

American College of Zoological Medicine
Job Task Analysis Report
May 22, 2012

The American College of Zoological Medicine (ACZM) has completed a major goal, as highly recommended by the American Board of Veterinary Specialists, in conducting a Job Task Analysis (JTA). The purpose of a JTA is to define the minimal expectations for veterinarians working in the specialty practice of zoological medicine. Because the ACZM has both a Qualification (Day 1) and Certification (Day 2) examination, it was necessary to define the minimal competencies and knowledge base for veterinary specialists at both levels. The important aspect of the JTA for the ACZM is to create examinations that accurately reflect the jobs that specialists of various disciplines within zoological medicine perform, which ultimately makes the examination legally defensible as well as reflective of the minimal competencies that the ACZM is asserting are needed for successful practice in the field.

The ACZM hired Schroeder Measurement Technologies, Inc. (SMT) as a consultant for the JTA. The first step done by SMT personnel was to use information from various websites, job descriptions, and published research to develop an exhaustive list of the tasks, knowledge, skills, and abilities (KSAs) required for entry level veterinarians in zoological medicine to be competent in the field.

In July 2011, the ACZM held the first part of the JTA to provide content area expertise for the Qualification examination. A group of 13 diplomates, comprised of subject matter experts (SMEs) representative of the diversity of zoological medicine gathered July 12–13, 2011, at The Wilds in Cumberland, OH. The initial KSAs and task list was presented to this group. After thorough and extensive group discussions, the list was revised, augmented, and finally approved by consensus as the content outline for the Qualifying Examination. The SMEs then considered the breadth and complexity of the nine domains represented in the approved content outline, and assigned weights to each domain. Based on the structure of the Day 1 examination, these domains with their assigned weights will be used to establish the content outline which will serve as the blueprint for the Qualifying Examination.

A second meeting using 20 diplomates as SMEs was held November 4–5, 2011, at Disney's Animal Kingdom Lodge in Orlando, FL. The goal of the meeting was to develop blueprints for four Certification Examinations (Aquatics, General Zoo, Wildlife, and Zoological Companion Animals). The content outline from the Qualifying Examination was used as the starting point for each separate Certification Examinations. The eight or nine SMEs participating in the individual examination discussions reviewed the Qualifying Examination content outline, and through extensive discussion revised, augmented, and finally approved by consensus, the content outline for each of the respective Certification Examinations. The SMEs then considered the breadth and complexity of the nine domains in the approved content outline and assigned weights to distribute the examination content across the nine domains in each of the five taxon based Certification examinations. In order to maintain consistency across the Qualifying and Certification Examinations, the whole group of SMEs then reconvened as one group to review and approve the final content outlines for each Certification examination.

The ACZM Examination Committee now has the challenge to start to implement the JTA domain weighted content blueprint into the Qualifying and Certification examinations. It is anticipated that the changes will begin to be implemented immediately and will be fully integrated into the examination structure by 2015 in line with decisions made by the current ACZM executive committee.

The full reports of the JTA for the Qualifying and Certification examinations will be available on the members-only section (password protected) of the ACZM web site. It is hoped that diplomates will take the time to look at these documents and begin the process of helping examination candidates incorporate these content outlines and domain weights into study strategies.

The domain and taxon weights for the Qualifying Examination (Table 1) and for the Certification Examination (Table 2), and the Content Outline Task Element lists for both examinations (Table 3, 4) will be posted on the publicly accessible portion of the ACZM web site. The resulting examination blueprints will become the structure of the ACZM Board Examination over the next 3 years. The current list of subjects that have long been used for the examination structure (Table 5) are incorporated into the domain list and resulting examination blueprints. It is important to realize that the target weights for each domain in each examination allow for some limited flexibility in the actual construction and content of the examination.

The final part of the JTA is the actual task analysis. The various task elements for the Qualifying examination and each of the Certification examinations are presented in Table 5. These task elements will help to convey the context of the content outlines and domains, especially the Communication, Education, Administration and Research domains.

