



Australian and New Zealand College of Veterinary Scientists

Fellowship Examination

June 2017

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

Section A: Answer **ONE** essay-style question worth 60 markstotal 60 marks

Section B: Answer **FIVE** short-answer questions each worth 24 marks.....total 120 marks

Section C: Answer **TEN** short-answer questions each worth 6 marks.....total 60 marks

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Paper 1: Veterinary Emergency Medicine and Critical Care

Section A: Answer ONE (1) essay-style question

1. Answer **all** parts of this question:
 - a) List and briefly describe the different zones of the adrenal gland, the hormones produced by **each**, and the stimuli for that production. *(10 marks)*
 - b) Briefly describe the role of the hypothalamic-pituitary-adrenal axis in the regulation of cortisol production. *(6 marks)*
 - c) Briefly describe the suspected pathophysiology of critical illness related corticosteroid insufficiency (CIRCI). *(5 marks)*
 - d) Describe a sound approach to the diagnosis and treatment of CIRCI in veterinary medicine. Include in your answer: *(14 marks)*
 - i. The current evidence for the existence of CIRCI in dogs.
 - ii. How the diagnosis and treatment strategies in veterinary medicine differs from human medicine.
 - e) Describe the renin-angiotensin-aldosterone system with regard to the response to haemorrhage. *(9 marks)*
 - f) Briefly describe the mechanisms of action of **two (2)** drugs from different classes used in the treatment of congestive heart failure that directly interfere with the function of renin-angiotensin-aldosterone system. *(4 marks)*
 - g) Describe the mechanism of action of catecholamine vs. non-catecholamine vasopressor agents, providing specific examples. *(12 marks)*

Section B starts over page

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

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

- a) Briefly describe the mechanisms of action of pimobendan. (4 marks)
- b) Describe the indications for pimobendan in dogs based on evidence in the literature. (8 marks)
- c) Summarise the literature regarding the use of pimobendan in cats. (5 marks)
- d) Regarding the drug amiodarone: (7 marks)
 - i. Name the Vaughan Williams classification of this drug.
 - ii. Briefly describe the mechanism of action.
 - iii. Describe the potential indications for this drug in veterinary medicine.

2. Regarding a dog undergoing an exploratory celiotomy under general anaesthesia:

- a) Describe a sound approach to the management of hypotension. (14 marks)
- b) Describe the abnormalities that would raise suspicion of a diagnosis of malignant hyperthermia. (3 marks)
- c) Describe the treatment of a dog with suspected malignant hyperthermia. (7 marks)

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

- a) Describe the pathophysiology of hepatic encephalopathy. *(14 marks)*
- b) Discuss medical management of a dog with hepatic encephalopathy. *(10 marks)*

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

- a) Describe the complement cascade and its role in inflammatory and immune responses. *(12 marks)*
- b) Describe the immunologic mechanisms of erythrocyte destruction in immune mediated haemolytic anaemia, differentiating intravascular vs. extravascular hemolysis. *(12 marks)*

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

- a) Describe the current state of knowledge regarding the syndrome of delayed post-operative bleeding in retired racing greyhounds. *(7 marks)*
- b) Explain an evidence based pharmacologic approach to treatment of the syndrome of delayed post-operative bleeding in retired racing greyhounds in Australia. *(8 marks)*
- c) List and describe, with explanations of purported etiology, the unique features of greyhound dogs compared to other dog breeds that an emergency and critical care specialist should be aware of. Do **not** include discussion of the syndrome of delayed post-operative bleeding in this section of your answer. *(9 marks)*

Section C starts over page

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

1. Describe the production of antidiuretic hormone and the mechanisms that regulate its secretion. (6 marks)
2. Explain the process of fibrinolysis, including activators and inhibitors. (6 marks)
3. Briefly describe the **three (3)** arrhythmogenic mechanisms that may affect ventricular myocytes. (6 marks)
4. List the main hormones that control glucose homeostasis in the body, and their effect on glucose concentrations (including the time course of that effect). (6 marks)
5. With reference to the components of the Starling equation, describe the **two (2)** main pathophysiologic forms of pulmonary oedema. (6 marks)
6. List and describe the **four (4)** main mechanisms of heat dissipation in dogs. Identify the mechanism that is **most** important when environmental temperature approaches body temperature. (6 marks)
7. Briefly describe the features of the healthy, intact, vascular endothelium that give it an anticoagulant phenotype. (6 marks)
8. Describe and/or draw a figure to explain the Haldane effect. (6 marks)
9. Regarding antimicrobial resistance, describe intrinsic, circumstantial and acquired resistance. (6 marks)
10. List and briefly describe the components of dead space related to breathing. (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 questions are of equal value.

