvovirus, Circoviridae- PCV, Hepadnaviridae- Hepatitis B virus, Retroviridae- Bovine, Reoviridae- Blue tongue, Rota virus, Birnaviridae-IBD, Paramyxoviridae- Newcastle disease, canine distemper, rinderpest, Rhabdoviridae- Vesicular stomatitis, Rabies, Bovine Ephemeral fever, Bornaviridae,

Orthomyxoviridae- Influenza virus A/B/C, Coronaviridae- Transmissible gastroenteritis virus, Arteriviridae-PRRS, Picornaviridae- FMD, swine vesicular disease, Classical swine fever, Bovine viral diseases in Livestock and Poultry, their Epidemiology, Clinical Signs, Diagnosis, Prevention and Control. Epidemiology, clinical signs, diagnosis and control of livestock fungal diseases (Candidiasis, Cryptococcosis, Aspergillosis, Histoplasmosis, Blastomycosis, Rhinosporidiosis).

History of Immunology; Lymphoid organs, tissues and Cells: Types of Immunity. Antigens & Antibody. Major histocompatibility complex (MHC). Antigen processing and presentation. Complement system. Cytokines. Hypersensitivity. Autoimmunity; Immunotolerance; Concept of Immunity to Microbes, Vaccines and other biological. Basic concepts and scope of Recombinant DNA technology; Application of molecular and biotechnological techniques: Polymerase chain reaction.

2. VETERINARY PATHOLOGY (40 marks)

Introduction and scope of Veterinary Pathology. Causes of disease. Haemodynamic disorders. Glycogen overload, amyloidosis and fatty changes. Cell injury- degenerations, necrosis and its types, apoptosis, differences between post-mortem autolysis and necrosis, gangrene and its types. Pigments and calcification. Photosensitization. Disturbances in growth. Inflammation. Wound healing. Immunopathology. Animal Oncology- Definitions, general characteristics and classification of neoplasms. Pathology of various types of tumours in domestic animals. Veterinary Clinical Pathology: Haematology, Urinalysis, etc. Biopsy and cytology. Necropsy. Pathological changes affecting Digestive, Respiratory, Musculoskeletal, Cardiovascular, Haematopoietic, Lymphoid, Urinary, Reproductive, Nervous, Endocrine systems, Skin and Appendages, Ear and Eye.

Pathology of viral infections: Pathogenesis, gross and microscopic pathology of viral infections. Pathology of prion diseases. Pathology of bacterial infections: Pathogenesis, gross and microscopic pathology of bacterial infections. Pathogenesis, gross and microscopic pathology of fungal infections and mycotic diseases. Pathogenesis, gross and microscopic pathology of parasitic infections. Pathological changes of nutritional imbalances (in brief) due to carbohydrates, proteins, fats, minerals and vitamins and metabolic diseases.

Avian Inflammation. Pathogenesis, gross and microscopic pathology of poultry viral diseases. Pathogenesis, gross and microscopic pathology of poultry bacterial diseases. Pathogenesis, gross and microscopic pathology of Mycoplasma infections, chlamydiosis. Pathogenesis, gross and microscopic pathology of fungal and mycotic diseases. Miscellaneous diseases and common vices.

3. VETERINARY PUBLIC HEALTH & EPIDEMIOLOGY (40 marks)

Aims and scope of Veterinary Public Health. One Health concept and initiatives. Principles and concepts of food hygiene and safety. Milk hygiene. Hygienic and safe milk production practices. Cleaning, sanitation and hygiene of milk plant, meat plant, abattoir and dairy equipments. Pathological conditions associated with the transport of food animals. Hygiene in abattoirs and meat plants. Detection of conditions or diseases and judgements during ante mortem and post mortem inspection. Meat as a source of disease transmission. Sources of contamination of meat and methods of carcass decontamination. Occupational health hazards in abattoir and meat plants. Foodborne infections and intoxications associated with

foods of animal origin such as (*Bacillus cereus*, Campylobacteriosis, *Clostridium botulinum*, *Clostridium perfringens*, *E. coli*, Listeriosis, Non typhoidal salmonellosis, *Staphylococcus aureus*, Shigellosis, *Vibrio cholerae*, *Vibrio parahaemolyticus*, Q fever, Poliomyelitis Hepatitis A, Aflatoxicosis. Toxic residues (pesticides, antibiotics, metals and hormones) in foods and associated health hazards. Types of biohazards. Hazard analysis and critical control points (HACCP) system. International food safety standards: OIE, WTO agreements and Codex Alimentarius Commission. Sanitary and phytosanitary measures in relation to foods of animal origin. Food Safety and Standards Act and Regulations. Role of FSSAI, BIS, etc.