Table 1. Domain Weights for the ACZM Qualifying Examination

Domain Section	Anatomy, Taxonomy, and Physiology	Environmental	Preventive Medicine	Restraint	Medicine and Surgery	Diagnostics	Biologics and Therapeutics	Communication, Education, and Administration	Research
Aquatic	13%	18%	16%	11%	17%	12%	9%	3%	1%
Avian	12%	14%	13%	11%	22%	14%	10%	3%	1%
Herptile	12%	16%	16%	10%	21%	12%	9%	3%	1%
Mammal	10%	12%	16%	15%	20%	12%	11%	3%	1%
Wildlife	7%	18%	9%	13%	22%	14%	7%	7%	3%

Table 2. Taxon Weights for the ACZM Certification Examinations

Taxon	Aquatics	General Zoo	Wildlife	Zoological Companion Animals
Mammals	39%	43%	45%	32%
Fish	39%	5%	6%	4%
Birds	8 %	28%	30%	32%
Invertebrates	5%	1%	2 %	1 %
Herpetofauna	9 %	22%	17%	--
Amphibians	--	--	--	5 %
Reptiles	--	--	--	26 %

Table 3. ACZM Qualifying Examination Content Outline Task Elements

- I. Anatomy, Taxonomy, and Physiology
 - A. Compare and contrast differences among zoological species.
 - i. Anatomical
 - ii. Physiological
 - B. Know general taxonomy and phylogeny.
- II. Environmental
 - A. Evaluate potential hazards.
 - i. Biological
 - ii. Chemical
 - iii. Physical
 - B. Understand husbandry requirements relative to natural history.
 - C. Evaluate environmental conditions in relation to animal health and welfare.
 - D. Understand life support systems for managed environments.
 - E. Describe and apply principles of hygiene and sanitation.
 - F. Understand basic principles of ecology.
 - G. Understand principles of disease ecology.
 - H. Apply principles of behavior and welfare.
 - i. Appropriate social structures and natural behaviors
 - ii. Recognize and manage aberrant behaviors
 - iii. Environmental enrichment
 - iv. Operant conditioning
 - v. Ethical issues
 - vi. Objective criteria for euthanasia decisions
 - I. Understand conservation medicine and one health approaches.
 - J. Understand basic epidemiological principles.
 - i. Terminology
 - ii. Disease surveillance
 - iii. Risk analysis
- III. Preventive Medicine
 - A. Describe and utilize principles of nutrition.
 - i. Dietary requirements and formulation
 - ii. Food handling and storage
 - iii. Food safety
 - B. Develop and implement pest control programs.
 - C. Develop preventive medicine protocols.
 - i. Biosecurity
 - ii. Vaccination
 - iii. Parasite management
 - iv. Quarantine
 - v. Age- and taxon-specific
 - vi. Animal movements
- IV. Restraint
 - A. Understand tranquilizers, sedatives, anesthetics, and other restraint agents.
 - i. Mechanisms and actions

- ii. Administration and routes
 - iii. Clinical pharmacokinetics
- B. Describe effects and indications for use of different types of restraint.
- C. Understand the safety implications for humans, non-target species, and the environment.
- D. Understand the use and clinical applications of capture and immobilization equipment.
- E. Understand patient risks involved with capture and anesthesia.
- F. Understand the principles of anesthetic monitoring.
 - i. Clinical applications
 - ii. Interpretation
 - iii. Intervention
- V. Medicine and Surgery
 - A. Gather and evaluate patient history information from owners, caretakers, and managers.
 - B. Perform physical examinations.
 - C. Describe indications for surgery and surgical techniques.
 - D. Describe pre- and post-operative management.
 - E. Identify the etiology and understand the pathophysiology of diseases.
 - F. Understand diagnostic and treatment modalities for diseases.
 - G. Plan and assess patient management.
 - H. Identify and address public health issues regarding zoological species.
 - I. Describe principles of wound management.
 - J. Describe and explain species-appropriate euthanasia techniques.
 - K. Describe triage approaches.
 - L. Create and prioritize a list of differential diagnoses from results of clinical examination and diagnostic procedures.
 - M. Understand and apply principles of pain management.
 - N. Understand and apply principles of fluid therapy.
 - O. Understand the principles of reproductive management.
 - i. Contraception
 - ii. Assisted reproduction
- VI. Diagnostics
 - A. Describe the principles and clinical applications of diagnostic technologies.
 - B. Interpret results of diagnostic tests.
 - C. Select appropriate samples for examination and analysis.
 - D. Select appropriate techniques for collection, handling, and storage of diagnostic samples.
 - E. Plan a diagnostic approach to the investigation of individual animal- or population-related disease.
 - F. Conduct gross necropsy and postmortem analyses.
 - G. Correlate histopathology and other diagnostic results with disease processes.
- VII. Biologics and Therapeutics
 - A. Explain mechanisms of actions.
 - B. Describe effects and indications for use.
 - C. Select routes of administration.

