



Australian and New Zealand College of Veterinary Scientists

Fellowship Examination

June 2019

Veterinary Emergency Medicine and Critical Care

Paper 1

Perusal time: **Twenty (20)** minutes

Time allowed: **Four (4)** hours after perusal

Section A: Answer **ONE (1)** question

Section B: Answer **ALL FIVE (5)** questions

Section C: Answer **ALL TEN (10)** questions

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Section A: Answer **ONE (1)** essay-style question, worth 60 marks.....total 60 marks

Section B: Answer **FIVE (5)** short-answer questions, each worth 24 markstotal 120 marks

Section C: Answer **TEN (10)** short-answer questions, each worth 6 markstotal 60 marks

Paper 1: Veterinary Emergency Medicine and Critical Care

Section A: Answer one (1) question

1. Answer **all** parts of this question:

- a) Explain, in detail, the mechanisms of inflammation-induced coagulation. *(38 marks)*

- b) Based on the American College of Veterinary Emergency and Critical Care consensus on the rational use of antithrombotics (CURATIVE), list the diseases that are associated with a high and low risk of thrombosis in dogs and cats, and explain which of these require thromboprophylaxis therapy. *(10 marks)*

- c) Based on CURATIVE, state the recommended thromboprophylaxis therapy for the following conditions: *(12 marks)*
 - i. aortic thromboembolism in a dog

 - ii. aortic thromboembolism in a cat

 - iii. venous thromboembolism in a dog

 - iv. venous thromboembolism in a cat.

Section B starts over page

Section B: Answer ALL five (5) short-answer questions

1. Answer **both** parts of this question:

- a) Describe the physiology of oesophageal and gastric motility in dogs and cats. *(15 marks)*

- b) Regarding pharmacological interventions for gastrointestinal dysmotility disorders: *(9 marks)*
 - i. list **three (3)** drug classes,
 - ii. describe the mechanism of action for each of these drug classes, and
 - iii. give **one (1)** example of a medication within each class.

2. Answer **both** parts of this question:

- a) Describe in detail, the pathophysiology of proximal and distal renal tubular acidosis. *(18 marks)*

- b) Compare and contrast the biochemical changes seen in dogs with proximal versus distal renal tubular acidosis. *(6 marks)*

3. Answer **all** parts of this question:

- a) How is lactate produced in the body and, after production, how is it used? *(4 marks)*

- b) Hyperlactataemia may be divided into type A and type B hyperlactataemia. List and describe the different classifications within the type A and B groups, including in your answer **two (2)** differential diagnoses or causes for each of these classifications. *(19 marks)*

- c) Which type(s) is/are more common in emergency and critical care cases? *(1 mark)*

Section B continued over page

4. Answer **both** parts of this question:

- a) Define and describe the endothelial glycocalyx and its function. In your answer also discuss the traditional Starling and revised Starling theories of fluid flux. *(18 marks)*
- b) List **three (3)** conditions in which the endothelial glycocalyx composition is affected or 'damaged'. Include in your answer a brief description of the mechanism by which the endothelial glycocalyx is altered. *(6 marks)*

5. Answer **both** parts of this question:

- a) In regard to animal trauma triage (ATT) score and the modified Glasgow coma score (mGCS):
 - i. Describe in detail the ATT score and the mGCS score as applied to small animal patients after trauma. In your answer also discuss how they are used to predict prognosis or outcome. *(11 marks)*
 - ii. Compare and contrast the features of the ATT and mGCS. *(4 marks)*
- b) In a patient with a traumatic brain injury (TBI), list **three (3)** immediate (tier 1) therapies that can be instituted for treatment. Discuss the benefits and potential complications, of each of these initial therapies in small animal TBI. *(9 marks)*

Section C starts over page

Section C: Answer ALL ten (10) short-answer questions

1. Discuss the difference between central venous and mixed venous oxygen saturation. Include in your answer whether or not these values can be used interchangeably. *(6 marks)*

2. State the drug class, indications, contraindications and mechanism of action for each of the following topical drugs used in the treatment of glaucoma in dogs: *(6 marks)*
 - Latanoprost
 - Dorzolamide

3. Explain the reason for the difference between PaCO₂ and ETCO₂. *(6 marks)*

4. List the **four (4)** components of the pharmacokinetics of drugs, as outlined by the ADME scheme, and provide **one (1)** example of how each may be affected by critical illness. *(6 marks)*

5. Discuss the rationale behind the administration of Heliox in dogs with brachycephalic obstructive airway syndrome (BOAS) and explain the challenges for its use. *(6 marks)*

6. Name **two (2)** different types of snail or slug baits that cause toxicity in dogs. For each type of toxin, describe the mechanism of toxicity and the associated clinical signs. *(6 marks)*

