



Australian and New Zealand College of Veterinary Scientists

Membership Examination

June 2018

Veterinary Emergency and Critical Care Paper 1

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

Answer **ALL FOUR (4)** questions

Answer **FOUR (4)** questions, each worth 30 marks..... total 120 marks

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Paper 1: Veterinary Emergency and Critical Care

Answer all four (4) questions

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

a) Answer **both** parts of the sub-question:

i. Name the following equation:

$$J_v = L_p A [(P_{mv} - P_{int}) - \sigma_d (\Pi_p - \Pi_{int})] \quad (1 \text{ mark})$$

ii. Using the components of the equation in question 1 a) i., describe fluid movement between the extracellular fluid spaces. *(4 marks)*

b) Briefly describe how the discovery of the endothelial glycocalyx has changed the view on microvascular fluid movement. *(3 marks)*

c) List **four (4)** pathophysiological mechanisms that can potentiate the accumulation of interstitial fluid and cause interstitial oedema. *(2 marks)*

d) List **four (4)** clinical conditions where the glycocalyx may be compromised. *(2 marks)*

e) Using the equation in question 1 a) i., describe the changes that may occur in a burns patient leading to interstitial oedema. *(5 marks)*

f) Briefly describe how carbon monoxide toxicity results in tissue hypoxia. *(3 marks)*

g) Describe the chain of events that leads to histamine release in anaphylaxis. *(5 marks)*

h) Briefly describe how anaphylaxis results in hypotension. *(3 marks)*

Question 1 continued over page

- i) The term ‘shock organ’ is used to describe the predominant organ system affected in individual species by anaphylaxis.

Answer **all** parts of this sub-question:

- i. Define the factor that determines which organ system is the shock organ. *(1 mark)*
- ii. Name the shock organs of the dog. *(0.5 marks)*
- iii. Name the shock organ of the cat. *(0.5 marks)*

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

- a) Define the term ‘nosocomial infection’. *(2 marks)*
- b) List **two (2)** common sites for nosocomial infection. *(2 marks)*
- c) List **six (6)** factors that increase the risk of nosocomial infection. *(3 marks)*
- d) List **six (6)** methods that can be employed to prevent the spread of infectious diseases within a hospital. *(3 marks)*
- e) Discuss the use of prophylactic antibiotics for an enterotomy procedure. *(6 marks)*
- f) List the factors that should be considered when selecting an empirical antimicrobial agent in a critically ill patient. *(5 marks)*
- g) Discuss the implications of receiving an ‘intermediate susceptibility’ on a culture and susceptibility report. *(3 marks)*
- h) Describe the differences between time-dependent and concentration-dependent antibiotics. In your answer, provide an example of **each** type of antibiotic. *(6 marks)*

Continued over page

3. Answer **all** parts of this question:
- a) List **eight (8)** possible causes of hyperkalaemia in small animals. *(4 marks)*
 - b) Briefly describe how hyperkalaemia affects the generation of a cardiac action potential. *(2 marks)*
 - c) Describe the mechanism of action of calcium gluconate in the treatment of hyperkalaemia. *(3 marks)*
 - d) Describe the electrocardiographic changes that may be seen with varying degrees of hyperkalaemia. *(6 marks)*
 - e) List **three (3)** drugs that can be used to alter urethral tone in a cat. For **each** drug listed, briefly describe the site and mechanism of action, **and** list any potential side effects. *(9 marks)*
 - f) Regarding post-obstructive diuresis:
 - i. Define the term post-obstructive diuresis. *(2 marks)*
 - ii. Briefly list the potential clinical consequences of post-obstructive diuresis. *(1 mark)*
 - iii. Describe potential factors contributing to the development of post-obstructive diuresis. *(3 marks)*

Continued over page

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

a) Regarding blood gas analysis:

- i. Define the anion gap. *(1 mark)*
- ii. State the formula for calculating the anion gap. *(1 mark)*
- iii. List **three (3)** causes of an elevated anion gap metabolic acidosis. *(3 marks)*
- iv. Describe why the serum sodium concentration is often below reference range in a patient with diabetic ketoacidosis on presentation. *(4 marks)*
- v. Describe why the serum potassium concentration must be closely monitored during the treatment of a diabetic ketoacidotic patient. *(6 marks)*

b) Regarding the oxygen haemoglobin dissociation curve for a dog:

- i. Draw the normal oxygen haemoglobin dissociation curve for a dog. *(2 marks)*
- ii. On your curve, mark the points that show:
 - normoxia in a healthy patient on room air *(1 mark)*
 - mild hypoxaemia *(1 mark)*
 - severe hypoxaemia. *(1 mark)*

c) Regarding the oxygen haemoglobin dissociation curve:

- i. Describe the clinical consequences of the oxygen haemoglobin dissociation curve moving to the left. *(3 marks)*
- ii. List **three (3)** clinical conditions that may cause the oxygen haemoglobin dissociation curve to move to the left. *(3 marks)*

d) Compare and contrast the use of the A-a gradient and the $\text{PaO}_2/\text{FiO}_2$ ratio calculations for assessing pulmonary function. *(4 marks)*

End of paper



Australian and New Zealand College of Veterinary Scientists

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June 2018

Veterinary Emergency and Critical Care Paper 2

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Answer **ALL FOUR (4)** questions

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Paper 2: Veterinary Emergency and Critical Care

Answer all four (4) questions

1. A two-year-old, male, neutered domestic short hair cat presents after being found unable to move. On clinical examination, he is minimally responsive with a heart rate of 140 beats per minute (bpm), a respiratory rate of 50 breaths per minute, a rectal temperature of 35.9°C, grey mucous membranes and a capillary refill time (CRT) of 3 seconds. Abdominal pain is present and you detect pelvic crepitus. The cat cannot stand and his femoral pulses are weak.

Answer **all** parts of this question:

- a) Describe a treatment plan for the first 30 minutes, including the type, volume and rate of any fluids that should be administered. (6 marks)
- b) Describe the clinical parameters that are monitored to assess the response to initial treatment. (3 marks)
- c) Peripheral blood lactate concentration was measured when the cat first presented; it was 10.0 mmol/L. Describe the **most** likely cause of elevated lactate in this patient **and** explain why this increase occurs. (4 marks)
- d) The cat has free peritoneal fluid. Name the **two (2)** most likely peritoneal fluid types in this cat. (1 mark)

You collect a peripheral blood sample and a sample of peritoneal fluid. The partial in-house fluid analysis results are below:

	Peritoneal fluid Value measured	Peripheral blood Value measured (blood normal range)
Potassium	14.0 mmol/L	9 mmol/L (3.5–5.0 mmol/L)
Creatinine	620 µmol/L	280 µmol/L (100–200 µmol/L)
PCV /TP	2%, 28 g/L	26%, 50 g/L (25–45%, TP 60–85 g/L)

- e) Interpret these results. Include in your answer the reasons that the abdominal fluid potassium and creatinine concentrations are higher than in the peripheral blood. (5 marks)

Question 1 continued over page

- f) List the further diagnostic tests that should be performed to complete the in-house abdominal fluid analysis. (3 marks)
- g) Describe the management of this cat over the next three hours. Include the steps to remove the abdominal fluid **and** any specific treatment and monitoring that are necessary. (8 marks)

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

- a) A four-year-old, male, neutered Beagle presents with grand mal seizures of over 30 minutes duration. The dog has a heart rate of 200 bpm, hyperaemic mucous membranes and a rectal temperature of 41.5°C.

Answer **all** parts of this sub-question:

- i. Briefly describe the initial stabilisation for this patient, including the first-line anticonvulsant drug of choice. (4 marks)
- ii. The dog continues to seizure. Describe the additional drugs available for the treatment of refractory seizures **and** the order in which they should be used. (4 marks)
- iii. A colleague recommends the tests listed below be performed. Justify the use of **each** of these tests in this patient: (10 marks)
 - blood glucose concentration
 - venous blood gas including lactate concentration
 - serum electrolyte concentrations: Na⁺, K⁺, Cl⁻ and iCa⁺⁺
 - PCV/total protein (TP)
 - PT/APTT
 - creatinine concentration.
- iv. List **four (4)** differential diagnoses for seizures in this dog. Justify **each** of these differential diagnoses. (4 marks)

Question 2 continued over page

- b) A five-year-old, medium sized crossbreed dog is receiving treatment for head trauma. A colleague is concerned that the dog has increased intracranial pressure.

