



# Australian and New Zealand College of Veterinary Scientists

## Membership Examination

June 2016

## Veterinary Pathology Paper 1

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

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

Answer **ALL FOUR (4)** questions

Answer **FOUR** questions each worth 30 marks .....total 120 marks

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# Paper 1: Veterinary Pathology

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**Answer all four (4) questions**

1. Answer **one (1)** of the following:

- a) Outline the role of intact and damaged endothelium and its derived mediators in haemostasis and control of vascular growth. *(30 marks)*
- b) Outline the cell cycle, indicating critical points of cell cycle regulation. For **each** critical point, describe examples of alterations or abnormalities which may lead to neoplasia. *(30 marks)*

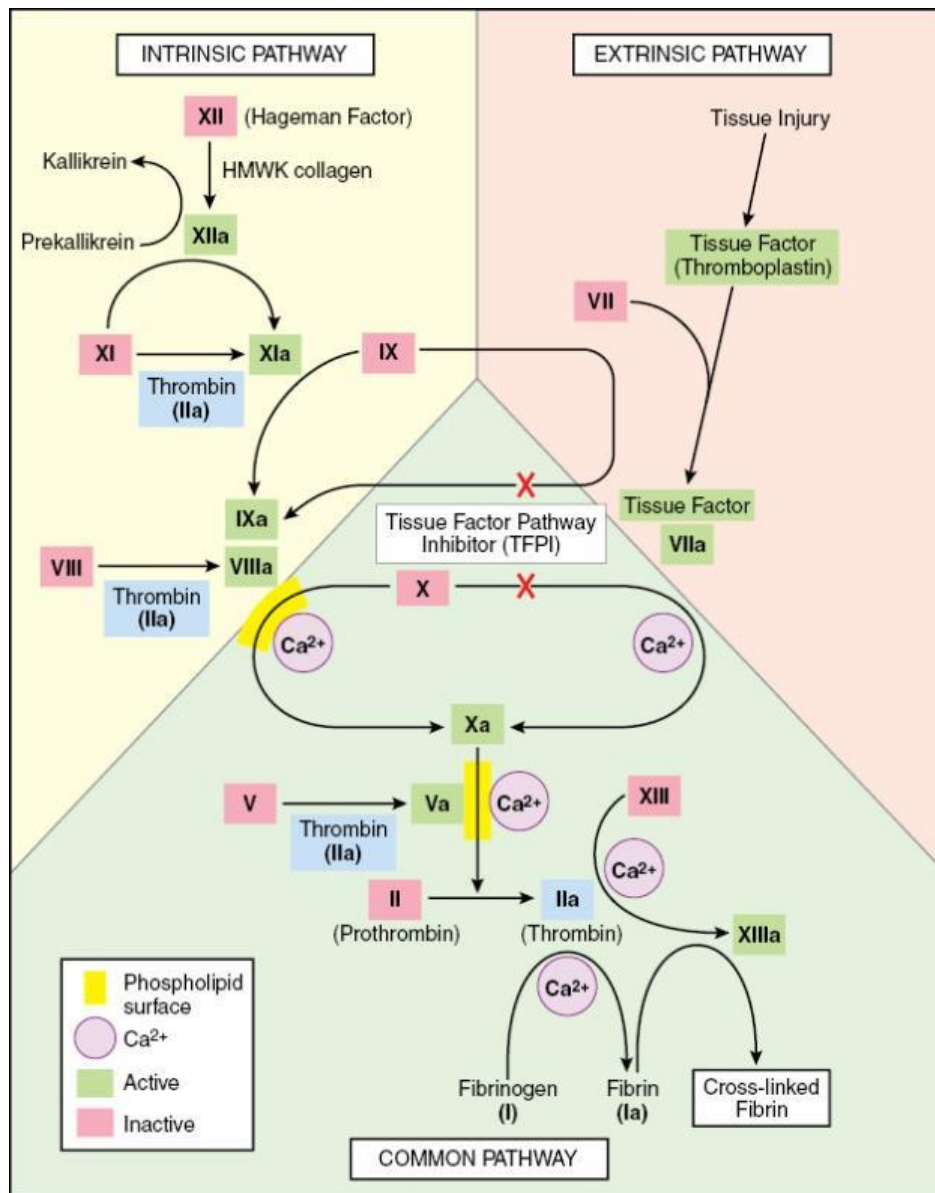
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2. Answer **two (2)** of the following:

a) Examine the diagram below that outlines the coagulation cascade.

