



# Australian and New Zealand College of Veterinary Scientists

## Fellowship Examination

June 2022

## Veterinary Radiology

### Paper 1

Perusal time: **Twenty (20)** minutes

Time allowed: **Three (3)** hours after perusal

**Section A:** Answer **ALL FOUR (4)** questions

**Section B:** Answer **ALL TWELVE (12)** questions

**Answer all questions for this paper in the provided answer books.**

**Section A:**

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

**Section B:**

Answer **TWELVE (12)** short-answer questions, each worth 5 marks..... total 60 marks

# Paper 1: Veterinary Radiology

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## Section A: Answer ALL four (4) long-answer questions

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

a) In abdominal imaging a low kVp is used for radiography and a high kVp is used for computed tomography (CT). Describe the effect of kVp on image contrast and compare and contrast the way in which contrast is produced in the abdomen in: *(20 marks)*

i. radiography

ii. CT.

b) With regards to CT, briefly describe factors which affect contrast and spatial resolution and how these can be manipulated for optimum image quality. *(10 marks)*

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

a) Discuss the Doppler effect with respect to vascular ultrasound imaging. *(5 marks)*

b) Compare continuous wave and pulsed wave Doppler ultrasound with respect to image formation and clinical application. *(20 marks)*

c) Describe spectral broadening and **two (2)** mechanisms by which it most commonly occurs in clinical imaging. *(5 marks)*

3. Explain how T1 weighted spin echo images and T1 weighted 3 dimensional (3D) gradient images are formed and compare their principal advantages and disadvantages in general and with reference to imaging the canine brain. *(30 marks)*

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

- a) Describe the technique that should be used to obtain a nuclear medicine study of the musculoskeletal system of a horse. *(20 marks)*
  
- b) Describe radiation safety factors that should be considered and how they should be managed. *(10 marks)*

**Section B starts on the next page**

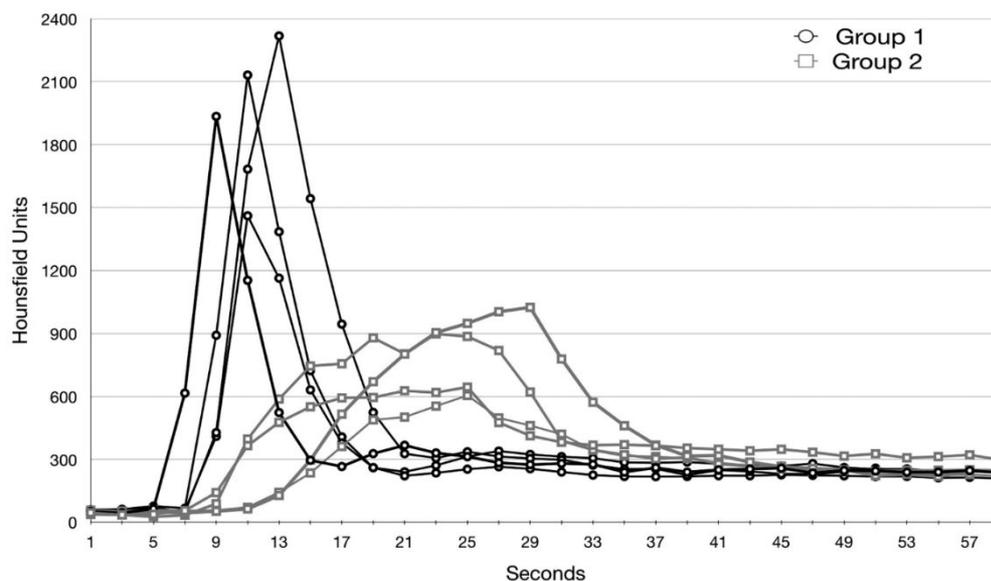
**Section B: Answer ALL twelve (12) short-answer questions**

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

- a) Draw the atlas (C1) in transverse section and indicate the location of the sutures which fuse to form it. Label the osseous components they divide. (3 marks)
- b) List the features of incomplete ossification of the atlas. (2 marks)

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

- a) For the below diagram, two different injection protocols (three per group) have been utilised. Which group likely represents a fixed injection rate, and which group likely represents a fixed injection duration? (2 marks)



- b) Describe the clinical relevance of injection duration on bolus geometry when imaging the abdomen. (3 marks)

3. Briefly compare the advantages and disadvantages of flat-panel detector and image intensifier fluoroscopy systems. (5 marks)

