American College of Veterinary Internal Medicine (ACVIM)
General - Large Animal Internal Medicine Exam (GEN-LAIM)
Test Specifications

I. General Section	**50%**
A. Cardiology	**5.5%**
1. Describe the cardiac cycle	
2. Describe the electrical conduction system, including the cardiac action potentials	
3. Describe the determinants of heart rate, cardiac output, peripheral vascular resistance, preload, and afterload	
4. Describe pathophysiology of left- and right- sided congestive heart failure	
5. Describe the components of a normal electrocardiogram (ECG)	
6. Recognize blood-based biomarkers associated with heart disease (e.g., troponin, NT-pro BNP)	
7. Describe pharmacology of therapeutics used in the treatment of cardiac disease (e.g., anti-arrhythmic drugs, ACE inhibitors, diuretic drugs, omega-3 fatty acids)	
B. Endocrine	**6%**
1. Describe the normal physiology of the thyroid gland	
2. Describe the normal physiology of the parathyroid gland	
3. Describe the normal physiology of the adrenal gland	
4. Describe the normal physiology of the endocrine pancreas	
5. Describe the normal physiology of the hypothalamic pituitary axis	
6. Recognize endocrine effects of adipose tissue	
7. Describe physiologic effects of endocrine hormones (e.g., steroidal, nonsteroidal)	
C. Gastrointestinal/Hepatobiliary	**6.5%**
1. Explain the production and function of GI hormones	
2. Describe the anatomy and physiology of the liver and biliary system	
3. Describe the anatomy and physiology of the monogastric gastrointestinal system	
4. Describe the anatomy and physiology of the exocrine pancreas	
5. Describe the role of the liver in drug and toxin metabolism and excretion	
6. Describe bile acid metabolism	
7. Explain digestion and absorption of macro-nutrients (i.e., protein, fat, fiber, and carbohydrate)	

8. Explain digestion and absorption of micro-nutrients (e.g., vitamins and minerals)	
9. Discriminate between mechanisms of vomiting and regurgitation	
10. Discriminate between mechanisms of diarrhea	
11. Recognize indications for various types of fecal analyses	
12. Describe pharmacology of therapeutics used in the treatment of gastrointestinal and hepatobiliary disease (e.g., gastro-protectants, motility modifiers, anti-emetics, probiotics)	
D. Hemolymphatic/Immunology	**5.5%**
1. Differentiate between primary and secondary hemostasis	
2. Differentiate between innate vs. acquired immunity	
3. Describe the roles of cytokines and chemokines	
4. Explain the pathophysiology of hypersensitivity reactions	
5. Recognize mechanisms of inflammation and fever	
6. Recognize the mechanisms of anemia	
7. Describe the maturation process of blood cell lines in bone marrow	
8. Describe principles of major and minor cross match	
9. Recognize principles of immunologic and molecular diagnostic techniques (e.g., immunohistochemistry, ELISA test for antibody or antigen), and the limitations of these tests	
10. Describe the role of the immune system in cancer development and progression	
11. Recognize the mechanisms of cell death (e.g., apoptosis, autophagy, necrosis)	
12. Describe pharmacology of therapeutics used in the treatment of immune-related or hematologic disease (e.g., vaccines, immunosuppressants, anti-inflammatories)	
13. Describe mechanisms and types of edema and effusions	
14. Describe the characteristic features of the immunoglobulin classes	
E. Nephrology/Urology	**6%**
1. Describe anatomy and physiology of the urinary system (e.g., RAAS system, counter current exchange, electrolyte handling)	
2. Recognize mechanisms of urinalysis abnormalities (e.g., proteinuria, glucosuria, pigmenturia)	
3. Recognize factors that impact urine concentration	
4. Describe the mechanisms of polyuria/polydipsia	
5. Describe the physiology of micturition	
6. Recognize factors that impact glomerular filtration rate	
7. Describe the renal regulation of acid-base status	
8. Describe the role of the kidney in drug and toxin excretion	
9. Differentiate between acute kidney injury vs. chronic kidney disease	

10. Describe pharmacology of therapeutics used in the treatment of urologic disease (e.g., diuretics, fluid therapy, continence)	
F. Neurology/Musculoskeletal	**5%**
1. Determine neuro-localization based on neurologic examination findings	
2. Describe the anatomy and physiology of sympathetic and parasympathetic nervous systems	
3. Describe the physiology of neuronal conduction and synaptic transmission	
4. Describe the cellular anatomy and physiology of the neuromuscular junction and normal muscle cell physiology	
5. Recognize mechanisms and effects of neurotoxins	
6. Describe pharmacology of therapeutics used in the treatment of neurologic disease and the role of the blood brain barrier	
G. Nutrition/Metabolism	**4%**
1. Describe mechanisms of appetite regulation	
2. Recognize components of the nutritional assessment	
3. Recognize factors that impact maintenance energy requirements	
4. Recognize key pathways of cellular glucose, protein and lipid metabolism	
5. Describe pathophysiology of starvation and refeeding syndrome	
6. Describe mechanisms of calcium, phosphorus, magnesium, and vitamin D homeostasis	
H. Respiratory	**5.5%**
1. Describe the anatomy and physiology of the respiratory system	
2. Interpret assessments of oxygenation (e.g., arterial blood gas, including calculation of A-a gradient, pulse oximetry)	
3. Describe findings from respiratory examination, including upper airway sounds, lung sounds, and respiratory patterns	
4. Describe the mechanisms of cough	
5. Describe the pulmonary regulation of acid-base status	
6. Describe pharmacology of therapeutics used in the treatment of respiratory disease (e.g., bronchodilators, anti-tussives)	
I. Pan-Systemic	**3.5%**
1. Recognize basic terminology of the microbiome (e.g., alpha diversity, beta diversity, gamma diversity)	
2. Describe mechanisms of pathogenicity of bacterial, viral, fungal, protozoal, and parasitic infections	
3. Describe the mechanisms of action of antimicrobial classes	
4. Recognize basic terminology describing the principles of pharmacology (e.g., pharmacokinetics, pharmacodynamics)	
5. Describe the mechanisms of action of sedatives, anesthetics, and analgesics	

