



Australian and New Zealand College of Veterinary Scientists

Fellowship Examination

June 2015

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

Section A: Answer **FOUR** essay-style questions each worth 30 marks total 120 marks

Section B: Answer **TWELVE** short-answer questions each worth 5 markstotal 60 marks

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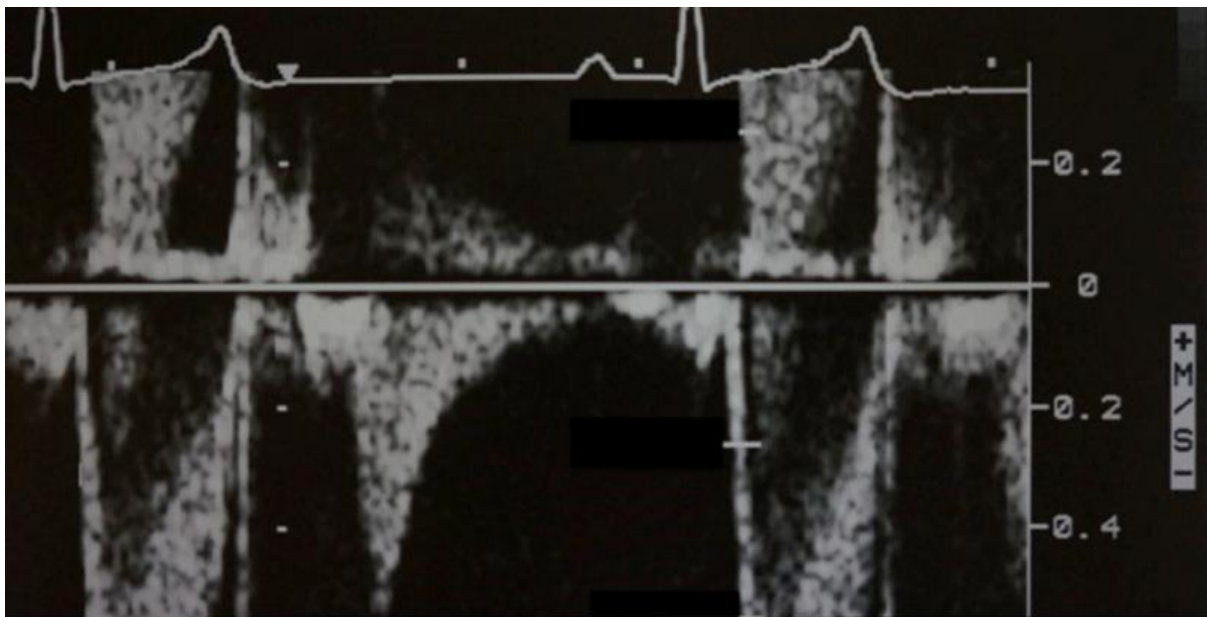
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Paper 1: Veterinary Radiology

Section A: Answer ALL four (4) essay-style questions

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

- a) Explain what is meant by the Doppler effect. (5 marks)
- b) Describe the technique by which spectral Doppler ultrasound would be used to determine the severity of a pulmonic stenosis lesion during an echocardiographic examination. As part of your answer explain how poor echocardiographic technique could affect the accuracy of your results. (15 marks)
- c) Identify the artefact depicted in the image below, explain the circumstances in which it occurs **and** describe how you would correct it. (10 marks)