Epidemiology- Principle, definition of epidemiological terms, application of epidemiological measures in the study of diseases and disease control. Strategies of disease management: prevention, control and biosecurity. National and international regulations on livestock diseases. Zoonosis-Definition, history and socio-economic impact of zoonotic diseases. Classification, prevention and control of zoonoses such as Bacterial Zoonoses (Anthrax, Bartonellosis, Borreliosis, Brucellosis, Campylobacteriosis, Cat scratch disease, Erysipelas, Glanders, *Helicobacter gastritis*, Leptospirosis, Listeriosis- *Listeria monocytogenes*, Melioidosis, Rat Bite fever, Tetanus, tuberculosis, Plague). Viral zoonoses (Monkey pox virus, Rota virus, Colorado tick fever, Newcastle disease, Hendra and Nipah virus, Rabies, Swine influenza, Avian influenza, CCHF, rift valley fever, Sandfly fever, Hantavirus, Lymphocytic Choriomeningitis virus, Foot Mouth Disease, Encephalomyocarditis, Chikungunya, Yellow fever virus, Dengue, West Nile fever, Japanese Encephalitis fever, Kyasanur forest disease, Hepatitis E virus). Prions (Scrapie/ bovine spongiform encephalopathy, Kuru/Creutzfeldt Jacob disease). Fungal (Candidiasis, Cryptococcosis, Aspergillosis, Histoplasmosis, Blastomycosis, Rhinosporidiosis), Parasitic: -(Toxoplasmosis, Cryptosporidiosis, Leishmaniasis, VLM, CLM, Ancylostomiasis, Trichinosis, Taeniasis and cysticercosis, Diphyllbothriosis, Cercarial dermatitis, Fasciolopsis, Paragonimiasis, Scabies). Rickettsia (Indian Tick Typhus and Scrub typhus), Chlamydia and Chlamydophila.

Emerging, re-emerging and occupational zoonoses. Role of domestic, wild, pet and laboratory animals and birds in transmission of zoonoses. Bioterrorism. Epidemiology, clinical manifestations and management of zoonoses.

Environmental contaminants in food chain-bioaccumulation, biomagnifications and persistent organic pollutants. Environmental pollution Air pollution. Air borne diseases. Water contamination. Water qualities. Water purification methods. Water borne diseases. Soil, marine and thermal pollution. Noise pollution. Nuclear hazards or radiological hazard). Disaster management and mitigation. Biomedical waste management. Global warming and greenhouse effect. Carcass disposal.

4. VETERINARY PHYSIOLOGY & BIOCHEMISTRY (40 marks)

Blood constituents and their functions. Haemostasis. Resting membrane potential and action potential. Conductive systems of the heart. Cardiac cycle. Electrocardiograph. Haemodynamics of circulation. Neuro muscular junction. Mechanism of muscle contraction in skeletal, cardiac, and smooth muscles. Organization of the nervous system. Autonomic nervous system. Types of neurons and their functions. Synapse. Special sense organs.

Prehension, mastication, and deglutition. Regulation of secretory functions of salivary glands, stomach, liver, pancreas, and intestine. Digestion and absorption of carbohydrates, protein, and fats in monogastric and polygastric animals. Digestion

in birds. Mechanics of breathing. Transport of blood gases. Neural and chemical regulations of breathing. Adaptation of respiration during muscle exercise. Respiration in birds.

Formation of dilute and concentrated urine in mammals. Acid-base balance. Formation and excretion of urine in birds. Synthesis, secretion, and transport of hormones. Mechanism of action of hormones. Hormones of the hypothalamus, pituitary glands, thyroid glands, parathyroid glands, adrenal glands, pancreas, testes, and ovaries. Gametogenesis. Folliculogenesis.