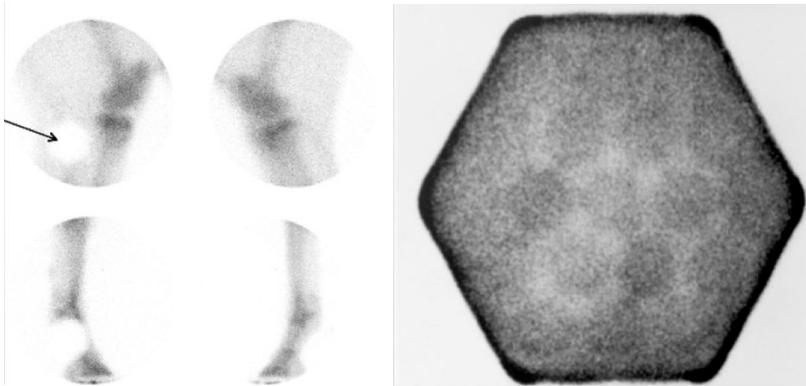
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4. List and briefly discuss **five (5)** effects of radiation on the cell. *(5 marks)*
5. Answer **all** parts of this question:
- a) Name the most common cause of an artefact in MRI imaging which causes a line of abnormal signal intensity that occurs parallel to an interface between tissues of markedly different signal intensity. *(2 marks)*
  - b) Describe at which stage of image formation this occurs. *(2 marks)*
  - c) Name the structure this artefact may mimic in the spinal cord. *(1 mark)*
6. Discuss the reported techniques for performing CT lymphangiography to investigate chylothorax in the dog and the factors that may affect the quality of the study. *(5 marks)*

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

- a) Name the component of the gamma camera which is malfunctioning to create the two field uniformity artifacts below. (2 marks)



- b) Describe the function of this component of the gamma camera. (3 marks)

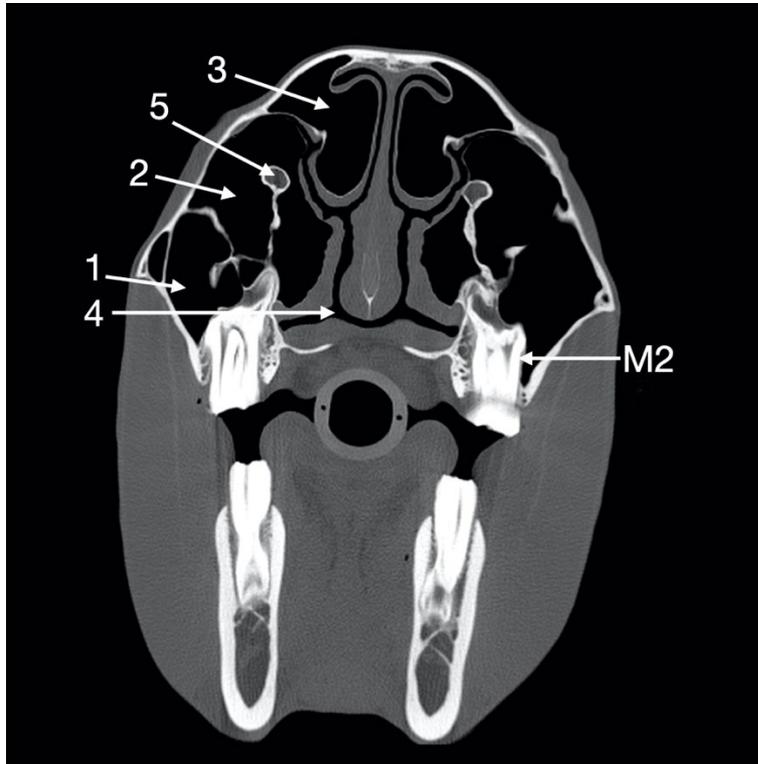
8. Answer **all** parts of this question:

- a) Name the structure that originates from the point indicated with arrows and inserts at the point indicated with the arrow heads. (0.5marks)