Question 5 f) requires completion of the table located in the answer booklet that has been provided to you.

Answer **FIVE** questions each worth 48 markstotal 240 marks

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Paper 2: Veterinary Emergency Medicine and Critical Care

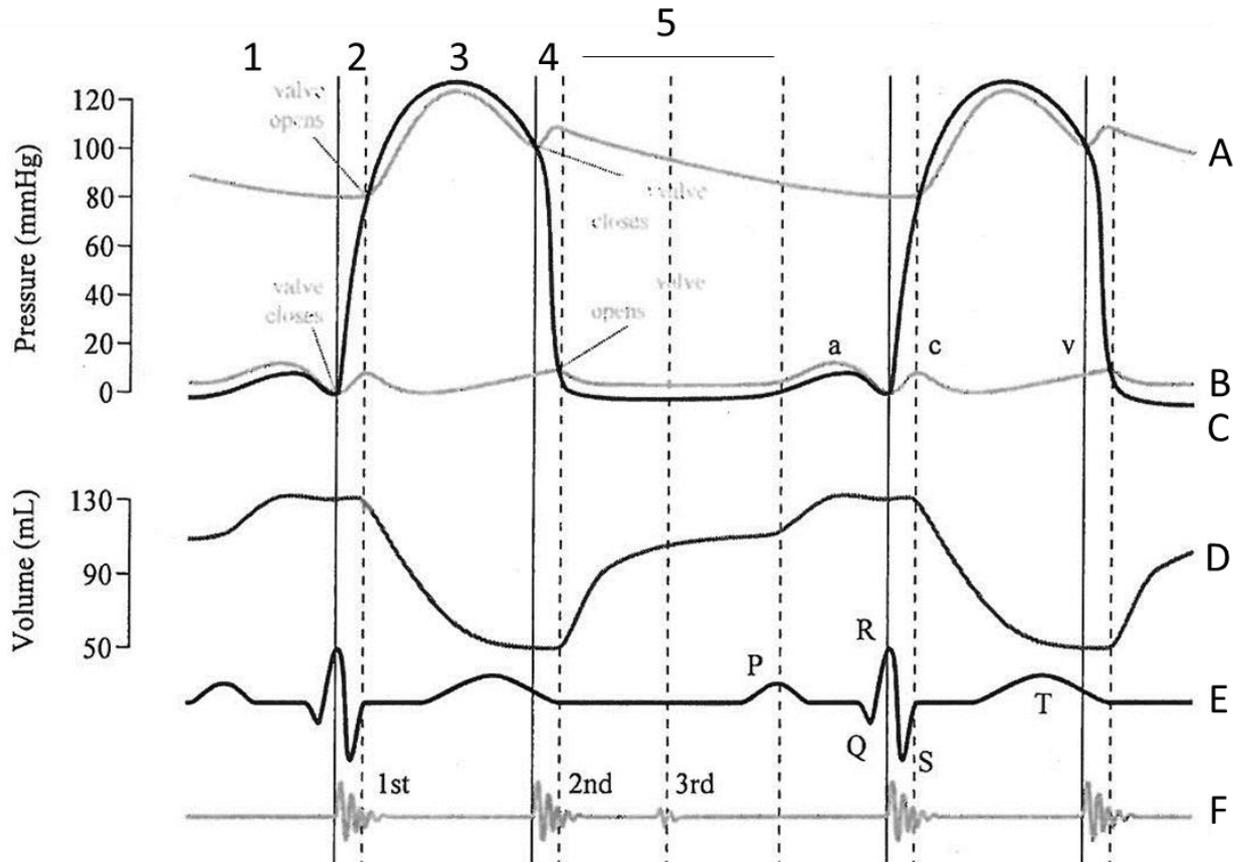
Answer all five (5) questions

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

- a) Describe the etiologic classification of anaphylaxis. Please provide specific examples. *(8 marks)*
- b) Describe how you would treat anaphylaxis in a dog secondary to a bee sting. For all treatments, provide a brief rationale including whether there is evidence to support that treatment. *(13 marks)*
- c) Define: i) sepsis, ii) severe sepsis, and iii) septic shock, as these terms are used in veterinary medicine, and list the diagnostic criteria for **each**. *(10 marks)*
- d) Describe how the veterinary definitions in 1 c) differ from those currently used in human medicine. *(7 marks)*
- e) Describe the development of red cell storage lesions and their significance in veterinary medicine. *(10 marks)*