Identify points within the cascade connected with **five (5)** canine inherited coagulopathies; for **each** identified coagulopathy outline: (15 marks)

- i. Clinical consequences of the defect in haemostasis.
- ii. Expected results of prothrombin time (PT) and activated partial thromboplastin time (aPTT) testing



(From Kumar V, Abbas AK, Fausto N: Robbins & Cotran pathologic basis of disease, ed 8, Philadelphia, 2009, Saunders.)  
Zachary and McGavin: Pathologic Basis of Veterinary Disease, 5th edition.  
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Question 2 continued over page

- b) For **each** of Th1, Th2 and Th17 immune responses, identify:
- i. **two (2)** major cytokines that induce the specific response (3 marks)
  - ii. **two (2)** major cytokines produced in each response (3 marks)
  - iii. predominant effector cell type mediating each response (3 marks)
  - iv. examples of **one (1)** disease characterised by **each** type of these immune responses (3 marks)
  - v. interactions with T regulatory cells. (3 marks)
- c) Define the following forms of adaptive changes that may occur in cells: hypertrophy, hyperplasia, atrophy, metaplasia. Using the gastrointestinal system, name specific disease examples. (15 marks)

3. Answer **three (3)** of the following:

- a) Outline the major classes of Toll-like receptors (TLR), their major ligands, and the microorganisms that are recognised by **each** receptor. (10 marks)
- b) Discuss **five (5)** paraneoplastic syndromes, providing specific examples and mechanisms (if known). (10 marks)
- c) Outline mechanisms adopted by infectious agents to avoid phagocytosis and intracellular killing, providing specific examples. (10 marks)
- d) Outline the significance of free radicals. Include in your answer a definition of free radicals, and provide **two (2)** examples detailing how free radicals may be produced, possible effects on the host, and host protective mechanisms. (10 marks)
- e) Outline the mechanisms by which papillomavirus infection leads to disorders of epithelial growth, and provide **two (2)** examples of diseases associated with specific papillomaviruses. (10 marks)

**Continued over page**

4. Answer **five (5)** of the following:
- a) Briefly outline the pathophysiology of type three hypersensitivity reactions, providing **two (2)** disease examples. *(6 marks)*
  - b) Describe **four (4)** possible outcomes for a thrombus following its formation. Mention significant clinical consequences for each outcome. *(6 marks)*
  - c) Name **three (3)** antimicrobial peptides and their mode of activity. *(6 marks)*
  - d) Outline the role of selectins and their ligands in the recruitment of intravascular leukocytes to sites of inflammation. *(6 marks)*
  - e) Define micro-RNA, and list **four (4)** examples of the role micro-RNAs play in both physiological and pathological processes. *(6 marks)*
  - f) List and briefly discuss the acute phase proteins most commonly examined as markers of inflammation in the domestic species. *(6 marks)*

**End of paper**



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## Veterinary Pathology

## Paper 2

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

Answer **ALL FOUR (4)** questions

Answer **FOUR** questions each worth 30 marks .....total 120 marks

# Paper 2: Veterinary Pathology

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**Answer all four (4) questions**

1. Answer **two (2)** of the following:

- a) Discuss **three (3)** major histiocytic diseases of dogs, including clinical presentation, cell type of origin, either cytologic **or** histological features, and relevant immunohistochemical markers. *(15 marks)*
  
- b) On the following two pages are the complete blood count and biochemistry results from a four-year-old Holstein-Friesian cow that presented to a veterinarian with a three day history of depression, anorexia and decreased manure production. *(15 marks)*
  - i. interpret these results
  - ii. outline the most likely cause/s of these changes and most probable diagnosis
  - iii. recommend to the veterinarian diagnostic tests that may yield additional useful information.