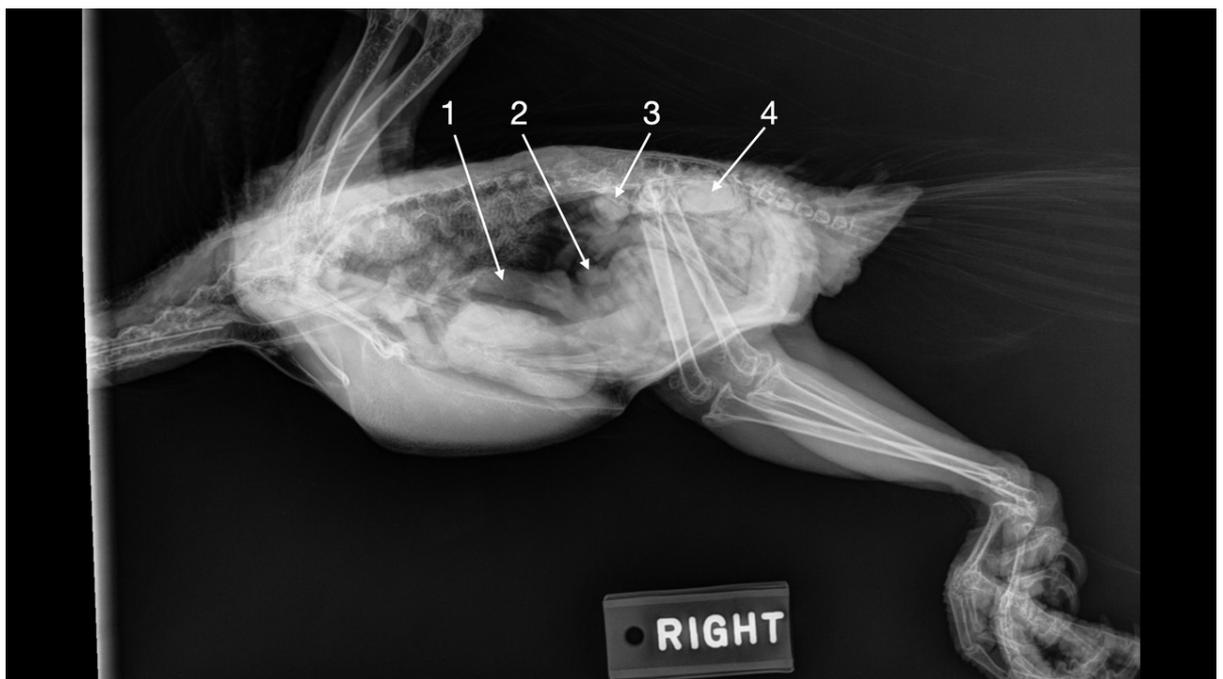


Question 8 continued over the page

- b) Transverse CT image bone window of mature equine skull at the level of M2. In your answer book, name the structures indicated by numbers 1-5. (2.5 marks)



- c) Lateral radiograph of the abdomen of a Cockatoo. In your answer book, name the structures indicated by numbers 1-4. (2 marks)



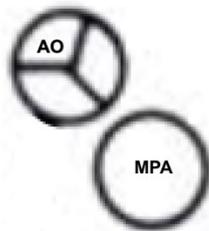
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9. Describe the anatomy of the urinary tract relevant to urinary continence and the anatomy and function of the neurologic structures that control urinary continence. Diagrams can be used if appropriate. (5 marks)

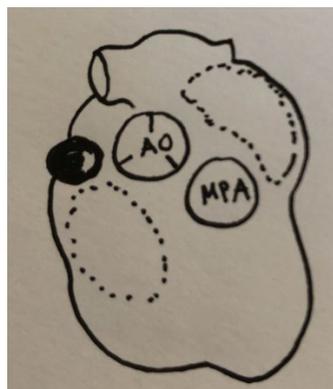
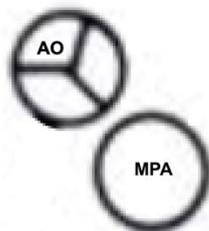
10. Answer **all** parts of this question:

a) Reproduce the simplified diagram of the aorta (AO) and main pulmonary artery (MPA) (left image) and draw the location of the normal coronary arteries at the level of the heart base. The diagram on the right including anatomic features of the heart is for orientation purposes only and does not need to be reproduced.