Puberty. Estrous cycle. Ovulation. Fertilization. Pregnancy. Parturition. Biosynthesis of milk constituents. Galactopoiesis. Lactogenesis. Growth curves. Growth in meat-producing animals. Thermoregulation in farm animals. Responses of animals to heat and cold. Effect of different environmental variables (temperature, humidity, light, radiation, and altitude) on animal performance. General adaptive syndrome. Circadian rhythm. Neurophysiology of behaviors. Types of behavior. Communication.

Scope and Importance of Biochemistry. Structure of Biological Membranes and Transport across Membranes. Donnan Membrane Equilibrium. Dissociation of Acids, pH, Buffer Systems, Biochemistry of Carbohydrates. Biochemistry of lipids. Fat indices. Structure and functions of prostaglandins. Biochemistry of proteins. Amino acids. Biochemistry of nucleic acids: Chemistry of purines, pyrimidines, nucleosides and nucleotides. Biological significance of nucleosides and nucleotides. Structures and functions of deoxyribonucleic acid (DNA) and atypical ribonucleic acid (RNA).

Enzymes: Definition and classification. Properties. Factors influencing enzyme action. Enzyme units. Enzyme inhibition. Respiratory chain or electron transport chain, oxidative phosphorylation, inhibitors, uncouplers and other factors influencing electron transport chain. Carbohydrate metabolism. Lipid metabolism. Protein metabolism. Deamination, transamination and decarboxylation of amino acids. Ammonia transport and urea cycle. Nucleic acid metabolism. DNA and RNA biosynthesis and regulation. Regulation and Integration of metabolism. Disorders of Carbohydrate Metabolism: Diabetes mellitus, Ketosis, Bovine Ketosis, Pregnancy toxemia, hypoglycaemia in baby pigs, hyperinsulinism in Dogs. Hormonal control of carbohydrate metabolism and regulation of blood sugar. Biochemical tests for the detection of disturbance in carbohydrate metabolism. Plasma Proteins and clinical significance. Lipid Profile in disease diagnosis. Liver function tests. Biochemical tests of renal function. Disturbance in acid base balance and its diagnosis. Biochemistry of digestive disorders.

5. VETERINARY PARASITOLOGY (40 marks)

Types of parasites, types of hosts and vectors, modes of transmission of parasites and methods of dissemination of the infective stages of various parasites. General harmful effects of parasites including various tissue reactions caused by parasites, pathogenesis, epidemiology and general control measures (chemo- and immunoprophylaxis). Introduction, and general account of flukes such as *Fasciola*, amphistomes, *Opisthorchis* and *Paragonimus*; tapeworms such as *Dipylidium*, *Taenia*, *Echinococcus* and *Diphyllobothrium*; round worm such as *Ascaris*, *Toxocara* and *Strongyloides*, *Oesophagostomum*, hook worms, gastrointestinal nematodes of ruminants (GIN), *Thelazia*, *Spirocerca*, *Dirofilaria*, *Trichinella* and *Trichuris*. Study of anthelmintic resistance and its types.

Introduction and general life cycles of arthropods. Important morphological features, general bionomics, vector potentiality, pathogenesis and control of arthropods affecting animals and birds. *Musca*, *Stomoxys*, *Chrysops*, bottle flies/myiasis, lice and fleas. General account of soft ticks (*Argas*, *Ornithodoros* and *Otobius*). Hard ticks (*Hyalomma*, *Haemaphysalis*, *Rhipicephalus* (*Boophilus*) and *Amblyomma*). Mites (*Demodex*, *Notoedres*, *Sarcoptes*, *Psoroptes*, *Chorioptes*, *Cnemidocoptes* and *Otodectes*). Study of insecticide or acaricide resistance.

Introduction and general life cycle of protozoa of veterinary importance. Important morphological features, life cycles, modes of transmission of the following parasites such as *Trypanosoma evansi*, *Histomonas*, *Entamoeba* and *Giardia*. Coccidiosis of poultry and domestic animals. Cyst forming coccidia (*Toxoplasma*, *Sarcocystis* and *Neosporacanthium*) including *Cryptosporidium*. Piroplasms (canine and bovine *Babesia* spp., bovine *Theileria* spp.) and *Anaplasma*, *Cytauxzoon* and *Ehrlichia*.