7. Describe the effects of hyperkalaemia on the cardiac myocyte. List **one (1)** ECG alteration seen with hyperkalaemia. List **two (2)** medications that can be administered to treat hyperkalaemia and their mechanisms of action. *(6 marks)*

Section C continues over page

8. List and describe **two (2)** indicators or predictors of the successful return of spontaneous circulation (ROSC) after cardiopulmonary arrest (CPA). List the core elements of the Utstein-style guidelines for cardiopulmonary resuscitation (CPR) and give **one (1)** example within each category that has been proposed to provide consistency in the reporting of CPR events. *(6 marks)*

9. Name the **two (2)** main causes of hypernatremia and list **two (2)** of the common differentials for each. *(6 marks)*

10. List and briefly describe both the independent and dependent variables in the Stewart approach to acid-base. For each of the independent variables, state how acidosis or alkalosis may develop. *(6 marks)*

End of paper



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Paper 2

Perusal time: **Twenty (20)** minutes

Time allowed: **Four (4)** hours after perusal

Answer **ALL FIVE (5)** questions

All five (5) questions are of equal value.

Question 1 a) requires completion of the table located in the answer booklet that has been provided to you.

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Answer **FIVE (5)** questions, each worth 48 markstotal 240 marks
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Paper 2: Veterinary Emergency Medicine and Critical Care

Answer all five (5) questions

1. You are presented with a two-year-old, male, neutered Beagle cross with a seven-day history of anorexia and a two-day history of intermittent vomiting. The owner is concerned about his enlarged abdomen. The abdominal fluid score is 4/4.

Answer **all** parts of this question:

- a) The characteristics of peritoneal fluid can be used to narrow down the differential diagnosis. Fill in the table provided in your answer booklet, with regard to fluid classification, characteristics and list **two (2)** differential diagnoses for each classification. *(12 marks)*
- b) Within the exudate category, briefly describe the **four (4)** types of effusion and the characteristics of each. *(6 marks)*
- c) Describe, in detail, the appropriate management of peri-operative hypotension in a patient with septic peritonitis. *(16 marks)*
- d) Discuss and provide the evidence supporting the use of closed-suction abdominal drain placement in the post-operative management of septic peritonitis of gastrointestinal origin. *(4 marks)*
- e) Two days after surgery, the dog is still anorexic without any evidence of post-operative septic peritonitis, but is no longer vomiting. The dog is not on vasopressor drugs and his blood gases and electrolytes are normal. Discuss, in detail, an appropriate nutrition plan for this 15 kg patient, including the rationale for your choices. *(10 marks)*

Continued over page

2. A colleague phones you to ask for advice in treating a dog that has presented to her clinic with suspected methaemoglobinaemia (cyanotic mucous membranes and chocolate-coloured blood). The patient was normal 60 minutes prior to presentation and was walking in bushland with its owner. The dog is now tachypnoeic and obtunded.

Answer **all** parts of this question:

- a) List the differential diagnosis for methaemoglobinaemia. (3 marks)
- b) Outline the pathophysiology of methaemoglobinaemia. (6 marks)
- c) Discuss the case for and against the induction of emesis in veterinary patients suspected of toxin ingestion (6 marks). Justify whether or not you would induce emesis in this patient (1 mark).
- d) Discuss the case for and against gastric lavage in veterinary patients suspected of toxin ingestion (6 marks). Justify whether or not you would perform gastric lavage in this patient (1 mark).
- e) Discuss the case for and against the administration of activated charcoal in veterinary patients suspected of toxin ingestion (6 marks). Justify whether or not you would administer activated charcoal to this patient (1 mark).
- f) Discuss the case for and against the use of intravenous lipid emulsion in veterinary patients suspected of toxin ingestion (6 marks). Justify whether or not you would administer intralipid to this patient (1 mark).
- g) Your colleague comments that the pulse oximeter reads 85% on this patient breathing room air and this doesn't change, despite oxygen therapy. Explain why this occurs in patients with methaemoglobinaemia. (4 marks)
- h) What additional treatment recommendations would you provide for this patient? (Exclude any recommendations you have made for this patient in previous parts of this question.) (7 marks)

Continued over page

3. An eight-year-old, female, spayed domestic long-hair cat presents with a two-day history of vomiting and inappetence.

The initial assessment shows that she is able to stand, but is weak. Her heart rate is 190 beats/minute, mucous membranes are pink and tacky, and capillary refill time is less than two seconds. Her respiratory rate is 50 breaths per minute with increased expiratory effort. Her temperature is 37.2°C. Abdominal palpation is benign.

An intravenous catheter is placed and, using the blood from the hub of the stylet, you find that her packed cell volume is 45%, total solids are 88 g/L and her blood glucose is 26.5 mmol/L. You drop some of the serum from a capillary tube onto the ketone square of a urine dipstick. The result is negative for ketones.

