



# Australian and New Zealand College of Veterinary Scientists

## Membership Examination

June 2021

# 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

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Answer all four (4) questions

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

- a) Describe a normal lead 2 ECG trace. Include in your answer the generation and path of electrical conduction through the heart, and the corresponding phases of cardiac contraction and relaxation. *(6 marks)*
  
- b) Regarding dilated cardiomyopathy (DCM):
  - i. Define dilated cardiomyopathy (DCM). *(1 mark)*
  
  - ii. Briefly describe how DCM results in decreased cardiac output. *(5 marks)*
  
  - iii. Describe the role of compensatory mechanisms in the development of congestive heart failure in patients with DCM. You may include a diagram as part of your answer. *(14 marks)*
  
- c) List **three (3)** drugs from different antiarrhythmic classes used in the treatment of tachyarrhythmias. For each drug listed describe the mechanism of action. *(4 marks)*

**Continued over page**

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

- a) With regards to hyperlactataemia:
  - i. Define type A hyperlactataemia. (2 marks)
  - ii. Provide **two (2)** examples of type A hyperlactataemia and **two (2)** examples of type B hyperlactataemia. (2 marks)
  
- b) Briefly compare and contrast the clinical manifestations of hypovolaemic shock in the dog with the clinical manifestations of hypovolaemic shock in the cat. (5 marks)
  
- c) Compare and contrast the pathophysiology of cardiogenic shock due to myocardial failure with the pathophysiology of septic shock. (10 marks)
  
- d) List **two (2)** vasopressors commonly used in the management of systemic hypotension due to sepsis in the dog. (1 mark)
  
- e) For **each** drug listed in 2 d), briefly describe: (Total 10 marks, 5 marks each)
  - i. the mechanism by which it increases blood pressure (1.5 marks)
  - ii. the potential beneficial and detrimental effects of using this drug. (3.5 marks)

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

- a) Describe the effect of regulatory and counter-regulatory hormones on glucose homeostasis. Include in your answer the origin of each hormone, the trigger for its release and the sites at which it acts. (15 marks)
  
- b) Describe the pathophysiology of the formation of ketone bodies in diabetic ketoacidosis (DKA). (10 marks)
  
- c) Using **one (1)** clinical example for each, briefly compare and contrast the development of diabetes mellitus secondary to insulin deficiency with the development of diabetes mellitus secondary to insulin resistance. (5 marks)

**Continued over page**

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

a) Regarding brain injury:

- i. Describe the pathophysiology of traumatic brain injury. Include in your answer a brief discussion of primary and secondary brain injury. *(10 marks)*
- ii. Describe how severe acute intracranial hypertension results in the Cushing reflex (the central nervous system ischaemic response). *(5 marks)*
- iii. List **two (2)** hyperosmolar fluids used to reduce intracranial pressure. For each, describe the mechanism of action and any contraindications to their use. *(5 marks)*

b) Compare and contrast the pathophysiology and clinical signs of tetanus and botulism. *(10 marks)*

**End of paper**



# Australian and New Zealand College of Veterinary Scientists

## Membership Examination

June 2021

## Veterinary Emergency and Critical Care Paper 2

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 2: Veterinary Emergency and Critical Care

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Answer all four (4) questions

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

- a) An adult dog is diagnosed with acute pancreatitis. A complete blood count (CBC) and biochemistry panel are performed. Briefly describe the cause of each abnormal result in this patient. (7 marks)

## Complete blood count

Parameter	Result	Reference interval (adult dog)
RBC	<b>8.7</b>	5.5–8.5 x 10 <sup>12</sup> /L
HCT	<b>0.57</b>	0.37–0.55
RETIC	67	10.0–110.0 x 10 <sup>9</sup> /L
WBC	<b>19.0</b>	6.0–17.0 x 10 <sup>9</sup> /L
NEUT	<b>15.8</b>	3.0–11.5 x 10 <sup>9</sup> /L
BANDS	<b>1.0</b>	0.0–0.3 x 10 <sup>9</sup> /L
LYM	1.3	1.0–4.8 x 10 <sup>9</sup> /L
MONO	0.8	0.2–1.4 x 10 <sup>9</sup> /L
EOS	0.2	0.1–1.3 x 10 <sup>9</sup> /L
BASO	0.0	<0.1
PLT	270	200–500 x 10 <sup>9</sup> /L