AH & VETY PAPER-III (200marks)

1. VETERINARY ANATOMY (40 marks)

Introduction to anatomy and branches of anatomy and descriptive terms used. General Osteology, Arthrology and Myology: Study of properties and structure of bone. Classification of skeletons, classification of bones. Introduction to arthrology, classification of joints, structure of diarthrodial joints. Introduction to myology, classification of muscles, etymology of muscles. Description of tendon, ligaments, aponeurosis, synovial bursa and synovial sheath. General Angiology, Neurology and Aesthesiology: Introduction to angiology. Structure of heart. General plan of systemic and pulmonary circulations, lymphatic and venous systems. Introduction to neurology and parts of central, peripheral and autonomic nervous system and sense organs. Different surface regions, joint regions, Palpable Bony areas or prominences of the body of the animal. Palpable Lymph nodes and Arteries of the body and Surface veins for Vene puncture. General Splanchnology: Introduction, boundaries of thoracic, abdominal and pelvic cavities, topography of different organs of digestive, respiratory, urinary, endocrine, male and female reproductive systems of domestic animals and fowl.

Fore limb: Bones of fore limb of ox and differences. Joints, ligaments, stay apparatus, major blood vessels, nerves, veins and lymph nodes of fore limb. Head and neck: Cranial and facial bones, cervical vertebrae of ox and differences. Articulations and special ligaments of the head and neck. Muscles of face, mastication, eye, ear. Teeth, hard and soft palate, tongue, pharynx, larynx, thyroid, parathyroid and salivary glands and differences. Cranial nerves, blood vessels and lymph nodes of head and neck regions. Study of sense organs, trachea and oesophagus. Sites for Tracheotomy, Esophagotomy, Cornual, Importance of Cornual nerve and superficial Temporal artery in Amputation of Horn in cattle.

Thorax: Thoracic vertebrae, ribs and sternum of ox and differences in dog, pig and fowl. Joints, special ligaments, blood vessels, nerves. Organs of thorax and differences. Pleura, its reflections and mediastinum. Areas of auscultation and percussion of heart and lungs. Abdomen: Bones of abdomen of ox and differences. Joints, special ligaments blood vessels, nerves of abdomen region. Blood and nerve supply to abdominal viscera. Peritoneal reflections, organs of digestive, urinary,

male and female reproductive systems present in abdomen and differences. Mammary glands in cow and differences. Spleen of ox and differences. Major veins, lymphvessels, lymphnodes and endocrine glands of abdomen. Boundaries and Clinical importance of the flank and Para Lumbar Fossa. Sites for Laparotomy, Rumenocentesis, Rumenotomy, Caesarean Operation.

Hind limb and pelvis: Bones of hind limb and pelvis of ox and differences in horse, dog, pig and fowl. Joints, ligaments, blood vessels, lymph nodes and nerves of hind limb, pelvis and tail region and pelvic viscera. Pelvic peritoneal reflections, organs of digestive, urinary, male and female reproductive systems present in pelvic cavity and differences in horse, dog, pig and fowl. Boundaries of the inguinal canal and structures of the spermatic cord, pre pubic tendon and its importance. External genital organs.

Cytology, cell junctions, study of basic tissues. Microscopic structures of digestive, circulatory, urinary, respiratory, nervous, lymphatic, endocrine, male and female genital systems and mammary glands of domestic animals. Microscopic structure of sense organs i.e. eye, ear and integument. Introduction to embryology, gametogenesis, fertilization, cleavage, types of eggs, morula, blastulation, gastrulation, types of implantations, twinning. Formation of foetal membranes in mammals and birds, Placenta and its classification. Different germ layers and their derivatives. Development of organs of digestive system including accessory structures i.e tongue, teeth, salivary glands, liver and pancreas.