- D. Understand clinical pharmacokinetics.
- E. Explain the safety implications for humans and environmental exposure.
- VIII. Communication, Education, and Administration
 - A. Explain issues related to zoological medicine to the public, policy makers, and other professionals.
 - B. Train and supervise individuals with respect to zoological species.
 - C. Know international regulations as they relate to zoological species.
 - D. Understand terminology specific to zoological species.
- IX. Research
 - A. Understand the concepts of animal care and use.
 - B. Understand study design.
 - C. Understand basic principles of statistical analysis

Table 4. ACZM Certification Examination Content Outline Task Elements

Aquatics

I. Anatomy, Taxonomy, and Physiology

A. Understand and utilize clinically significant differences among aquatic species.

- i. Anatomical
- ii. Physiological

B. Apply knowledge of taxonomy and phylogeny.

II. Environmental

A. Evaluate and manage potential hazards and understand differential effects across taxonomic groups.

- i. Biological
- ii. Chemical
- iii. Physical

B. Apply husbandry requirements relative to natural history.

C. Address environmental conditions in relation to animal health and welfare.

D. Manage life support systems for artificial environments.

- i. Filtration
- ii. Water chemistry
- iii. Air quality

E. Describe and apply principles of hygiene and sanitation.

F. Understand the clinical impact of basic principles of ecology.

G. Understand the clinical impact of disease ecology.

H. Implement behavior and welfare management.

- i. Appropriate social structures and natural behaviors
- ii. Recognize and manage aberrant behaviors
- iii. Environmental enrichment
- iv. Operant conditioning
- v. Ethical issues
- vi. Objective criteria for euthanasia decisions

I. Apply principles of conservation medicine and One Health approaches.

J. Utilize basic epidemiological principles.

- i. Terminology
- ii. Disease surveillance
- iii. Risk analysis

III. Preventive Medicine

A. Describe and utilize principles of nutrition.

- i. Dietary requirements and formulation
- ii. Food handling and storage
- iii. Food safety

B. Develop and implement pest control programs.

C. Develop and implement preventive medicine protocols.

- i. Biosecurity
- ii. Vaccination

- iii. Parasite management
- iv. Quarantine
- v. Age- and taxon-specific
- vi. Animal movements

IV. Restraint

- A. Demonstrate appropriate use of tranquilizers, sedatives, anesthetics, and other restraint agents.
 - i. Mechanisms and actions
 - ii. Administration and routes
 - iii. Clinical pharmacokinetics
- B. Demonstrate appropriate use of different types of restraint (e.g., behavioral, chemical, physical).
- C. Understand and manage the safety implications for humans, non-target species, and the environment.
- D. Demonstrate appropriate use of capture and immobilization equipment.
- E. Manage patient risks involved with capture and anesthesia.
- F. Understand the principles of monitoring during restraint.
 - i. Clinical applications
 - ii. Interpretation
 - iii. Intervention
- G. Select appropriate methods for animal transport.

V. Medicine and Surgery

- A. Gather and evaluate case history.
- B. Perform physical examinations and recognize abnormalities.
- C. Describe indications for surgery and demonstrate surgical techniques.
- D. Implement pre- and post-operative management plans.
- E. Identify the etiology and understand the pathophysiology of diseases.
- F. Select appropriate diagnostic and treatment modalities for diseases.
- G. Plan and assess medical case management.
- H. Identify and address public health issues regarding aquatic species.
- I. Apply principles of trauma and wound management.
- J. Select species-appropriate euthanasia techniques.
- K. Implement triage approaches.
- L. Create and prioritize a list of differential diagnoses from results of history, clinical examination, and diagnostic procedures.
- M. Understand and apply principles of pain management.
- N. Understand and apply principles of fluid therapy.
- O. Understand and apply the principles of reproductive management.
 - i. Contraception
 - ii. Assisted reproduction
 - iii. Obstetrics

VI. Diagnostics

- A. Describe the principles and clinical applications of diagnostic modalities.
- B. Examine samples, interpret results of diagnostic tests, and understand their limitations.

