



# Australian and New Zealand College of Veterinary Scientists

## **Membership Examination**

June 2018

## **Veterinary Pathology**

### **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 Pathology

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Answer all four (4) questions

1. Outline the role of mast cells in the development of disease. Your answer should include the mechanisms for mast cell activation and degranulation, **and** the contents and functions of mast cell granules. (30 marks)

2. Apoptosis is a vital process with many and varied roles within the body.

Answer **all** parts of this question:

a) Define apoptosis, **and** describe some of the processes in which apoptosis is particularly important. (10 marks)

b) Outline the pathways of apoptosis. (15 marks)

c) Briefly describe the morphological appearance of a cell undergoing apoptosis. (5 marks)

3. Answer **two (2)** of the following: (for a total of 30 marks)

a) Many grading schemes for tumours have been published in the field of veterinary pathology. However, when these schemes are applied, they are often poorly predictive of tumour behaviour. Identify possible reasons for the failure of tumour grading schemes to predict tumour behaviour. (15 marks)

b) Define amyloid **and** outline **two (2)** examples of amyloidosis in veterinary medicine. Your examples should include the type of amyloid involved. (15 marks)

**Question 3 continued over page**

- c) Virchow's triad depicts the key initiators of thrombosis:
- i. List the **three (3)** components, **and** for **each** of the components describe **three (3)** diseases or alterations within the body that may predispose to thrombosis by altering the component. *(10 marks)*
  - ii. Describe the expected gross appearance of a thrombus that develops within a large artery. *(5 marks)*

4. Answer **two (2)** of the following: *(for a total of 30 marks)*

- a) Describe how microbial agents may predispose to the development of autoimmunity. *(15 marks)*
- b) *Ras* is the most frequently mutated oncogene in human cancers. Describe both the normal function of the *Ras* protein **and** why mutations within the *Ras* oncogene can influence the neoplastic transformation of a cell. *(15 marks)*
- c) Endogenous pigments are often seen in the examination of tissues, either by cytology or histology. Choose **two (2)** endogenous pigments **and** briefly discuss the appearance **and** significance of **each** pigment when it is seen in a pathological setting. Include in your answer the **most** likely organ or tissue affected, as well as a special stain (if applicable) that you may use to highlight or confirm the nature of the pigment. *(15 marks)*

**End of paper**



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## Veterinary Pathology

## 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 Pathology

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## Answer all four (4) questions

1. Answer **two (2)** of the following: *(for a total of 30 marks)*

- a) Describe the pathogenesis of pemphigoid diseases in dogs. **In addition**, describe the histological appearance of pemphigus foliaceus. *(15 marks)*
- b) Below and on the following page are the haematology, biochemistry and urinalysis results from a ten-year-old, female, spayed Jack Russell terrier. The referring veterinarian reports a two-month history of progressively worsening polyuria, polydipsia, and weight loss, and mild dehydration is noted on clinical examination. *(15 marks)*
- Provide a brief interpretation these results.
  - Outline the **most** likely cause(s) of these changes **and** provide the **most** probable diagnosis(es).
  - Provide a recommendation to the veterinarian for the diagnostic tests that may yield additional useful information.

| Haematology    | Result |          | Units              | Reference Intervals |
|----------------|--------|----------|--------------------|---------------------|
| RBC count      | 8.8    | <b>H</b> | $\times 10^{12}/L$ | 5.4–8.5             |
| Haemoglobin    | 215    | <b>H</b> | g/L                | 125–201             |
| Haematocrit    | 64     | <b>H</b> | L/L                | 40–60               |
| MCV            | 68     |          |                    | 63–73               |
| MCHC           | 345    |          |                    | 330–360             |
| Platelet count | 256    |          | $\times 10^9/L$    | 177–398             |
| WBC count      | 33.0   | <b>H</b> | $\times 10^9/L$    | 5.3–19.8            |
| Neutrophil ABS | 30.0   | <b>H</b> |                    | 3.1–14.4            |
| Lymphocyte ABS | 0.5    | <b>L</b> | $\times 10^9/L$    | 0.9–5.5             |
| Monocyte ABS   | 2.5    | <b>H</b> | $\times 10^9/L$    | <1.6                |
| Eosinophil ABS | 0.0    |          | $\times 10^9/L$    | <1.3                |
| Basophil ABS   | 0.0    |          | $\times 10^9/L$    | rare                |