Question 1 continued over page

## Chemistry

Parameter	Result	Reference interval
GLUC	3.9	3.4–7.4 mmol/L
UREA	<b>8.9</b>	3.0–8.7 mmol/L
CREA	130	40–140
PHOS	1.7	1.0–2.6 mmol/L
CA	<b>1.97</b>	2.30–3.00 mmol/L
TP	<b>45</b>	51–72 g/L
ALB	<b>26</b>	31–44 g/L
GLOB	19	14–37 g/L
ALT	<b>121</b>	3–83 U/L
ALKP	<b>1621</b>	0–170 U/L
GGT	<b>32</b>	1–12 U/L
TBIL	<b>100</b>	0–20 µmol/L
CHOL	7.1	3.9–7.8 mmol/L
AMYL	<b>2337</b>	180–1200 U/L
LIP	<b>2986</b>	0–395 U/L

- b) Discuss the use of antibiotics in the treatment of acute pancreatitis in dogs. (5 marks)
- c) Answer **both** parts of this sub-question: (10 marks)
- i. List **three (3)** potential complications of pancreatitis.
  - ii. For each complication listed in c) i, describe the clinical signs and expected diagnostic findings.
- d) List **three (3)** typical ultrasonographic changes in the abdomen of a dog with acute pancreatitis. (3 marks)
- e) Discuss the interpretation and limitations of the SNAP canine pancreatic lipase test when diagnosing acute pancreatitis in the dog. (5 marks)

**Continued over page**

2. A three-year-old female British bulldog is presented at 64 days gestation. This is her first litter and there are six puppies present. She has been actively contracting for 30 minutes without delivering a pup. You perform a clinical examination.

Answer **all** parts of this question:

- a) List **five (5)** factors that indicate medical and/or surgical intervention is required. *(5 marks)*
- b) You elect to perform a caesarean section. Describe the anaesthetic management of the bitch. Briefly justify each treatment provided. Do not include a description of surgical procedures in your answer. *(10 marks)*
- c) Briefly describe the surgical technique for performing a canine caesarean. *(10 marks)*
- d) At two weeks post-partum the bitch is presented for generalised muscle tremors, tachycardia, agitation and a temperature of 39.7°C.

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

- i. State the most likely diagnosis and any test(s) that could be performed to confirm this. *(2 marks)*
- ii. Briefly describe **three (3)** factors that may contribute to the development of this condition. *(3 marks)*

**Continued over page**



3. A five-year-old Maltese terrier presents with a three-day history of vomiting, lethargy and inappetence.

Physical examination findings are:

Mentation	dull and lethargic
Heart rate	160 beats/min
Respiratory rate	48 breaths per minute
Temperature	39.3°C
MM colour	pale
CRT	2 seconds
Pulse quality	hypodynamic
The remainder of the physical exam is unremarkable	

Initial diagnostic results are as follows:

### Haematology

Parameter	Units	Result	Reference range
Red blood cells	$\times 10^{12}/L$	<b>2.81</b>	5.5–8.5
Haematocrit	L/L	<b>21</b>	37–55
Haemoglobin	g/L	<b>6.2</b>	12–18
Reticulocytes	$\times 10^3/L$	<b>121</b>	10.0–110.0
White blood cells	$\times 10^9/L$	<b>25.9</b>	6.0–17.0
Segmented neutrophils	$\times 10^9/L$	<b>19.5</b>	3.0–12.0
Band neutrophils	$\times 10^9/L$	<b>4.2</b>	0–0.2
Lymphocytes	$\times 10^9/L$	2.6	1.0–4.8
Monocytes	$\times 10^9/L$	<b>2.8</b>	0.12–1.5
Eosinophils	$\times 10^9/L$	0.4	0.0–0.8
Basophils	$\times 10^9/L$	0.1	0.0–0.4
Platelets	$\times 10^9/L$	284	200–500
Morphology WBC	Moderate toxic change		
Morphology RBC	Polychromasia with anisocytosis, moderate spherocytes: 5 per 100x oil immersion field		

**Question 3 continued over page**

## Biochemistry

Parameter	Abbreviation	Units	Result	Reference range
Glucose	GLU	mmol/L	<b>12.8</b>	3.3–6.4
Albumin	ALB	g/L	36	26–46
Globulin	GLOB	g/L	46	22–46
Total protein	TP	g/L	82	52–82
Urea	UREA	mmol/L	<b>15.9</b>	2.1–9.3
Creatinine	CREA	µmol/L	<b>293</b>	35–141
Alanine aminotransferase	ALT	U/L	85	0–88
Alkaline phosphatase	ALP	U/L	205	0–212
Total bilirubin	TBIL	µmol/L	<b>26.9</b>	0–15.4
Sodium	Na	mmol/L	<b>133</b>	139–150
Potassium	K	mmol/L	<b>3.2</b>	3.4–4.9
Chloride	Cl	mmol/L	<b>105</b>	106–127

## Venous blood gases

Parameter	Units	Result	Reference range
pH		<b>7.382</b>	7.350–7.450
pCO <sub>2</sub>	mmHg	<b>22.0</b>	35.0–38.0
HCO <sub>3</sub>	mmol/L	<b>16.2</b>	20.0–24.0
Standard base excess	mmol/L	<b>-9.6</b>	-5–0
Lactate	mmol/L	<b>5.8</b>	0–2.5