- C. Select and obtain appropriate antemortem samples for examination and analysis.
- D. Demonstrate appropriate techniques for collection, handling, and storage of diagnostic samples.
- E. Plan a diagnostic approach to the investigation of individual animal- or population-related disease.
- F. Conduct gross necropsy and recognize basic pathology.
- G. Select and obtain appropriate postmortem samples for examination and analysis.
- H. Recognize histopathological findings and correlate with other diagnostic results.

VII. Biologics and Therapeutics

- A. Select and administer appropriate therapeutic agents considering:
 - i. Mechanisms of actions
 - ii. Effects and indications
 - iii. Clinical pharmacokinetics and pharmacodynamics
- B. Understand and manage hazards for animals, humans, and environmental exposure.
- C. Calculate volumes and concentrations needed for therapeutic administration.

VIII. Communication, Education, and Administration

- A. Explain and present information related to zoological medicine to the public, media, policymakers, and other professionals.
- B. Train and supervise individuals with respect to aquatic species.
- C. Know international regulations as they relate to aquatic species and animal health (e.g., CITES, OIE).
- D. Understand terminology specific to aquatic species.
- E. Contribute to the development of policies and standard operating procedures related to animal management and public health and safety.
- F. Maintain accurate and comprehensive medical records.

IX. Research

- A. Advise in animal care and use research policy.
- B. Understand research methodologies and develop an appropriate study design.
- C. Apply basic principles of statistical analysis.
- D. Identify and critique appropriate and relevant scientific literature.

General Zoo

I. Anatomy, Taxonomy, and Physiology

- A. Understand and utilize clinically significant differences among zoological species.
 - i. Anatomical
 - ii. Physiological
- B. Apply knowledge of taxonomy and phylogeny.

II. Environmental

A. Evaluate and manage potential hazards and understand differential effects across taxonomic groups.

- i. Biological
- ii. Chemical
- iii. Physical

B. Apply husbandry requirements relative to natural history.

C. Address environmental conditions in relation to animal health and welfare.

D. Manage life support systems for artificial environments.

E. Describe and apply principles of hygiene and sanitation.

F. Understand the clinical impact of basic principles of ecology.

G. Understand the clinical impact of disease ecology.

H. Implement behavior and welfare management.

- i. Appropriate social structures and natural behaviors
- ii. Recognize and manage aberrant behaviors
- iii. Environmental enrichment
- iv. Operant conditioning
- v. Ethical issues
- vi. Objective criteria for euthanasia decisions

I. Apply principles of conservation medicine and One Health approaches.

J. Utilize basic epidemiological principles.

- i. Terminology
- ii. Disease surveillance
- iii. Risk analysis

III. Preventive Medicine

A. Describe and utilize principles of nutrition.

- i. Dietary requirements and formulation
- ii. Food handling and storage
- iii. Food safety

B. Develop and implement pest control programs.

C. Develop and implement preventive medicine protocols.

- i. Biosecurity
- ii. Vaccination
- iii. Parasite management
- iv. Quarantine
- v. Age- and taxon-specific
- vi. Animal movements

IV. Restraint

A. Demonstrate appropriate use of tranquilizers, sedatives, anesthetics, and other restraint agents.

- i. Mechanisms and actions
- ii. Administration and routes
- iii. Clinical pharmacokinetics

B. Demonstrate appropriate use of different types of restraint (e.g., behavioral, chemical, physical).

- C. Understand and manage the safety implications for humans, non-target species, and the environment.
- D. Demonstrate appropriate use of capture and immobilization equipment.
- E. Manage patient risks involved with capture and anesthesia.
- F. Understand the principles of monitoring during restraint.
 - i. Clinical applications
 - ii. Interpretation
 - iii. Intervention
- G. Select appropriate methods for animal transport.