2. VETERINARY SURGERY AND RADIOLOGY (40 marks)

Introduction: Historical perspective, Definitions, classification of surgery, tenets of Halsted. Pre-operative, intraoperative and post operative considerations: Sterilization and disinfection. Sutures. Treatment of acute and chronic inflammation. Haemostasis. Basic surgical affections. abscess, tumour, cyst, hernia, haematoma, necrosis, gangrene, burn and scald, frost bite. Veterinary anaesthesiology: Introduction: Development of anaesthesiology, Terminology, classification and indications. General considerations of anaesthesia: Painandits management in animals. Local and regional anaesthesia. Preanaesthetics. General anaesthesia. Dissociative anaesthesia. Toxicity, antidote and reversal agents.

Introduction to Radiology-General terminology of radiology, Physical properties of X-Rays, cope and uses of Radiology, Directional terms for veterinary radiology. Radiation hazards and safety measures. Production of quality diagnostic radiograph. Contrast radiography. Diagnostic ultrasonography. Advanced diagnostic imaging tools- The brief introduction to the use and limits of some advanced imaging techniques, Canine lameness. Bovine lameness. Fracture. Luxations. Spinal trauma, diagnosis and its management.

Regional Surgery of Head and Neck: Affections of lips, cleft palate, tongue, cheek, and their treatment. Affections of teeth and jaws and their treatment. Affections of nose, face, ear, head and horn and their treatment. Affections of eye and their treatment. Oesophagus and their treatment. Affections of larynx and Trachea. Thoracic affections: Surgical approaches, perforated wounds, pyothorax, pneumothorax, pneumocele, Diaphragmatic hernia and traumatic pericarditis in cattle .Abdominal affections: Surgica approach to the abdomen indifferent animal species. Surgical affections of the stomach in large animal and their management. Surgical affections of small intestines, large intestine and their management. Urinary system. Genital system: Surgical affections of male and female genital system and their management.

3. VETERINARY MEDICINE (40 marks)

History and scope of Veterinary Medicine, concept of animal diseases. Concepts of diagnosis, differential diagnosis, treatment and prognosis. General systemic states, hyperthermia, hypothermia, fever, septicemia, toxemia, shock, allergy, anaphylaxis, oedema, coma, anaemia, common clinical poisonings and dehydration.

Etiology, clinical manifestations, diagnosis, differential diagnosis, treatment, prevention and control of the following diseases of cattle, buffalo, sheep, goat, pig, dog, cat and poultry: Diseases of digestive, respiratory, cardiovascular, urinary, nervous, musculoskeletal, haemopoietic, and lymphatic systems, skin, sense organs including affections of peritoneum, liver and pancreas. Emergency medicine and critical care. Diagnosis and management of diseases caused by deficiency of iron, copper, cobalt, zinc, manganese, selenium, calcium, phosphorus, magnesium, iodine, vitamin A, D, E, B complex, K and C. Diseases of neonates, Aetiology, clinical manifestations, diagnosis, differential diagnosis, treatment prevention and control of metabolic or production and endocrine diseases of cattle, buffalo, sheep, goat, pig, dog, cat and poultry.

Aetiology, epidemiology, clinical manifestations, diagnosis, treatment, prevention and control of bacterial, fungal and rickettsial diseases of livestock. Aetiology, epidemiology, clinical manifestations, diagnosis, treatment, prevention and control of viral and parasitic diseases of diseases of cattle, buffalo, sheep, goat, horse, pig, dog, cat and poultry. Principles of zoo hygiene, public health problems arising from zoos.

Legal duties of veterinarians, laws related to medicine, evidence, common offences against animals and laws related to these offences. Examination of living and dead animals in criminal cases. Cruelty to animals and bestiality. Legal aspects of: Examination of animals for soundness, examination of injuries and post-mortem examination. Causes of sudden death in animals. Provincial and Central Acts relating to animals. Glanders and Farcy Act 1899 (13 of 1899). Dourine Act 1910 (5 of 1910), Laws relating to offences affecting Public Health. Laws relating to poisons and adulteration of drugs. Livestock importation act, liability and insurance. Code of conduct and ethics for veterinarians - the regulations made under the Act. Animal welfare. Animal Welfare organizations and its role in animal welfare.