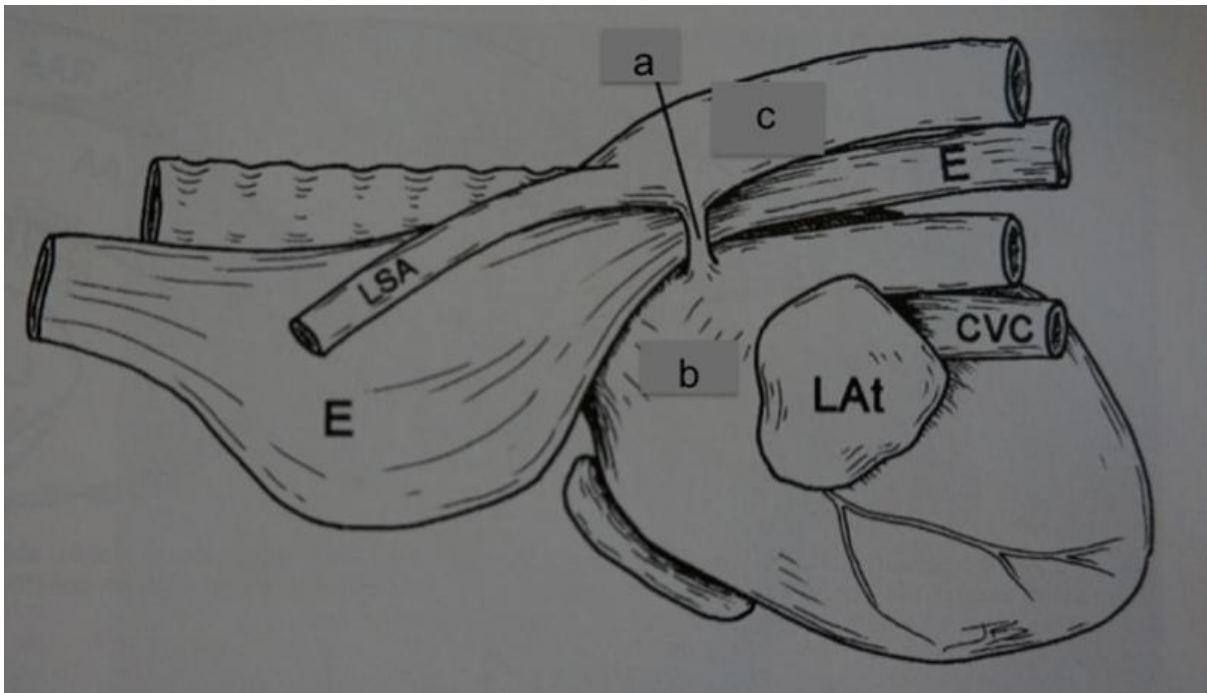
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2. Answer **all** parts of this question:

a) Defend the use of low kVp and high mAs techniques for film screen imaging of the small animal abdomen. (15 marks)

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

i. Identify the developmental anomaly depicted in the diagram below where E = oesophagus, LAt = Left atrium, LSA = left subclavian artery and CVC = caudal vena cava. (2 marks)



ii. Identify structures **a**, **b** and **c**. (3 marks)

iii. Describe the embryology of this developmental anomaly **and** identify its clinical implications for the patient. (10 marks)

Continued over page

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

- a) Distinguish between low and high spatial frequency algorithms used for computed tomography (CT) image processing. In your answer describe the impact of these different algorithms on image noise and contrast resolution. *(15 marks)*
- b) Explain how low and high spatial frequency algorithms are used for image interpretation in combination with different window and level settings. *(10 marks)*
- c) Explain using a diagram how the window and level settings are used to manipulate contrast and brightness of a CT image. *(5 marks)*

4. Background noise is a component of every magnetic resonance imaging (MRI) image.

Answer **all** parts of this question:

- a) Define background noise, describe its source **and** its effect on image quality. *(5 marks)*
- b) List **five (5)** factors that influence the amount of noise relative to the primary signal. *(5 marks)*
- c) Explain how altering **each** of these **five (5)** factors can **improve** the signal to noise ratio when performing an MRI scan. *(20 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) Explain how proton density weighting is achieved in magnetic resonance (MR) imaging in regards to selection of repetition time (TR) and echo time (TE).
(3 marks)
 - b) What tissue properties predominantly determine image contrast in proton density weighted images. (2 marks)