Continued over page

2. In regard to the below Wigger's diagram



Answer **all** parts of this question:

- In your answer booklet name the six variables of the **Y** axis, denoted **A–F** on the Wigger's diagram. (3 marks)
- In your answer booklet name the five phases of the cardiac cycle, denoted **1–5** on the Wigger's diagram; describe how **two (2)** of these phases are further subdivided. (7 marks)
- Describe the five phases of the cardiac cycle, including the variation in **each** of the **Y** axis variables during **each** phase as appropriate. (20 marks)
- Briefly describe the placement of a central venous catheter and pulmonary artery catheter and the information that can be obtained with **each**. (18 marks)

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3. The following questions are regarding a young male cat with urethral obstruction.

Answer **all** parts of this question:

- a) Describe the effects of hyperkalemia on action potential generation and the subsequent effects on the electrocardiogram. *(10 marks)*
- b) List the spectrum of treatment options for hyperkalemia in this cat, and describe their mechanisms of action. *(10 marks)*
- c) Explain your considerations when devising an intravenous fluid plan for this cat for the duration of hospitalisation. *(8 marks)*
- d) Describe methods for providing local analgesia and anaesthesia for urethral catheterisation in this cat, including a detailed description of the technique where appropriate. *(10 marks)*
- e) Provide a mechanistic explanation of the treatment options for urethral spasm in cats following urinary obstruction. *(10 marks)*

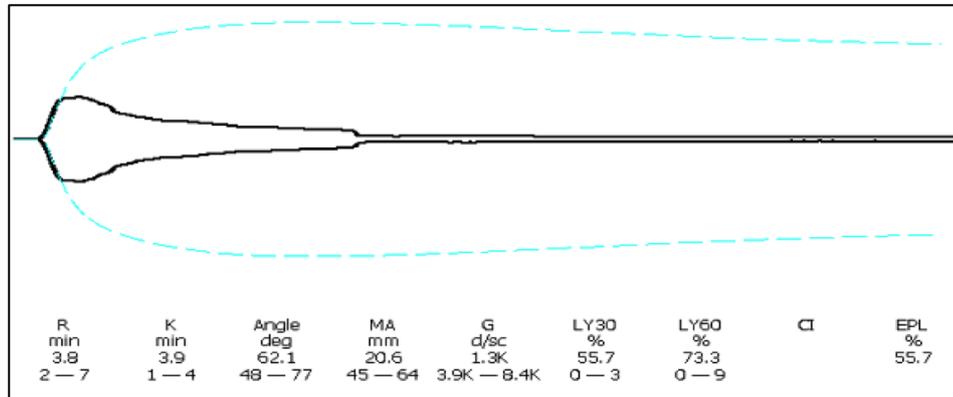
4. Answer **all** parts of this question:

- a) Describe the etiopathogenesis of heatstroke in dogs. *(10 marks)*
- b) Explain in detail why a 30 kg English bulldog is likely more susceptible to heatstroke than a 30 kg Pointer dog. *(6 marks)*
- c) Describe the pathophysiology of disseminated intravascular coagulation (DIC) and associated findings on coagulation tests. *(10 marks)*
- d) List and describe recognised associations with non-survival in dogs with heatstroke. *(8 marks)*

Question 4 continued over page

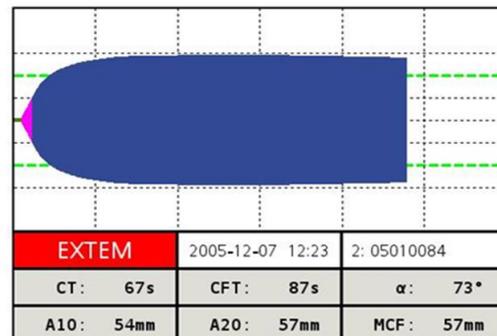
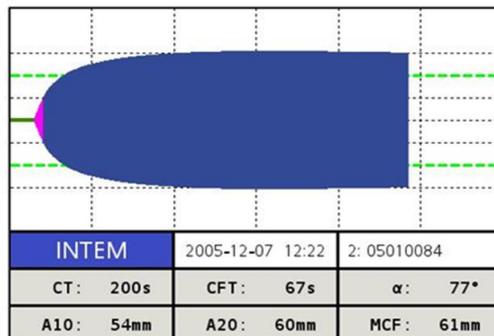
e) Interpret the following viscoelastic test results and suggest appropriate therapeutic intervention:

i. Thromboelastography (TEG) from a dog with liver disease. This TEG was performed on kaolin activated, citrated whole blood. (7 marks)