4. VETERINARY GYNAECOLOGY AND OBSTETRICS (40 marks)

Veterinary gynaecology. Bovine: Applied clinical anatomy and embryology of female reproductive tract- Applied reproductive physiology and endocrinology of oestrous cycle. Transportation and survivability of gametes in female reproductive tract – Follicular Dynamics-ovulation and aberrations of ovulation-Incidence causes, diagnosis treatment and prevention of ovulatory failures-Fertilization. Pathological affections of ovary, uterine tubes, uterus, cervix, vagina and external genitalia. Clinical management of specific and non-specific forms of infectious infertility. Role of nutrition, climate and stress on reproductive efficiency-Infertility-Anestrus and repeat breeding syndrome. Herd reproductive health management and fertility parameters in individual animals and in herds. Assisted reproductive techniques. Techniques of Pregnancy diagnosis. Phantom pregnancy – Medical termination of pregnancy– Aberrations of oestrous cycle- Methods of Population control by medical and surgical techniques. Principle, procedure and application of ultrasonography in farm and pet animal reproduction.

Veterinary obstetrics. Farm and pet animals - Maternal recognition of pregnancy - Applied Endocrinology of pregnancy- Pregnancy diagnosis - Duration of pregnancy-Implantation, Placentation. Wandering of ovum- Telegony-Superfetation and Superfecundation - Clinical management of specific and non specific causes of abortion, mummification, maceration, cervicovaginal prolapsed, uterinetorsion. Parturition. Lactational disorders - Puerparium and factors affecting puerparium - Postpartum care of the dam and neonate in different species of farm and pet animals-Dystocia. Fetotomy. Cesarean section in small and large animals-Maternal obstetrical paralysis - Retention of fetal membranes, Total uterine prolapse and common metabolic diseases of puerperal period- Injuries incidental to parturition - Post partum uterine infections - Postpartum resumption of ovarian activity.

Veterinary andrology and A.I. Farm and pet animals - Comparative clinical reproductive anatomy and endocrinology of the male reproduction - - Sexual behavior and libido- Sperm transport, erection and ejaculation -Coital injuries and vices in male animals - Semen and ejaculate - Semen collection techniques-Structure of Spermatozoa - Semen evaluation - Semen extenders, dilution, preservation and post thaw evaluation - Artificial insemination techniques in farm and pet animals - Forms of male infertility. Breeding soundness evaluation of bull - In vitro tests for evaluation of male fertility -Medical and surgical techniques for population control of the male reproduction - Surgical procedure on the male reproductive tract in farm and pet animals.

5. VETERINARY PHARMACOLOGY AND TOXICOLOGY (40 marks)

Introduction, Principles of drug activity: Pharmacokinetics & Pharmacodynamics. Adverse drug reactions, drug interactions. Drugs acting on digestive system. Rumen pharmacology. Drugs acting on cardio vascular system. Drugs acting on respiratory system. Drugs acting on urogenital system. Pharmacological basis of fluid therapy. Pharmacotherapeutics of hormones. Drugs acting on skin and mucous membranes.

Neurohumoral transmission, Pharmacology of neurotransmitters. Autacoids pharmacology. Classification of drugs acting on CNS. History, mechanism and stages of general anaesthesia. Inhalant, intravenous and dissociative anaesthetics. Hypnotics and sedatives; psychotropic drugs, anticonvulsants, opioid analgesics, non-steroidal anti-inflammatory drugs, analeptics and other CNS stimulants. Drugs acting on somatic nervous system: Local anaesthetics, muscle relaxants Euthanizing agents.

Antimicrobial agents: Classification, general principles in antimicrobial chemotherapy, antimicrobial resistance, combined antimicrobial therapy Antitubercular drugs. Antifungal agents. Antiviral and anticancer agents. Anthelmintics. Antiprotozoal agents. Ectoparasiticides. Antiseptics and disinfectants. Pharmacology of drugs of abuse in animals. Pharmacology of indigenous medicinal plants.

General Toxicology: Sources and classification of toxicants, factors modifying toxicity, general approaches to diagnosis and treatment of poisoning. Toxicity caused by metals and non-metals. Poisonous plants. Toxicity caused by Agrochemicals. Fungal and bacterial toxins. Venomous bites and stings.