**Question 1. b) continued over page**

| <b>Biochemistry</b> | <b>Result</b> |          | <b>Units</b> | <b>Reference Intervals</b> |
|---------------------|---------------|----------|--------------|----------------------------|
| Sodium              | 130           | <b>L</b> | mmol/L       | 142–150                    |
| Potassium           | 3.8           | <b>L</b> | mmol/L       | 3.9–5.9                    |
| Chloride            | 101           |          | mmol/L       | 99–116                     |
| Bicarbonate         | 10.1          | <b>L</b> | mmol/L       | 15.2–25.0                  |
| Anion gap           | 27.1          | <b>H</b> |              | 14–22                      |
| Glucose, serum      | 23.0          | <b>H</b> | mmol/L       | 3.3–6.8                    |
| Urea                | 13.2          | <b>H</b> | mmol/L       | 3.0–10.6                   |
| Creatinine          | 178           | <b>H</b> | µmol/L       | 54–152                     |
| Calcium             | 2.3           |          | mmol/L       | 1.6–2.7                    |
| Phosphorous         | 2.6           | <b>H</b> | mmol/L       | 0.8–2.4                    |
| Protein, total      | 75            | <b>H</b> | g/L          | 48–71                      |
| Albumin             | 42            | <b>H</b> | g/L          | 23–39                      |
| Globulins           | 33            |          | g/L          | 17–39                      |
| Bilirubin, total    | 3.6           |          | µmol/L       | 0–4.3                      |
| ALP                 | 578           | <b>H</b> | IU/L         | 20–155                     |
| AST                 | 80            | <b>H</b> | IU/L         | 17–69                      |
| ALT                 | 101           | <b>H</b> | IU/L         | 16–91                      |
| GGT                 | 3             |          | IU/L         | 0–9                        |
| CK                  | 359           |          | IU/L         | 73–510                     |
| Cholesterol         | 10.3          | <b>H</b> | mmol/L       | 3.3–8.2                    |
| Amylase             | 856           |          | IU/L         | 317–937                    |
| Lipase              | 457           |          | IU/L         | 70–950                     |
| Total T4            | 9             | <b>L</b> | nmol/L       | 13–52                      |
| TSH (endogenous)    | 0.09          | <b>L</b> | µg/L         | 0.1–0.6                    |
| Free T4             | 18.2          |          | nmol/L       | 15–44                      |
| Sample appearance   | Lipaemic      |          |              |                            |

### Urinalysis

Method: cystocentesis

- SG 1.023
- Protein: 1+
- Glucose 3+
- Ketones: 1+

**Continued over page**

- c) Below and on the following page are the haematological and biochemical results from a 12-month-old Holstein Friesian heifer presenting to the referring veterinarian as recumbent and dehydrated, with increased respiratory effort. (15 marks)

- i. Provide a brief interpretation these results.
- ii. Outline the **most** likely cause(s) of these changes **and most** probable diagnosis(es).

| Haematology            | Result                    |          | Units              | Reference Intervals |
|------------------------|---------------------------|----------|--------------------|---------------------|
| RBC count              | 7.08                      |          | $\times 10^{12}/L$ | 4.9–7.5             |
| Haemoglobin            | 121                       | <b>H</b> | g/L                | 84–120              |
| Haematocrit            | 0.339                     | <b>H</b> | L/L                | 0.21–0.30           |
| MCV                    | 48                        |          | fL                 | 36–50               |
| MCH                    | 17                        |          | pg                 | 14–19               |
| MCHC                   | 356                       |          | g/L                | 380–430             |
| Machine platelet count | 548                       |          | $\times 10^9/L$    | 160–650             |
| Smear platelet comment | clumped and adequate      |          |                    |                     |
| White cell count       | 25.8                      | <b>H</b> | $\times 10^9/L$    | 5.1–13.3            |
| Neutrophil ABS         | 23.2                      | <b>H</b> | $\times 10^9/L$    | 1.7–6.0             |
| Band ABS               | 0.3                       | <b>H</b> | $\times 10^9/L$    | <0.2                |
| Lymphocyte ABS         | 2.3                       |          | $\times 10^9/L$    | 1.8–8.1             |
| Monocyte ABS           | 0.0                       |          | $\times 10^9/L$    | 0.1–0.7             |
| Eosinophil ABS         | 0.0                       |          | $\times 10^9/L$    | 0.1–1.2             |
| Basophil ABS           | 0.0                       |          | $\times 10^9/L$    | <0.2                |
| Fibrinogen             | 8                         | <b>H</b> | g/L                | 3–7                 |
| PCV                    | 35                        |          | %                  | 0.24–0.38           |
| Plasma protein         | 103                       | <b>H</b> | g/L                | 60–80               |
| Plasma appearance      | Normal                    |          |                    |                     |
| Smear morphology       | RBC: normal. WBC: normal. |          |                    |                     |