(1 mark)



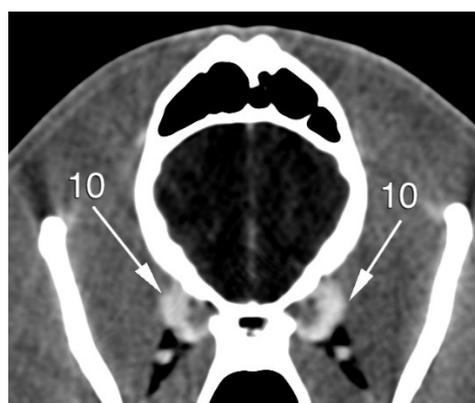
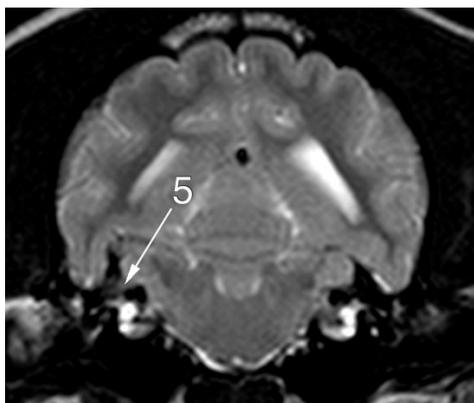
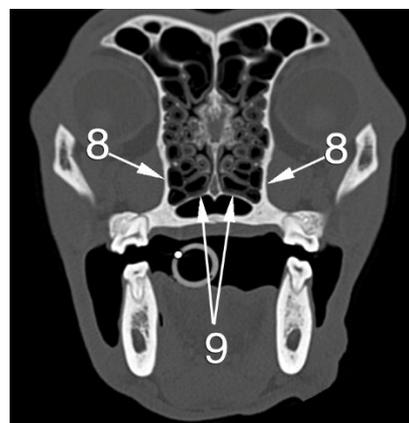
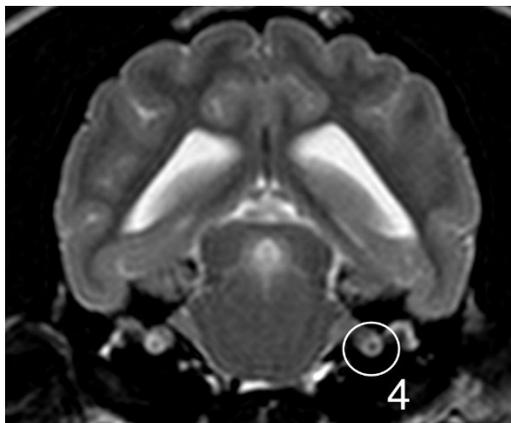
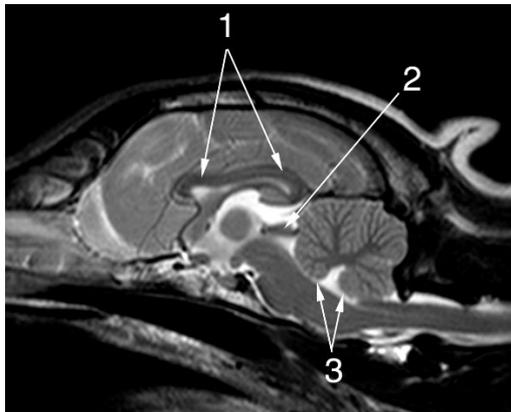
b) Reproduce the simplified diagram of the aorta (AO) and main pulmonary artery (MPA) (left image) and draw the location of the abnormal coronary artery formation described as an 'R2A' anomaly. The diagram on the right including anatomic features of the heart is for orientation purposes only and does not need to be reproduced. (2 marks)



c) Name the congenital cardiac condition that coronary artery position is relevant to and describe its relevance. (2 marks)

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11. In your answer book, name the structures indicated by numbers 1-10 below: (5 marks)



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12. Describe the vascular supply and anatomy of the neurohypophysis and adenohypophysis as they relate to how the canine pituitary gland enhances over time on computed tomography after administration of intravenous contrast. *(5 marks)*

**End of paper**



# Australian and New Zealand College of Veterinary Scientists

## **Fellowship Examination**

June 2022

## **Veterinary Radiology**

## **Paper 2**

Perusal time: **Twenty (20)** minutes

Time allowed: **Three (3)** hours after perusal

**Section A:** Answer **ALL FOUR (4)** questions

**Section B:** Answer **ALL TWELVE (12)** questions

**Answer all questions for this paper in the provided answer books.**

**Section A:**

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

**Section B:**

Answer **TWELVE (12)** short-answer questions, each worth 5 marks.....total 60 marks

## Paper 2: Veterinary Radiology

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### Section A: Answer ALL four (4) long-answer questions

1. Feline infectious peritonitis (FIP) is the most common infectious cause of neurological disease in cats. Recently, three clinical syndromes have been recognised in cats with neurological FIP: central vestibular syndrome; T3-L3 myelopathy; and multifocal central nervous system disease.