**Question 1 b) continued over page**

<b>Haematology</b>	<b>Result</b>		<b>Reference Intervals</b>
RBC count	8.0	<b>H</b>	4.9–7.5 x10 <sup>12</sup> /L
Haemoglobin	128	<b>H</b>	84–120 g/L
Haematocrit	0.33	<b>H</b>	0.21–0.30 L/L
MCV	45		36–50 fL
MCH	17		14–19 pg
MCHC	390		380–430 g/L
Machine platelet count	512		160–650 x10 <sup>9</sup> /L
White cell count	5.8		5.1–13.3 x10 <sup>9</sup> /L
Neutrophil ABS	3.6		1.7–6.0 x10 <sup>9</sup> /L
Band ABS	0.0		<0.2 x 10 <sup>9</sup> /L
Lymphocyte ABS	1.7	<b>L</b>	1.8–8.1 x10 <sup>9</sup> /L
Monocyte ABS	0.4		0.1–0.7 x10 <sup>9</sup> /L
Eosinophil ABS	0.0		0.1–1.2 x10 <sup>9</sup> /L
Basophil ABS	0.0		<0.2 x10 <sup>9</sup> /L
Fibrinogen	8	<b>H</b>	3–7 g/L
PCV	0.40	<b>H</b>	0.24–0.38 L/L
Plasma protein	90	<b>H</b>	60–80 g/L
Plasma appearance	normal		
Smear morphology	normal		

**Question 1 b) continued over page**



<b>Biochemistry</b>	<b>Result</b>		<b>Reference Intervals</b>
Sodium	144		136–145 mmol/L
Potassium	3.3	<b>L</b>	3.6–5.6 mmol/L
Chloride	70	<b>L</b>	94–111 mmol/L
Bicarbonate	50	<b>H</b>	20–30 mmol/L
Anion gap	29	<b>H</b>	11–19 mmol/L
Glucose, serum	4.2	<b>H</b>	2.0–3.0 mmol/L
Urea	13.8	<b>H</b>	2.0–6.6 mmol/L
Creatinine	80	<b>H</b>	40–60 µmol/L
Calcium	2.2		2.0–3.0 mmol/L
Phosphate	1.9		1.2–2.3 mmol/L
Protein, total	75	<b>H</b>	59–73 g/L
Albumin	37	<b>H</b>	28–36 g/L
Globulins	48		27–50 g/L
Bilirubin, total	15.1	<b>H</b>	0–6.8 µmol/L
AST	101		53–105 IU/L
GLDH	17		2.0–23 IU/L
GGT	73	<b>H</b>	20–46 IU/L
CK	112	<b>H</b>	82–96 IU/L
Magnesium	1.1		0.7–1.23 mmol/L
Sample appearance		normal	

**Continued over page**

- c) Below and on the following page are the complete blood count and biochemistry results from a six-year-old Quarter horse mare that presented to a veterinarian with a 12-hour history of reluctance to move and a stiff gait. (15 marks)
- i. interpret these results
  - ii. outline the most likely cause/s of these changes and the probable diagnosis
  - iii. recommend to the veterinarian diagnostic tests that may yield additional useful information.

Haematology	Result		Reference Intervals
RBC count	10.2		6.2–12.5 x10 <sup>12</sup> /L
Haemoglobin	168		113–190 g/L
Haematocrit	0.45		0.31–0.51 L/L
MCV	42		38–52 fL
MCH	18		14–19 pg
MCHC	360		343–377 g/L
Machine platelet count	325		100–350 x10 <sup>9</sup> /L
White cell count	22.9	<b>H</b>	3.4–12.2 x10 <sup>9</sup> /L
Neutrophil ABS	19.0	<b>H</b>	1.5–7.1 x10 <sup>9</sup> /L
Band ABS	0.6	<b>H</b>	<0.1 x 10 <sup>9</sup> /L
Lymphocyte ABS	2.0		1.0–5.5 x10 <sup>9</sup> /L
Monocyte ABS	1.3	<b>H</b>	<0.1 x10 <sup>9</sup> /L
Eosinophil ABS	0.0		<0.1 x10 <sup>9</sup> /L
Basophil ABS	0.0		<0.2 x10 <sup>9</sup> /L
PCV	53	<b>H</b>	32–47%
Plasma protein	72		59–72 g/L
SAA	1007	<b>H</b>	<10 mg/L
Plasma appearance	normal		
Smear morphology	mild toxic change, 1+ reactive lymphocyte		

