PUNJAB PUBLIC SERVICE COMMISSION

COMBINED COMPETITIVE EXAMINATION (CCE) SYLLABUS

VETERINARY SCIENCE

Total Marks: 100

Topics

1. **APPLIED BASIC VETERINARY SCIENCES**

Applied anatomy and physiology: Functional organisation of the digestive, respiratory, cardiovascular, urinary, reproductive, endocrine, nervous and musculoskeletal systems; skin, udder and lactation. Relevant differences among ruminants, equines, companion animals and poultry, with applications to health and production. **Applied biochemistry:** Principles of nutrient metabolism, energy balance, fluid and electrolyte balance and acid–base regulation; their relevance to nutritional, metabolic and clinical disorders. **General pathology:** Cell injury, inflammation, degeneration, necrosis, circulatory disturbances, tissue repair and neoplasia; interpretation of these processes in common animal diseases. Necropsy and interpretation of common gross lesions. **Microbiology, immunology and parasitology:** Characteristics of bacteria, viruses, fungi and parasites relevant to disease transmission and control. Host–pathogen relationships, innate and acquired immunity, maternal immunity, vaccination and immunosuppression. Application of parasite life cycles to prevention and control.

2. **CLINICAL MEDICINE, DIAGNOSTICS AND PRIORITY ANIMAL DISEASES**

Clinical assessment: History taking, systematic clinical examination, identification of problems, differential diagnosis and clinical decision making. Recognition of emergencies. **Diagnostic approaches:** Selection, collection, preservation and transportation of specimens. Interpretation of basic hematology, serum biochemistry, urinalysis, fecal examination, cytology, microscopy, microbial culture, antimicrobial susceptibility reports, serology and molecular tests. Principles, indications and limitations of radiography and ultrasonography. **Priority livestock infectious diseases:** Foot-and-mouth disease, haemorrhagic septicemia, blackleg, anthrax, peste des petits ruminants, lumpy skin disease, bovine ephemeral fever, brucellosis, bovine tuberculosis and rabies. **Priority poultry infectious diseases:** Newcastle disease, avian influenza, infectious bursal disease, infectious bronchitis, Marek's disease, salmonellosis and colibacillosis. **Parasitic and vector-borne diseases:** Tick infestations, theileriosis, babesiosis, anaplasmosis, trypanosomiasis, gastrointestinal helminthiasis, fasciolosis, coccidiosis, mange and other common ectoparasite infestations; practical control strategies. **Common clinical and production disorders:** Mastitis, neonatal diarrhoea, pneumonia, bloat, ruminal acidosis, displaced abomasum, hypocalcaemia, ketosis, pregnancy toxemia and lameness. Recognition, diagnostic approach, management principles and prevention of production losses. Representative fungal diseases: dermatophytosis and aspergillosis; recognition, diagnostic approach, management principles and prevention. **Companion and working animals:** canine parvovirus infection, canine distemper, feline panleukopenia, equine colic, strangles, glanders and equine piroplasmosis. Preventive healthcare of companion animals, working equids and camels.

3. VETERINARY SURGERY, ANESTHESIA, REPRODUCTION AND OBSTETRICS

Surgical principles: Animal handling and restraint; asepsis, sterilisation, wound assessment, wound healing and surgical infection prevention. Indications and welfare considerations for common procedures, including castration, dehorning, hernia repair and management of hoof conditions. **Anesthesia and emergency care:** Principles of local and general anesthesia, analgesia and perioperative monitoring. Initial assessment and stabilisation of shock, hemorrhage, traumatic injuries and fractures; postoperative care; principles of fluid and electrolyte therapy; recognition of dehydration and acid–base disturbances. **Reproductive management:** Estrous cycles, estrus detection, breeding timing, artificial insemination, semen quality and handling, breeding soundness examination of males, pregnancy diagnosis and reproductive records. Interpretation of conception rate, services per conception and calving interval. **Infertility and reproductive disorders:** Anestrus, repeat breeding, reproductive infections, abortion and common postpartum disorders; diagnostic approach, prevention and herd-level management. **Obstetrics and neonatal care:** Recognition and management principles of dystocia, retained fetal membranes, metritis and uterine or vaginal prolapse. Parturition management, colostrum provision and prevention of neonatal losses.

4. EPIDEMIOLOGY, HERD HEALTH AND BIOSECURITY

Epidemiological principles: Disease occurrence and distribution; incidence, prevalence, morbidity, mortality, case fatality and attack rate. Risk factors, association and causation; transmission patterns and population susceptibility. **Research and evidence interpretation:** Principles of sampling, observational studies and clinical trials. Basic descriptive statistics, bias, confounding and uncertainty. Interpretation of simple tables, graphs and study findings. Interpretation of relative risk, odds ratios and confidence intervals using simple supplied data; statistical significance and practical importance. **Diagnostic performance:** Sensitivity, specificity and predictive values; interpretation of screening and confirmatory tests. **Surveillance and outbreak investigation:** Passive, active and sentinel surveillance; case definitions, line lists, time–place–animal analysis, specimen selection, source tracing and disease reporting. Early warning, disease mapping and risk-based surveillance. **Herd and flock health programs:** Vaccination strategies, vaccine cold chains, assessment of vaccination failure, quarantine, isolation, cleaning, disinfection, movement management and farm biosecurity.