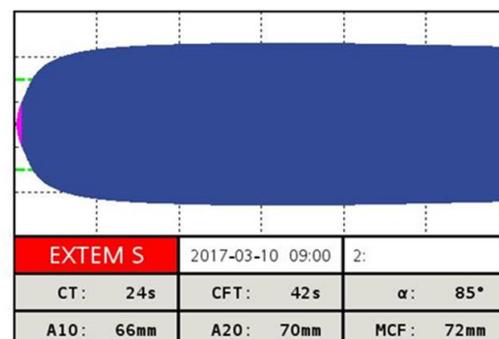
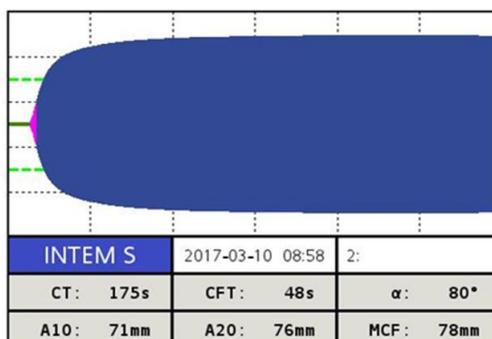


ii. Rotational thromboelastometry (ROTEM) performed pre-operatively in a dog scheduled to have an adrenalectomy. A normal ROTEM tracing is shown for comparison. (7 marks)

NORMAL



PATIENT



Continued over page

5. A nine-year-old male neutered Weimaraner (body weight 30 kg) develops tachypnea and dyspnea 24 hours following source control surgery for abdominal sepsis. The results of an arterial blood gas sample analysis, with the patient breathing room air is shown below; concurrently the dogs SpO₂ is 89%.

Arterial blood gas

Parameter	Measured value	Reference interval	Units
PaCO ₂	35.3	33.3–39.8	mmHg
PaO ₂	54.0	87.0–97.8	mmHg
Haemoglobin	9.7	11.8–17.9	g/L
SaO ₂	89	96–100	%

Answer **all** parts of this question:

- List the differential diagnoses for this dog’s respiratory status. Provide a justification for **each** differential. (6 marks)
- The dog does not improve with supplemental oxygen. List the indications for mechanical ventilation in **this** patient. Include a calculation of the A-a gradient. (4 marks)
- Explain the technique and the potential advantages and disadvantages of using high flow nasal oxygen in place of mechanical ventilation in this patient. (7 marks)
- Explain the open lung approach to ventilation, include in your answer descriptions of airway pressure release ventilation (APRV) and high frequency oscillatory ventilation (HFOV). Describe the potential advantages and disadvantages of each technique in this patient. (8 marks)

You intubate and mechanically ventilate this dog, and during mechanical ventilation obtain concurrent arterial and mixed venous blood gases, as well as measurements using a pulmonary artery catheter. The tidal volume is 240 mL and the dogs ETCO₂ is 42 mmHg. FiO₂ = 0.6.

Arterial blood gas

Parameter	Measured value	Reference interval	Units
PaCO ₂	48.1	33.3–39.8	mmHg
PaO ₂	71.0	87.0–97.8	mmHg
Haemoglobin	9.4	11.8–17.9	g/L
SaO ₂	92.0	96–100	%

Question 5 continued over page

Central Venous blood gas

Parameter	Measured value	Reference interval	Units
PvCO ₂	53.0	35.3–38.0	mmHg
PvO ₂	35.0	50.0–54.2	mmHg
Haemoglobin	9.4	12.0–18.0	g/L
ScvO ₂	80.0	73–80	%

- e) Calculate: (10 marks)
- the oxygen extraction ratio
 - PaO₂ to FiO₂ ratio
 - alveolar dead space.
- f) Complete the table provided in your answer booklet, to provide differential diagnoses for the capnogram abnormalities shown. (13 marks)

End of paper