## Urinalysis

Parameter	Result
Urine specific gravity	1.039
pH	6.5
Protein	Neg
Glucose	Neg
Ketones	Neg
Bilirubin	2+

Question 3 continued over page

Answer **all** parts of question 3:

- a) For each of the diagnostic tests above, describe the changes and provide the most likely cause in this patient. (12 marks)
- b) State the most likely diagnosis. Justify your answer. (3 marks)

The patient was given balanced intravenous isotonic crystalloid fluid therapy. Immediately following this, a physical exam was repeated with clinical findings as follows:

Mentation	dull
Heart rate	170 beats/min
Respiratory rate	44 breaths/min
Mucous membrane colour	pale
Rectal temperature	38.6°C

Parameter	Units	Result	Reference range
PCV	%	17	35–55
TP	g/L	74	52–82
Lactate	mmol/L	3.9	0–2.5

- c) A colleague suggests administering a blood transfusion. State whether this is indicated for this dog. Justify your answer. (5 marks)

Twenty minutes after starting the transfusion, the dog vomits and becomes tachycardic. The transfusion rate is currently 10 ml/kg/hr.

The patient is reassessed and the findings are:

Mentation	obtunded
Heart rate	180 beats/min
Respiratory rate	5 breaths per minute and irregular
Temperature	37.8°C
MM colour	pale
CRT	2 seconds
Pulse quality	hypodynamic
Mean arterial pressure	45mmHg
SpO <sub>2</sub>	91%

- d) Describe the approach to the patient at this time. In your answer, include any treatments and/or diagnostics that should be performed and comment on the ongoing management of the transfusion. (10 marks)

**Continued over page**

4. A seven-year-old, female, spayed, indoor domestic shorthaired cat presents with a one-month history of polyuria, polydipsia, weight loss and lethargy. The cat is now inappetent and has not urinated in the last 24-hours.

Physical examination findings are:

Mentation	obtunded
Heart rate	180 beats/min
Pulse quality	thready, synchronous
Respiratory rate	60 breaths per minute
Temperature	36.8°C
Mucous membranes	pale, tacky
CRT	3 seconds
Skin tent	increased

Mucosal ulcerations are noted on oral exam.

Abdominal palpation reveals pain with an enlarged painful left kidney and a small nodular right kidney. The bladder is small and non-painful.

An ECG is performed and the patient has a normal sinus tachycardia.

Initial diagnostics include blood tests and urinalysis. Results are as follows:

Parameter	Abbreviation	Units	Result	Reference range
Packed cell volume	PCV	%	<b>24</b>	25–45
Alkaline phosphatase	ALP	U/L	85	14–111
Alanine transaminase	ALT	U/L	100	12–130
Urea	UREA	mmol/L	<b>44</b>	5.7–12.9
Creatinine	CREA	µmol/L	<b>652</b>	71–212
Phosphorus	PHOS	mmol/L	<b>5.50</b>	1.00–2.42
Total protein	TP	g/L	<b>110</b>	57–89
Glucose	GLU	mmol/L	<b>16.3</b>	4.11–8.84
Sodium	Na	mmol/L	164	150–165
Potassium	K	mmol/L	<b>6.4</b>	3.5–5.8
Chloride	Cl	mmol/L	128	112–129
pH (venous)			<b>7.11</b>	7.31–7.42
Bicarbonate	HCO <sub>3</sub>	mmol/L	<b>11</b>	15.4–23.4
Anion gap	AG	mmol/L	<b>31</b>	13–27
Lactate	LAC	mmol/L	<b>4.6</b>	0.5–2

**Question 4 continued over page**

<b>Parameter</b>	<b>Result</b>
Collection method	cystocentesis
USG	1.020
Colour	yellow
Clarity or turbidity	slightly turbid
pH	8
Glucose	1
Ketones	Neg
Protein	2
Bilirubin	Neg
Hb	3
Leuc	3
Crystals	moderate struvite
Casts	granular casts
Epithelial cells	scant
Bacteria	occasional cocci intracellularly

Answer **all** parts of question 4:

- a) Identify the abnormalities on physical examination and clinical pathology results and state the most likely cause for each in this patient. *(10 marks)*
- b) Describe the clinical management of this cat in the first three hours. Include in your answer any diagnostic tests that should be performed and any drugs that should be given. Justify your recommendations. *(14 marks)*
- c) The patient is diagnosed with unilateral, left ureteral obstruction. List **three (3)** drugs used in the medical management of this condition (following removal of the blockage) and state their mechanism of action. *(6 marks)*

**End of paper**