5. VETERINARY PHARMACOLOGY, TOXICOLOGY AND ANTIMICROBIAL STEWARDSHIP

Rational therapeutics: Applied pharmacokinetics and pharmacodynamics; selection of drug class, route and regimen according to clinical indication. Contraindications, interactions, adverse effects and assessment of treatment response. Principles of antimicrobial, antiparasitic, anti-inflammatory, analgesic and supportive therapy. Prescription quality, storage, product quality, treatment records and pharmacovigilance. **Antimicrobial resistance and stewardship:** Selection and transmission of resistance among animals, humans and the environment; consequences for animal health, public health and food production. Culture and susceptibility testing, empirical versus targeted treatment; antimicrobial selection

and duration; distinctions among treatment, metaphylaxis and prophylaxis. Protection of critically important antimicrobials and monitoring of antimicrobial use. **Drug residue prevention:** Withdrawal periods, maximum residue limits and prevention of veterinary-drug residues in milk, meat and eggs. **Veterinary toxicology:** Cyanide, nitrate or nitrite, urea, pesticides, mycotoxins, heavy metals and poisonous plants. Recognition, diagnostic approach, immediate response, principles of antidotal and supportive treatment and prevention.

6. VETERINARY PUBLIC HEALTH, ONE HEALTH AND FOOD SAFETY

One Health: Relationships among human, animal, plant and environmental health. Joint surveillance, information sharing, coordinated risk assessment and prevention at the livestock–wildlife–human interface. Institutional coordination, community participation and preparedness for zoonotic outbreaks. **Priority zoonoses:** Rabies, brucellosis, bovine tuberculosis, anthrax, leptospirosis, Q fever, salmonellosis, campylobacteriosis, echinococcosis, toxoplasmosis and Crimean–Congo haemorrhagic fever. Reservoirs, exposure routes, occupational risks and coordinated prevention. **Milk and animal-source food hygiene:** Hygienic production, collection, processing, storage and transportation of milk, meat, eggs and fish. Pasteurization, cold-chain management and prevention of contamination and adulteration. **Meat inspection and slaughter hygiene:** Objectives and principles of ante-mortem and post-mortem inspection; slaughter hygiene, identification of public-health hazards and handling of condemned material. **Food-safety management:** Biological, chemical and physical hazards; antimicrobial residues, aflatoxins and other contaminants. Good hygiene practices, hazard analysis and critical control points (HACCP), traceability, sampling, recall and risk communication. **Environmental and occupational safety:** Safe handling of animals and specimens; personal protection, laboratory biosafety and biosecurity. Management of carcasses, manure, wastewater, sharps and veterinary waste.

7. ANIMAL PRODUCTION, NUTRITION AND FARM MANAGEMENT

Livestock production systems: Smallholder and commercial dairy, beef, sheep, goat and camel production systems. Locally important breeds, production constraints and opportunities for improvement. **Housing and husbandry:** Housing, ventilation, stocking density, water supply, sanitation and animal comfort. Calf and young-stock rearing, milking management, lactation and dry-period management; maintenance of working animals. **Poultry production:** Broiler, layer and breeder management; hatchery hygiene, incubation, hatchability, chick quality, brooding, lighting, litter management and ventilation. **Performance assessment:** Milk yield and quality, growth, mortality, culling, reproductive efficiency, feed conversion, egg production and flock uniformity. Use of farm records and benchmarks to identify and resolve management problems. **Nutritional principles:** Functions of energy, protein, fibre, minerals, vitamins and water; digestion and nutrient utilisation in ruminants, monogastric animals and poultry. **Balanced feeding:** Requirements for maintenance, growth, reproduction and production; body-condition assessment and recognition of nutritional deficiencies and excesses. Simple ration evaluation using supplied feed-composition and requirement data. **Fodder and feed resources:** Locally available feeds, pasture management, seasonal fodder planning, hay, silage, crop residues and safe use of non-conventional feeds. **Feeding management:** Feeding of young, transition and lactating animals and poultry; prevention of feeding-related disorders, drought feeding and water security. **Feed safety and**

efficiency: Sampling, quality assessment, adulteration, spoilage, mycotoxins and storage losses. Safe use of supplements, urea and additives; principles of probiotics, prebiotics and feed enzymes. Reduction of feeding costs and nutrient losses while maintaining health and productivity. **Aquaculture:** Basic production systems, water quality, stocking, feeding, biosecurity and recognition of fish mortality events; food-safety implications and integrated production systems. **Wildlife and zoo animals:** Principles of conservation, captive-animal health, quarantine, welfare and disease risks at wildlife–livestock interfaces.