Answer **both** parts of this sub-question:

- i. Describe the clinical signs that would support the diagnosis of increased intracranial pressure. (4 marks)
- ii. Briefly discuss the use of hyperventilation in the management of increased intracranial pressure. (4 marks)

3. A six-year-old, 20 kg, female entire dog presents to your clinic for vomiting, polyuria and polydipsia (PU/PD), lethargy and inappetance. She is a valuable breeding bitch that was mated 6-weeks ago. Upon clinical examination, she is dull, dehydrated and febrile, with a temperature of 39.6°C. An abdominal focussed assessment with sonography (AFAST) exam reveals multiple uterine loops distended with flocculent fluid. You suspect a pyometra.

Answer **all** parts of this question:

- a) Name the stage of the oestrus cycle in which pyometra occurs. (1 mark)
- b) Name **two (2)** possible differential diagnoses. (2 marks)
- c) You perform a complete blood count (CBC) and biochemistry. List the abnormalities in the clinical pathology results **and** briefly describe why **each** abnormality might occur in a dog with pyometra. (12 marks)

Table 1

Parameter	Abbreviation	Units	Result	Reference range
Haematocrit	HCT	L/L	33.2	37.3–61.7
Red Blood Cells	RBC	$\times 10^{12}/L$	3.8	5.65–8.76
Reticulocytes ABs	Retic	$\times 10^9/L$	61.1	10.0–110.0
Haemoglobin	Hb	g/L	12.0	13.1–20.5
White Blood Cells	WBC	$\times 10^9/L$	34.0	5.05–16.76
Neutrophils		$\times 10^9/L$	29.7	2.95–11.64
Bands		$\times 10^9/L$	2.8	
Lymphocytes		$\times 10^9/L$	0.7	1.05–5.10
Monocytes		$\times 10^9/L$	3.6	0.16–1.12
Eosinophils		$\times 10^9/L$	0.42	0.06–1.23
Basophils		$\times 10^9/L$	0.00	0.00–0.10
Platelet Count	PLT	$\times 10^9/L$	365	200–500

Question 3 continued over page

Table 2

Parameter	Abbreviation	Units	Result	Reference range
Alkaline Phosphatase	ALP	U/L	340	23–212
Alanine Transaminase	ALT	U/L	428	10–100
Gamma-Glutamyltransferase	GGT	U/L	3	0–7
Total Bilirubin	TBIL	μmol/L	4	2–10
Cholesterol	CHOL	mmol/L	4.3	1.7–5.8
Urea	UREA	mmol/L	24.0	2–9
Creatinine	CREA	μmol/L	136	27–124
Phosphorus	PHOS	mmol/L	1.4	0.93–2.13
Total Protein	TP	g/L	90	54–82
Albumin	ALB	g/L	32	25–44
Globulin	GLOB	g/L	58	23–52
Glucose	GLU	mmol/L	5.5	4.2–6.1
Amylase	AMYL	U/L	1480	500–1500
Lipase	LIPA	U/L	1468	200–1800

- d) Surgery is not an option in this case. Describe the medical management of this dog. Include in your answer the mechanism of action of any drugs used **and** justify the treatment recommendations. (12 marks)
- e) *E.coli* can cause nephrogenic diabetes insipidus (DI). Define nephrogenic diabetes insipidus **and** briefly describe how *E.coli* causes it to occur. (3 marks)

Continued over page

4. A 10 kg mixed-breed dog is presented to your clinic shortly after ingesting a 200 g block of dark chocolate. The dog is starting to exhibit mild clinical signs.

Answer **all** parts of this question:

- a) List the **two (2)** main toxins found in dark chocolate. (2 marks)
- b) The bar of chocolate contains 420 mg of toxic agent per 100 g. Calculate the total toxin dose **and** show your method of calculation. (2 marks)
- c) The total combined dose of toxic compounds in chocolate may produce mild, moderate and severe signs.

Answer **both** parts of this sub-question:

- i. State the dose range (mg/kg) of toxic compounds in chocolate to produce in the dog: (3 marks)
 - mild clinical signs
 - moderate clinical signs
 - severe clinical signs.
 - ii. Identify which level of severity is likely to apply to this patient. (1 mark)
- d) Describe the expected signs of moderate chocolate toxicity in the following organ systems: (7 marks)
- i. gastrointestinal
 - ii. neurological
 - iii. cardiac
 - iv. respiratory
 - v. renal.
- e) Describe the appropriate treatment of this patient and justify **each** treatment. Include in your answer **both** the immediate management of the ingestion **and** the management of the patient as its condition deteriorates. (15 marks)

End of paper