Answer **all** parts of this question:

- a) You need to talk to this cat's owner to obtain a history. One of the initial goals in your diagnostic plan for this cat is to determine if her hyperglycaemia is due to diabetes mellitus or if it has another cause. What are the **four (4)** cardinal signs of diabetes mellitus that you can determine from taking a thorough history? (2 marks)

After talking to the owner, you find that this cat has these four cardinal signs. On further examination of the cat, you find that she is in thin body condition (body condition score 2/9), there are no abnormal breath sounds auscultable and her oxygen saturation, measured by pulse oximetry, is 99%. She is 8-10% dehydrated. Her urinary bladder is small, but you are able to express enough urine to determine that her urine specific gravity is 1.024.

You perform a venous blood gas analysis and obtain the following results:

Parameter	Abbreviation	Units	Result	Reference range
pH	pH		7.02	7.31–7.46
Partial pressure of CO ₂	pCO ₂	mm Hg	21	31–41
Partial pressure of O ₂	pO ₂	mm Hg	28	45–65
Standardised base excess	SBE	mmol/L	-25	-8– -2
Bicarbonate	HCO ₃	mmol/L	8	18–22
Sodium	Na	mmol/L	138	145–158
Potassium	K	mmol/L	4.2	3.4–5.6
Chloride	Cl	mmol/L	107	110–122
Glucose	Glucose	mmol/L	26.5	4.4–6.6
Lactate	Lactate	mmol/L	2.5	0.2–2
Blood urea nitrogen	BUN	mmol/L	25	5.7–12.9
Comments: venous blood gas				

Question 3 continued over page

- b) What is the **most likely** cause of this cat's clinical and laboratory findings? List **three (3)** other differential diagnoses, and explain your reasoning for selecting which differential diagnosis is the most likely. (7 marks)
- c) Given your answer to 3 b) and your reasoning as to which is the most likely diagnosis, which test result does not fit this diagnosis, and how would you explain this finding? (2 marks)
- d) State the most likely cause of the increase in the cat's respiratory rate and effort, providing justification for your answer. (4 marks)
- e) Calculate this cat's corrected sodium. (2 marks)
- f) Calculate this cat's corrected chloride. (2 marks)
- g) Calculate this cat's serum osmolality. Is it within the normal reference range for this species? (3 marks)
- h) List **three (3)** types of replacement crystalloid fluids that you could use in a patient with diabetic ketoacidosis. For each fluid type, list the advantages and disadvantages for its use in this condition. State which of these fluids you would select to manage this patient, providing justification for your answer. (14 marks)
- i) Discuss the type(s) of insulin available for use in this patient and when you would begin insulin therapy in this patient. Give your reasoning for your decisions, with specific reference to the current literature. (12 marks)

Continued over page

4. A seven-year-old French bulldog presents with what the owners report as ‘erect ears’ and a ‘grin’. You suspect tetanus.

Answer **all** parts of this question:

- a) Discuss, in detail, the pathophysiology of tetanus. *(16 marks)*
- b) Discuss the evidence behind the use of tetanus antitoxin. Include in your answer: *(12 marks)*
- i. the mechanism of action.
 - ii. the benefits, risks and methods of administration.
- c) Name **five (5)** other therapies for tetanus in dogs. Include in your discussion: *(20 marks)*
- i. the mechanism of action
 - ii. the benefits and risks/complications associated with each treatment.

Continued over page

5. Answer **both** parts of this question:

- a) A two-year-old male, neutered, previously healthy terrier cross breed has been attacked by a larger dog. It was seen to be picked up by the thorax and shaken vigorously. On presentation, the dog has obvious thoracic injuries and respiratory difficulty.

Compare the advantages and disadvantages of **four (4)** different imaging modalities for the further assessment of this patient. Assume that cost does not affect decision-making. *(24 marks)*

- b) A 14-year-old, 6 kg cat, with a body condition score of 7/9, was presented after being missing outdoors for the past 12 hours. On presentation, the left hind leg is injured and the cat has been assessed to have no deep pain response when pressure is applied to the digits with a haemostat. The cat had no prior health concerns.

Radiographs of the left hind limb show numerous gas lucencies in the subcutaneous tissues of the left flank, inguinal region, and adjacent to the tibia. There is a severe comminuted tibial fracture.

There are multiple puncture wounds to the skin, affecting the lateral aspect of the left hindlimb, extending from the distal tibia to the caudal femur. A piece of bone shard is visible through one of the wounds.

Assuming that more urgent comorbidities have been addressed, justify and prioritise your recommendations for the management of this patient's hindlimb injuries. Include in your answer any pharmaceutical agents that should be administered. *(24 marks)*

End of paper