**Question 1 c) continued over page**

<b>Biochemistry</b>	<b>Result</b>		<b>Reference Intervals</b>
Sodium	133		130–152 mmol/L
Potassium	4.0		2.8–5.8 mmol/L
Chloride	94	<b>L</b>	95–114 mmol/L
Bicarbonate	20	<b>L</b>	22–35 mmol/L
Anion gap	23	<b>H</b>	7.2–15.2 mmol/L
Glucose, serum	10.5	<b>H</b>	3.7–9.0 mmol/L
Urea	11.2	<b>H</b>	2.6–9.6 mmol/L
Creatinine	302	<b>H</b>	70–146 µmol/L
Calcium	2.8		2.1–3.2 mmol/L
Phosphate	1.7	<b>H</b>	0.6–1.5 mmol/L
Protein, total	68		44–86 g/L
Albumin	38		23–42 g/L
Globulin	30		17–49 g/L
Bilirubin, total	60	<b>H</b>	17–35 µmol/L
ALP	680	<b>H</b>	62–380 IU/L
AST	3012	<b>H</b>	278–584 IU/L
GLDH	12	<b>H</b>	0.9–9.3 IU/L
GGT	36	<b>H</b>	5.2–34.4 IU/L
CK	22,156	<b>H</b>	104–590 IU/L
Magnesium	0.8		0.5–0.9 mmol/L
Sample appearance	normal		

**Continued over page**

2. Answer **three (3)** of the following:
- a) Detail the expected clinical pathology findings in **two (2)** of the following: *(10 marks)*
- i. *Clostridium difficile* infection in horses
  - ii. canine hypothyroidism
  - iii. renal disease in a parrot
- b) Outline methods for differentiation of inflammatory bowel disease from intestinal lymphoma in endoscopic intestinal biopsies from dogs **or** cats, describing the key differentiating features as well as any pitfalls associated with the method. *(10 marks)*
- c) List the histopathological features of **two (2)** of the following: *(10 marks)*
- i. chytridiomycosis in amphibians
  - ii. mycobacterial infection in birds
  - iii. morbillivirus infection in cetaceans.
- d) Discuss the various lesions that have been associated with porcine circovirus type 2 infection in pigs. *(10 marks)*
- e) Discuss the histopathological features of copper associated hepatopathy in a species of your choice. *(10 marks)*

**Continued over page**

3. Answer **three (3)** of the following:
- a) List the expected clinical pathology findings in **two (2)** of the following:  
(10 marks)
    - i. chronic hookworm infestation in a young dog
    - ii. hyperlipidemia in a pony
    - iii. anticoagulant rodenticide toxicity in a cat.
  - b) Discuss the diagnosis of and lesions associated with lungworm in sheep. Include specific aetiological agents in your answer. (10 marks)
  - c) Discuss histological grading of canine mast cell tumours. (10 marks)
  - d) Discuss total and differential cell counts, cytology, and protein analysis of equine joint fluid **and** how these might help distinguish between potential causes of joint effusions. (10 marks)
  - e) List the expected clinical pathology findings in **two (2)** of the following:  
(10 marks)
    - i. *Actinobacillus* peritonitis in horses
    - ii. *Theileria* infection in a steer
    - iii. ketosis in a dairy cow.

**Continued over page**

4. Briefly describe **five (5)** of the following:
- a) Acromegaly in cats. (6 marks)
  - b) The lesions in a fish infected with Koi herpes virus (cyprinid herpesvirus-3), mentioning susceptible species. (6 marks)
  - c) Gross and histopathological findings of *Coxiella burnetti* (Q fever infection) associated abortion in goats. (6 marks)
  - d) Pathological features of *Eimeria stiedii* infection in rabbits. (6 marks)
  - e) Syndromes associated with FeLV infection in cats. (6 marks)
  - f) Features of a supplied clinical history for a horse that would raise suspicion for Hendra virus infection. (6 marks)
  - g) Congenital abnormalities associated with Schmallenberg infection in sheep and cattle. (6 marks)

**End of paper**