Answer **all** parts of this question:

- a) Describe the basic pathologic process by which the FIP virus causes disease. *(2 marks)*
- b) Describe in detail the range of MRI features reported in neurologic FIP in cats and discuss how they vary in frequency between the different syndromes of presentation. *(24 marks)*
- c) Briefly discuss how the MRI features may differ between FIP and other infectious causes of central nervous system disease in the cat. *(4 marks)*

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

- a) Describe the pathologic features of palmar osteochondral disease (POD) and briefly discuss its pathophysiology. *(5 marks)*
- b) Discuss the use of diagnostic imaging in the diagnosis of POD in the horse, exploring the limitations and strengths of various modalities, imaging findings that would support a diagnosis, and the significance of imaging abnormalities for the managing clinician. *(25 marks)*

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3. You are presented with a seven-year-old Labrador that has a large volume peritoneal effusion. Peritoneal fluid analysis has classified it as a modified transudate (high protein transudate).

Answer **all** parts of this question:

- a) Describe the mechanism of formation of a modified transudate in the abdomen. *(4 marks)*
- b) List **two (2)** possible causes **each** of sinusoidal portal hypertension and post-sinusoidal portal hypertension in this patient. *(4 marks)*
- c) Describe in detail a reported sonographic method of evaluating for the presence of portal hypertension in this patient, providing findings that would be expected in a normal patient and those that would support a diagnosis of portal hypertension. *(10 marks)*
- d) For each of the **four (4)** disease processes listed in 3 b), describe in detail the ultrasound features reported (other than the presence of portal hypertension). *(12 marks)*
4. Dynamic airway disease is a common cause of obstruction, coughing and respiratory disease in dogs. With reference to the major literature in this field, discuss the ways in which different imaging modalities are used in the diagnosis of this disease, including their different strengths and limitations, and the challenges of imaging these patients. Include in your discussion a description of the imaging findings that would support a diagnosis of dynamic airway disease. *(30 marks)*

**Section B starts on the next page**

**Section B: Answer ALL twelve (12) short-answer questions**

1. List the criteria for ACVIM stage B2 heart disease and discuss the clinical relevance of this classification. *(5 marks)*
  
2. Describe **five (5)** echocardiographic findings that would help to differentiate dilated cardiomyopathy from chronic mitral valve degeneration in a rottweiler with cardiomegaly. *(5 marks)*
  
3. List the reported CT features of sinonasal aspergillosis in a dog. *(5 marks)*
  
4. List the reported CT features of cholesterinic granulomas in the horse. *(5 marks)*
  
5. Describe the T1 weighted and T2 weighted appearance of cerebral haemorrhage as it is depicted on MRI at the acute stage (<24 hrs), subacute (1-3 days), early (3+ days), late (7+ days) and chronic (14+ days) stages. You may use a table. *(5 marks)*
  
6. Describe the radiographic, contrast radiographic and CT findings of colonic torsion in the dog. *(5 marks)*
  
7. Answer **both** parts of this question:
  - a) Describe the external anatomic landmarks for the sonographic evaluation of the duodenum in the adult equine, and the intra-abdominal anatomic landmarks for identifying the duodenum. *(4 marks)*
  
  - b) List the sonographic findings expected in a horse with epiploic entrapment of a segment of small intestine. *(1 mark)*

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8. Briefly discuss the incidence, appearance and significance of the medullary rim sign in sonography of the feline kidney. *(5 marks)*
9. Answer **both** parts of this question:
- a) List the components of the common calcaneal tendon in the dog. *(2.5 marks)*
  - b) Describe or sketch the appearance and relative position of these structures just proximal to the calcaneus. *(2.5 marks)*
10. Answer **both** parts of this question:
- a) Outline ways in which chronic liver disease can impact haemostasis. *(3 marks)*
  - b) Provide an appropriate coagulation profile protocol for a patient prior to percutaneous liver biopsy. *(2 marks)*
11. List the neurological examination findings that would be consistent with an acute cerebellar infarct in a dog. *(5 marks)*
12. Describe the reported imaging features of, and associated with, caudal articular process dysplasia in pug breed dogs, and briefly discuss the significance of this finding. *(5 marks)*

**End of paper**