V. Medicine and Surgery

- A. Gather and evaluate case history.
- B. Perform physical examinations and recognize abnormalities.
- C. Describe indications for surgery and demonstrate surgical techniques.
- D. Implement pre- and post-operative management plans.
- E. Identify the etiology and understand the pathophysiology of diseases.
- F. Select appropriate diagnostic and treatment modalities for diseases.
- G. Plan and assess medical case management.
- H. Identify and address public health issues regarding zoological species.
- I. Apply principles of trauma and wound management.
- J. Select species-appropriate euthanasia techniques.
- K. Implement triage approaches.
- L. Create and prioritize a list of differential diagnoses from results of history, clinical examination, and diagnostic procedures.
- M. Understand and apply principles of pain management.
- N. Understand and apply principles of fluid therapy.
- O. Understand and apply the principles of reproductive management.
 - i. Contraception
 - ii. Assisted reproduction
 - iii. Obstetrics

VI. Diagnostics

- A. Describe the principles and clinical applications of diagnostic modalities.
- B. Examine samples, interpret results of diagnostic tests, and understand their limitations.
- C. Select and obtain appropriate antemortem samples for examination and analysis.
- D. Demonstrate appropriate techniques for collection, handling, and storage of diagnostic samples.
- E. Plan a diagnostic approach to the investigation of individual animal- or population-related disease.
- F. Conduct gross necropsy and recognize basic pathology.
- G. Select and obtain appropriate postmortem samples for examination and analysis.
- H. Recognize histopathological findings and correlate with other diagnostic results.

VII. Biologics and Therapeutics

- A. Select and administer appropriate therapeutic agents considering:

- i. Mechanisms of actions
 - ii. Effects and indications
 - iii. Clinical pharmacokinetics and pharmacodynamics
 - B. Understand and manage hazards for animals, humans, and environmental exposure.
 - C. Calculate volumes and concentrations needed for therapeutic administration.
- VIII. Communication, Education, and Administration
 - A. Explain and present information related to zoological medicine to the public, media, policymakers, and other professionals.
 - B. Train and supervise individuals with respect to zoological species.
 - C. Know international regulations as they relate to zoological species and animal health (e.g., CITES, OIE).
 - D. Understand terminology specific to zoological species.
 - E. Contribute to the development of policies and standard operating procedures related to animal management and public health and safety.
 - F. Maintain accurate and comprehensive medical records.
- IX. Research
 - A. Advise in animal care and use research policy.
 - B. Understand research methodologies and develop an appropriate study design.
 - C. Apply basic principles of statistical analysis.
 - D. Identify and critique appropriate and relevant scientific literature.

Wildlife

- I. Anatomy, Taxonomy, and Physiology
 - A. Compare and contrast differences among wildlife species.
 - i. Anatomical
 - ii. Physiological
 - B. Apply knowledge of taxonomy and phylogeny.
- II. Ecosystem
 - A. Evaluate and mitigate potential hazards.
 - i. Biological (e.g., invasive species, red tide)
 - ii. Chemical (e.g., oil spills, pesticides)
 - iii. Physical (e.g., climate, land use patterns)
 - B. Evaluate and manipulate environmental conditions in relation to animal health.
 - C. Understand basic principles of ecology.
 - D. Apply principles of disease ecology and modeling.
 - E. Apply principles of conservation medicine and One Health approaches.
 - i. Public health issues regarding wildlife species
 - ii. Zoonoses
 - iii. Ecological impacts
 - F. Utilize epidemiological principles.
 - i. Terminology

- ii. Disease surveillance
- iii. Risk analysis
- iv. Modeling
- v. Outbreak investigation

III. Wildlife Management

- A. Understand principles of nutrition.
 - i. Carrying capacity/micronutrients
 - ii. Feeding ecology
- B. Understand principles of wildlife management.
 - i. Population assessment
 - ii. Wildlife utilization
 - iii. Animal control
 - iv. Wildlife management models (e.g., regulatory framework)
- C. Develop and implement wildlife disease management programs.
 - i. Biosecurity
 - ii. Vaccination
 - iii. Parasite management
 - iv. Quarantine
 - v. Animal movement (e.g., translocation, reintroduction)
 - vi. Culling and depopulation
- D. Human/Domestic Animal/Wildlife conflict
- E. Understand animal behavior.
 - i. Appropriate social structures and natural behaviors
 - ii. Recognize and manage behavioral issues
- F. Understand husbandry requirements relative to natural history.
- G. Describe and apply principles of hygiene and sanitation.