8. ANIMAL GENETICS, BREEDING AND BIOTECHNOLOGY

Genetic principles: Inheritance, quantitative traits, heritability, selection, breeding values, inbreeding, crossbreeding and heterosis. **Breeding programs:** Performance and pedigree recording; selection of economically important traits. Breeding strategies suited to local production conditions; conservation of indigenous breeds, adaptability and disease resistance. **Reproductive biotechnology:** Estrus synchronization, semen cryopreservation, sexed semen, embryo transfer and in vitro embryo production. **Diagnostic biotechnology:** Applications and limitations of conventional polymerase chain reaction (PCR), reverse-transcription PCR, real-time PCR, enzyme-linked immunosorbent assay (ELISA), rapid antigen tests, point-of-care diagnostics and genomic sequencing. **Vaccines and emerging technologies:** Principles and applications of conventional, recombinant, viral-vectored and nucleic-acid vaccines. Genomic selection and its practical applications. Awareness of emerging applications of gene editing, nanotechnology and targeted drug delivery.

9. DIGITAL VETERINARY SERVICES, ARTIFICIAL INTELLIGENCE AND PRECISION FARMING

Digital services: Electronic clinical and farm records, animal identification, traceability, mobile disease reporting, geographic information systems (GIS) and tele-veterinary services. **Precision livestock farming:** Sensors and wearables for monitoring activity, estrus, rumination, temperature, milk quality and farm conditions. **Artificial intelligence:** Basic concepts of artificial intelligence (AI) and machine learning. Applications in diagnostic-image interpretation, disease surveillance, outbreak-risk prediction, production forecasting and clinical decision support. Generative AI applications in documentation, information retrieval and farmer communication; verification of outputs, factual errors and limitations of automated advice.

10. LIVESTOCK ECONOMICS, POLICY, GOVERNANCE AND EXTENSION

Sector development: Contributions of livestock and poultry to livelihoods, nutrition, food security, employment and rural development; principal constraints and development priorities.

Applied economics: Fixed and variable costs, farm budgets, gross margins, break-even analysis and partial budgeting. Simple cost–benefit and cost-effectiveness comparisons; economic losses from animal disease. **Markets and value chains:** Livestock and product marketing, quality incentives, producer organisations, credit, insurance, traceability and barriers to domestic and export market access. **Policy and regulation:** Objectives and implementation of frameworks concerning animal disease control, quarantine, veterinary medicines, feed quality, breeding, food safety and welfare. Veterinary certification and principles of sanitary trade requirements.

Institutional coordination: Roles of provincial and federal services, local administration, laboratories, universities, professional regulators, private providers and international organisations. **Veterinary service delivery and extension:** Access in underserved areas, mobile services, referral networks, farmer education, participatory extension, public–private partnerships and entrepreneurship. Inclusion of women and smallholders; risk communication and management of misinformation.

Program management and professional ethics: Needs assessment, priority setting, objectives, budgeting, implementation, monitoring and evaluation. Accountability, transparent resource allocation, informed consent, confidentiality, accurate certification and management of conflicts of interest. Planning and monitoring public vaccination campaigns; procurement and distribution of veterinary supplies, maintenance of essential stocks and equitable allocation of veterinary services.

11. **ANIMAL WELFARE, CLIMATE RESILIENCE AND DISASTER MANAGEMENT**

Welfare assessment: Physical and behavioural indicators; nutrition, environment, health, behaviour and mental state. Prevention of avoidable pain, injury, fear and distress. **Humane management:** Welfare during housing, handling, transport, markets and slaughter; euthanasia principles. Welfare of companion, working, laboratory and captive wildlife animals; responsible ownership and humane population management. **Ethical animal use:** Principles of replacement, reduction and refinement in teaching and research. **Climate resilience:** Effects of heat stress, floods, drought and changing vector distributions on health and productivity. **Sustainable production:** Efficient resource use, manure management, reduction of greenhouse-gas emissions and nutrient losses, biodiversity conservation and sustainable pasture management. **Disaster management:** Risk assessment, contingency planning, evacuation, rescue, emergency shelter, feed and water provision, carcass disposal and continuity of veterinary services. Post-disaster surveillance, rehabilitation and coordination with disaster-management authorities.