J. Epidemiology	**2.5%**
1. Apply terminology relating to epidemiology to the interpretation of diagnostic test results (e.g., sensitivity, specificity, predictive values)	
2. Recognize advantages, and disadvantages of various study designs	
3. Recognize advantages and disadvantages of basic statistical analyses (i.e., Chi-square, T tests, types of errors/bias, correlation, ANOVA)	
II. LAIM Specific Section	**50%**
A. Cardiology	**4.5%**
1. Interpret an ECG	
2. Recommend treatment of a cardiac arrhythmia	
3. Describe cardiac congenital anomalies	
4. Diagnose inflammatory cardiac diseases	
B. Endocrine	**4.5%**
1. Recognize pathophysiology of pars pituitary intermedia dysfunction	
2. Describe mechanisms of insulin resistance	
3. Describe the normal physiology associated with the estrus cycle and management of pregnant animals	
4. Diagnose periparturient conditions in dams and neonates (e.g., lactation, prematurity vs. dysmaturity)	
C. Gastrointestinal/Hepatobiliary	**8.5%**
1. Describe the anatomic and physiologic features of the gastrointestinal system	
2. Differentiate causes of dysmotility in ruminants and pseudoruminants	
3. Differentiate causes of abdominal distention in ruminants and pseudoruminants	
4. Differentiate nutritional causes of GI disorders in ruminants and pseudoruminants	
5. Differentiate between various types of gastrointestinal ulcers (large animal)	
6. Differentiate between causes of colic, including neonates	
7. Recommend medical and/or surgical treatment for colic, including neonates	
8. Differentiate among infectious causes of gastrointestinal & hepatobiliary disease	
9. Differentiate among toxic causes of gastrointestinal & hepatobiliary disease	
10. Diagnose esophageal disorders	
11. Differentiate between primary and secondary causes of hepatic lipidosis & hyperlipidemia	
12. Recommend diagnostics related to hepatopathies	
13. Diagnose hepatopathies	

D. Hemolymphatic/Immunology/Oncology	**4.5%**
1. Interpret diagnostics related to hemostatic disorders	
2. Diagnose failure of passive transfer	
3. Interpret a complete blood count	
4. Differentiate among causes of infectious vasculitis	
5. Differentiate among causes of hemolysis	
6. Differentiate among hemolytic disorders	
7. Diagnose lymphoma/lymphosarcoma	
8. Differentiate among infectious causes of lymphatic disease	
9. Develop a vaccination plan (e.g., timing, type, frequency)	
10. Describe mechanisms of SIRS and sepsis	
E. Nephrology/Urology	**5%**
1. Describe mechanisms of urolith formation	
2. Recognize principles of management of urolithiasis and uroabdomen	
3. Recognize differences in urinary anatomy across species	
4. Recognize principles of management of acute kidney injury	
5. Recognize principles of management of chronic kidney disease in equine	
6. Develop a fluid therapy plan	
7. Recognize principles of management of omphalitis	
8. Interpret urinary diagnostics (e.g., fractional excretions, SDMA)	
9. Differentiate among infections of the urinary system	
F. Neurology/Musculoskeletal	**5.5%**
1. Integrate species specific neurologic exam components	
2. Interpret diagnostic results for the nervous system (e.g., CSF, myelogram)	
3. Differentiate among myopathies (e.g., HYPP, blackleg)	
4. Differentiate among causes of central and peripheral neurologic disorders (e.g., traumatic, infectious, toxic, degenerative)	
5. Describe mechanisms of laminitis	
6. Recognize principles of management of arthropathies	
7. Recognize principles of management of lameness in ruminants	
G. Nutrition/Metabolism	**4%**
1. Describe pathophysiology and recognize principles of management of equine metabolic syndrome	

2. Recognize findings of nutritional deficiencies and excesses	
3. Recognize nutrients of concern based on pathophysiologic state including when a nutritional consultation is needed	
4. Describe pathophysiology and recognize principles of management of ketosis, hypomagnesemia, and hypocalcemia in ruminants	
5. Integrate species-specific nutritional assessment components (e.g., forage analysis, additional components of the ration)	
H. Respiratory	**7%**
1. Diagnose and recognize principles of management of common diseases and disorders of the upper respiratory system (e.g., guttural pouch mycosis, empyema, laryngeal/pharyngeal disfunction)	
2. Diagnose and recognize principles of management of common diseases and disorders of the lower respiratory system (e.g., BRD, viral vs. bacterial pneumonias, asthma)	
3. Interpret diagnostics of respiratory diseases & disorders (e.g., thoracocentesis, tracheal wash)	
I. Pan-Systemic	**4%**
1. Interpret a biochemical profile	
2. Apply regulatory requirements for therapeutics (e.g., drugs, biologics, supplements)	
3. Diagnose and recognize principles of management of uveitis	
4. Diagnose and recognize principles of management of infectious reproductive diseases including abortion and mastitis	
5. Apply principles of antimicrobial stewardship	
6. Recognize common neoplasias (e.g., dermatology, ocular)	
J. Epidemiology	**2.5%**
1. Develop a biosecurity protocol for infectious, zoonotic, and nosocomial pathogens	