IV. Capture and Restraint

- A. Apply use of tranquilizers, sedatives, anesthetics, and other restraint agents.
 - i. Mechanisms and actions
 - ii. Administration and routes
 - iii. Clinical pharmacokinetics
- B. Apply use of different types of restraint (e.g., snares, traps, nets)
- C. Understand and manage the safety implications for humans, non-target species, and the environment.
- D. Apply use of capture and immobilization equipment.
- E. Mitigate patient risks involved with capture and anesthesia (e.g., capture myopathy).
- F. Understand the principles of anesthetic monitoring.
 - i. Clinical applications
 - ii. Interpretation
 - iii. Intervention
- G. Select appropriate animal transport

V. Medicine and Surgery

- A. Gather and evaluate case history.
- B. Perform physical examinations and recognize abnormalities.
- C. Describe indications for and apply surgical techniques (e.g., snare removal,

transmitter implant)

- D. Identify the etiology and understand the pathophysiology of diseases.
- E. Select appropriate diagnostic and management modalities for diseases.
- F. Perform case management.
 - i. Pain management
 - ii. Fluid therapy
 - iii. Pre- and post-operative management plans.
 - iv. Wound management
 - v. Triage

G. Select species-appropriate euthanasia techniques.

H. Create and prioritize a list of differential diagnoses from results of history, clinical examination, and diagnostic procedures.

- I. Understand and apply the principles of reproductive management.
 - i. Contraception
 - ii. Assisted reproduction

VI. Diagnostics

A. Describe the principles and applications of diagnostic technologies.

B. Examine samples and interpret results of diagnostic tests and understand their limitations.

C. Select and obtain appropriate antemortem samples for examination and analysis.

D. Demonstrate appropriate techniques for collection, handling, and storage of diagnostic samples.

E. Plan a diagnostic approach to the investigation of individual animal- or population- related disease.

F. Conduct gross necropsy and recognize basic pathology.

G. Select and obtain appropriate postmortem samples for examination and analysis.

H. Recognize histopathological findings and correlate with other diagnostic results.

VII. Biologics and Therapeutics

A. Select and administer appropriate agents considering:

- i. Mechanisms of actions
- ii. Effects and indications
- iii. Clinical pharmacokinetics and pharmacodynamics
- iv. Safety and efficacy

B. Understand and mitigate hazards for animals, humans, and environmental exposure.

VIII. Communication, Education, and Administration

A. Explain and present information related to wildlife to the public, media, policymakers, and other professionals.

B. Manage a wildlife health program

- i. Staff training
 - ii. Occupational safety
 - iii. Supervision

C. Know international regulations as they relate to wildlife species and animal health (e.g., CITES, OIE).

D. Provide technical expertise on wildlife health and management.

i. Development of laws and regulations

ii. Development and implementation of policies and procedures

E. Maintain accurate and comprehensive records.

IX. Research

A. Advise in animal care and use research policy.

B. Understand research methodologies and develop an appropriate study design.

C. Apply principles of statistical analysis.

D. Identify and critique appropriate and relevant scientific literature.

Zoological Companion Animals

I. Anatomy, Taxonomy, and Physiology

A. Understand and utilize clinically significant differences among zoological companion species.

i. Anatomical

ii. Physiological

B. Apply knowledge of taxonomy and phylogeny.

II. Environmental

A. Evaluate and manage potential hazards and understand differential effects across taxonomic groups.

i. Biological

ii. Chemical

iii. Physical

B. Apply husbandry requirements relative to natural history.

C. Address environmental conditions in relation to animal health and welfare.

D. Manage life support systems for artificial environments.

E. Describe and apply principles of hygiene and sanitation.

F. Understand the clinical impact of basic principles of ecology.

G. Understand the clinical impact of disease ecology.

H. Implement behavior and welfare management.

i. Appropriate social structures and natural behaviors

ii. Recognize and manage aberrant behaviors

iii. Environmental enrichment

iv. Operant conditioning

v. Ethical issues

vi. Objective criteria for euthanasia decisions

I. Apply principles of conservation medicine and One Health approaches.

J. Utilize basic epidemiological principles.

i. Terminology

ii. Disease surveillance

iii. Risk analysis

III. Preventive Medicine

- A. Describe and utilize principles of nutrition.
 - i. Dietary requirements and formulation
 - ii. Food handling and storage
 - iii. Food safety
- B. Develop and implement pest control programs.
- C. Develop and implement preventive medicine protocols.
 - i. Biosecurity
 - ii. Vaccination
 - iii. Parasite management
 - iv. Quarantine
 - v. Age- and taxon-specific
 - vi. Animal movements