Suggested readings

1. Constable, P. D., Hinchcliff, K. W., Done, S. H., & Grünberg, W. (2017). Veterinary Medicine: A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats (11th ed.). Elsevier.
2. McDonald, P., Edwards, R. A., Greenhalgh, J. F. D., Morgan, C. A., Sinclair, L. A., & Wilkinson, R. G. (2022). Animal Nutrition (8th ed.). Pearson.
3. Noakes, D. E., Parkinson, T. J., & England, G. C. W. (Eds.). (2019). Veterinary Reproduction and Obstetrics (10th ed.). Elsevier.
4. Riviere, J. E., & Papich, M. G. (Eds.). (2018). Veterinary Pharmacology and Therapeutics (10th ed.). Wiley-Blackwell.
5. Rushton, J. (Ed.). (2009). The Economics of Animal Health & Production. CABI.

6. Swayne, D. E., Boulianne, M., Logue, C. M., McDougald, L. R., Nair, V., Suarez, D. L., de Wit, S., Grimes, T., Johnson, D., Kromm, M., Prajitno, T. Y., Rubinoff, I., & Zavala, G. (Eds.). (2020). Diseases of Poultry (14th ed.). Wiley-Blackwell.

7. Thrusfield, M., & Christley, R. (2018). Veterinary Epidemiology (4th ed.). Wiley-Blackwell.

8. König, H. E., & Liebich, H. G. (2009). Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. Schattauer, Germany.

9. Reece, W. O. (Ed.). (2004). Dukes' Physiology of Domestic Animals (12th ed.). Comstock Publishing Associates, USA.

10. Nelson, D. L., & Cox, M. M. (2013). Lehninger Principles of Biochemistry. Worth Publishers.

11. Tortora, G. J., Funke, B. R., & Case, C. L. (2012). Microbiology: An Introduction (11th ed.). Benjamin Cummings.

12. Urquhart, G. M., Armour, J., Duncan, J. L., Dunn, A. M., & Jennings, F. W. (2000). Veterinary Parasitology. Longman Scientific & Technical, UK.

13. Stine, K. E., & Brown, T. M. (2006). Principles of Toxicology (2nd ed.). Taylor & Francis, USA.

14. Memon, R. A., & Bashir, E. (1995). Extension Methods. National Book Foundation, Islamabad, Pakistan.

15. Venugopalan, A. (2000). Essentials of Veterinary Surgery (8th ed.). Oxford, New Delhi.

16. Roberts, S. J. (1986). Veterinary Obstetrics and Genital Diseases (2nd ed.). Edwards Brothers, Ann Arbor, Michigan, USA.

17. Banerjee, G. C. (2009). A Textbook of Animal Husbandry (8th ed.). Oxford & IBH Publishing Co., New Delhi, India.

18. Pond, W. G., Church, D. C., & Pond, K. R. (2006). Basic Animal Nutrition and Feeding (5th ed.). John Wiley & Sons, New York, USA.

19. Klug, W. S. (2010). Essentials of Genetics. Pearson Benjamin Cummings, San Francisco, USA.

20. Leeson, S., & Summers, J. D. (2002). Scott's Nutrition of the Chicken. International Book Distributing Co., Guelph, Ontario, Canada.

21. Bourdon, R. M. (2000). Understanding Animal Breeding. Prentice Hall, Upper Saddle River, New Jersey, USA.

22. Thomas, C. K., Sastry, N. S. R., & Ravikiran, G. (2012). Dairy Bovine Production. Kalyani Publishers, New Delhi, India.

23. Alvi, A. S. (1991). Meat Production and Technology in Pakistan. Pakistan Agricultural Research Council, Islamabad.

24. Walstra, P. (2005). Dairy Technology: Principles of Milk Properties and Processes. Marcel Dekker, New York, USA.

25. Nickels, W. G., McHugh, J. M., & McHugh, S. M. Understanding Business (7th ed.). McGraw-Hill Irwin.

Manuals, Standards and Official Publications

1. Merck & Co., Inc. (n.d.). Merck Veterinary Manual.

2. World Organisation for Animal Health (WOAH). (n.d.). Terrestrial Animal Health Code.

3. World Organisation for Animal Health (WOAH). (n.d.). Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.

4. Food and Agriculture Organization of the United Nations, United Nations Environment Programme, World Health Organization, & World Organisation for Animal Health. (2022). One Health Joint Plan of Action (2022–2026): Working Together for the Health of Humans, Animals, Plants and the Environment. World Health Organization.

5. Food and Agriculture Organization of the United Nations, United Nations Environment Programme, World Health Organization, & World Organisation for Animal Health. (2023). A Guide to Implementing the One Health Joint Plan of Action at National Level. World Health Organization.

6. Codex Alimentarius Commission. (2022). General Principles of Food Hygiene (CXC 1-1969). Food and Agriculture Organization of the United Nations & World Health Organization.

7. Government of Pakistan, Finance Division. (2026). Pakistan Economic Survey 2025–26.

Note: **The above list is only suggestive and not exhaustive. Candidates may consult other standard books and relevant material covering the prescribed syllabus.**

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