**Question 1. c) continued over page**

| <b>Biochemistry</b> | <b>Result</b> |          | <b>Units</b> | <b>Reference Intervals</b> |
|---------------------|---------------|----------|--------------|----------------------------|
| Sodium              | 138           |          | mmol/L       | 136–145                    |
| Potassium           | 3.0           | <b>L</b> | mmol/L       | 3.6–5.6                    |
| Chloride            | 59            | <b>L</b> | mmol/L       | 94–111                     |
| Bicarbonate         | 56            | <b>H</b> | mmol/L       | 20–30                      |
| Anion gap           | 24            | <b>H</b> | mmol/L       | 11–19                      |
| Glucose, serum      | 10.8          | <b>H</b> | mmol/L       | 2.0–3.0                    |
| Urea                | 21.0          | <b>H</b> | mmol/L       | 2.0–6.6                    |
| Creatinine          | 214           | <b>H</b> | μmol/L       | 40–165                     |
| Calcium             | 2.28          |          | mmol/L       | 2.0–3.0                    |
| Phosphate           | 2.7           | <b>H</b> | mmol/L       | 1.2–2.3                    |
| CA:P ratio          | 0.8           |          |              |                            |
| Protein, total      | 92            | <b>H</b> | g/L          | 59–73                      |
| Albumin             | 38            | <b>H</b> | g/L          | 28–36                      |
| Globulins           | 54            | <b>H</b> | g/L          | 27–50                      |
| Bilirubin, total    | 12.1          | <b>H</b> | μmol/L       | 0–6.8                      |
| AST                 | 256           | <b>H</b> | IU/L         | 53–105                     |
| GLDH                | 7.6           |          | IU/L         | 2.0–23                     |
| GGT                 | 34            |          | IU/L         | 20–46                      |
| CK                  | 650           | <b>H</b> | IU/L         | 82–96                      |
| Magnesium           | 1.10          |          | mmol/L       | 0.7–1.23                   |
| Triglycerides       | 0.3           |          | mmol/L       | 0.17–0.51                  |
| B-OHB               | 0.21          |          | mmol/L       | 0.3–1.0                    |
| Sample appearance   | Normal        |          |              |                            |

**Continued over page**

2. Answer **three (3)** of the following: *(for a total of 30 marks)*
- a) Briefly discuss equine arboviral disease in regards to cause and pathogenesis. Include both endemic **and** important exotic diseases. Include in your answer a summary of the diagnostic tests that are available **and** a description of the **most** likely clinical signs in affected horses. *(10 marks)*
- b) Answer **two (2)** of the following sub-questions: *(for a total of 10 marks)*
- i. Outline the causative agent, gross lesions and histological lesions of amoebic gill disease. *(5 marks)*
  - ii. Describe the histologic lesions that enable a diagnosis of death due to calicivirus infection in rabbits. *(5 marks)*
  - iii. Name the causative agent **and** describe the gross and histological lesions of spotty liver disease in chickens. *(5 marks)*
- c) Discuss the pathogenesis, gross lesions, and histology of *Lawsonia intracellularis* infection in pigs. *(10 marks)*
- d) Answer **two (2)** of the following sub-questions: *(for a total of 10 marks)*
- i. Provide differential diagnoses for eosinophilic pleocytosis from a cerebrospinal fluid (CSF) sample in dogs. *(5 marks)*
  - ii. Outline the expected clinical pathological findings for neonatal isoerythrolysis in a foal. *(5 marks)*
  - iii. Discuss the cytologic features of cutaneous follicular tumours and cysts in dogs **and** cats. *(5 marks)*
- e) Outline the cause, pathogenesis, gross lesions, histological lesions **and** diagnosis of blackleg in cattle. *(10 marks)*

**Continued over page**

3. Answer **three (3)** of the following: *(for a total of 30 marks)*
- a) List the expected findings in **two (2)** of the following: *(for a total of 10 marks)*
- i. Bronchoalveolar lavage (BAL) fluid from a horse with recurrent airway obstruction (RAO). *(5 marks)*
  - ii. Synovial fluid from a calf with septic polyarthritis. *(5 marks)*
  - iii. Piroplasmosis in a kangaroo (including a description or drawing of the parasite). *(5 marks)*
- b) Outline **four (4)** possible causes of microcytosis in dogs **and** how these might be differentiated. *(10 marks)*
- c) Discuss the typical clinical presentation, methods of diagnosis, gross appearance, histological appearance **and** expected behaviour of urothelial carcinomas in dogs. *(10 marks)*
- d) Discuss how gross appearance, cell count, cytology and biochemical analysis of feline thoracic fluid might help distinguish between the potential causes of pleural effusion. *(10 marks)*
- e) Describe the gross appearance of the heart and the probable sequelae of:
- i. Left atrioventricular valve endocardiosis (myxoid degeneration). *(3 marks)*
  - ii. Subaortic stenosis. *(3 marks)*
  - iii. Tetralogy of Fallot. *(4 marks)*

**Continued over page**

4. Answer **five (5)** of the following: *(for a total of 30 marks)*
- a) Briefly discuss the pathogenesis **and** major gross and histological features of beak and feather disease in Psittaciforme birds. *(6 marks)*
  - b) Describe the biochemical changes **and** histological appearance of pyrrolizidine alkaloid toxicity in sheep. *(6 marks)*
  - c) Provide **two (2)** examples of blood and/or urinary biomarkers for the assessment of renal function in small animals. Comment on how they may be used for diagnosis of renal disease **and** include their limitations. *(6 marks)*
  - d) Explain the cause, typical signalment, gross appearance **and** histology of feline sarcoids. *(6 marks)*
  - e) Describe the gross **and** histological lesions expected to be present in a case of bovine fungal abortion. *(6 marks)*
  - f) Outline the methodology **and** use of fractional excretion for the assessment of renal function, electrolytes and mineral balance in horses. *(6 marks)*

**End of paper**