IV. Restraint

- A. Demonstrate appropriate use of tranquilizers, sedatives, anesthetics, and other restraint agents.
 - i. Mechanisms and actions
 - ii. Administration and routes
 - iii. Clinical pharmacokinetics
- B. Demonstrate appropriate use of different types of restraint (e.g., behavioral, chemical, physical).
- C. Understand and manage the safety implications for humans, non-target species, and the environment.
- D. Demonstrate appropriate use of capture and immobilization equipment.
- E. Manage patient risks involved with capture and anesthesia.
- F. Understand the principles of monitoring during restraint.
 - i. Clinical applications
 - ii. Interpretation
 - iii. Intervention
- G. Select appropriate methods for animal transport.

V. Medicine and Surgery

- A. Gather and evaluate case history.
- B. Perform physical examinations and recognize abnormalities.
- C. Describe indications for surgery and demonstrate surgical techniques.
- D. Implement pre- and post-operative management plans.
- E. Identify the etiology and understand the pathophysiology of diseases.
- F. Select appropriate diagnostic and treatment modalities for diseases.
- G. Plan and assess medical case management.
- H. Identify and address public health issues regarding zoological companion species.
- I. Apply principles of trauma and wound management.
- J. Select species-appropriate euthanasia techniques.
- K. Implement triage approaches.
- L. Create and prioritize a list of differential diagnoses from results of history, clinical examination, and diagnostic procedures.
- M. Understand and apply principles of pain management.

- N. Understand and apply principles of fluid therapy.
- O. Understand and apply the principles of reproductive management.
 - i. Contraception
 - ii. Assisted reproduction
 - iii. Obstetrics

VI. Diagnostics

- A. Describe the principles and clinical applications of diagnostic modalities.
- B. Examine samples, interpret results of diagnostic tests, and understand their limitations.
- C. Select and obtain appropriate antemortem samples for examination and analysis.
- D. Demonstrate appropriate techniques for collection, handling, and storage of diagnostic samples.
- E. Plan a diagnostic approach to the investigation of individual animal- or population-related disease.
- F. Conduct gross necropsy and recognize basic pathology.
- G. Select and obtain appropriate postmortem samples for examination and analysis.
- H. Recognize histopathological findings and correlate with other diagnostic results.

VII. Biologics and Therapeutics

- A. Select and administer appropriate therapeutic agents considering:
 - i. Mechanisms of actions
 - ii. Effects and indications
 - iii. Clinical pharmacokinetics and pharmacodynamics
- B. Understand and manage hazards for animals, humans, and environmental exposure.
- C. Calculate volumes and concentrations needed for therapeutic administration.

VIII. Communication, Education, and Administration

- A. Explain and present information related to zoological medicine to the public, media, policymakers, and other professionals.
- B. Train and supervise individuals with respect to zoological companion species.
- C. Know international regulations as they relate to zoological companion species and animal health (e.g., CITES, OIE).
- D. Understand terminology specific to zoological companion species.
- E. Contribute to the development of policies and standard operating procedures related to animal management and public health and safety.
- F. Maintain accurate and comprehensive medical records.

IX. Research

- A. Advise in animal care and use research policy.
- B. Understand research methodologies and develop an appropriate study design.
- C. Apply basic principles of statistical analysis.
- D. Identify and critique appropriate and relevant scientific literature.

Table 5. Original ACZM Qualifying and Certification Examination content outline.

ANATOMY
ANESTHESIOLOGY
CLINICAL PATHOLOGY
CLINICAL PROCEDURES
DEMOGRAPHICS
DENTISTRY
ENVIRONMENTAL MEDICINE
EPIDEMIOLOGY
HUSBANDRY
GENETICS
IMMUNOLOGY
INFECTIOUS DISEASES
METABOLIC DISEASES
NUTRITION
PARASITOLOG
PATHOLOGY
PHARMACOLOGY
PHYSIOLOGY
RADIOLOGY
THERIOGENOLOGY
SURGERY
TAXONOMY
TOXICOLOGY