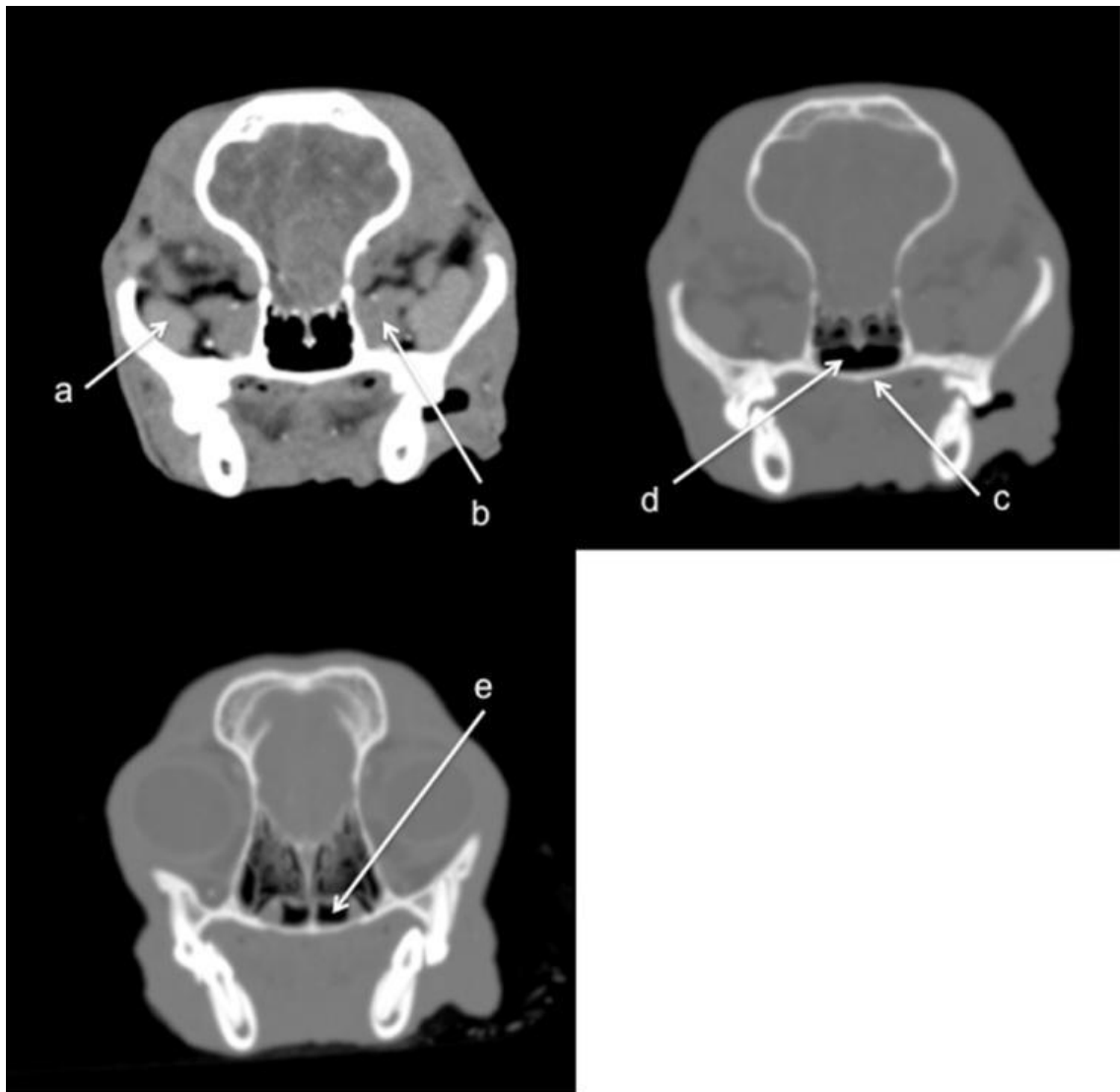
2. Explain what is meant by the term 'latent image centre' with regard to radiographic film. (5 marks)

3. Answer **both** parts of this question:
 - a) Provide recommendations to an owner at the time of release of a cat treated with Iodine-131 for home care and personal safety to be carried out in first seven days after discharge. (4 marks)
 - b) Identify the type(s) of radiation emitted from Iodine-123 and the half-life of this radionuclide. (1 mark)

4. Discuss the importance of using a set time or a minimum number of counts when acquiring a bone phase scintigram of the equine distal forelimbs using Tc-MDP.
(5 marks)

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5. In your answer booklet label the following structures/zones from the diagram below indicated as **a**, **b**, **c**, **d** and **e**. (5 marks)



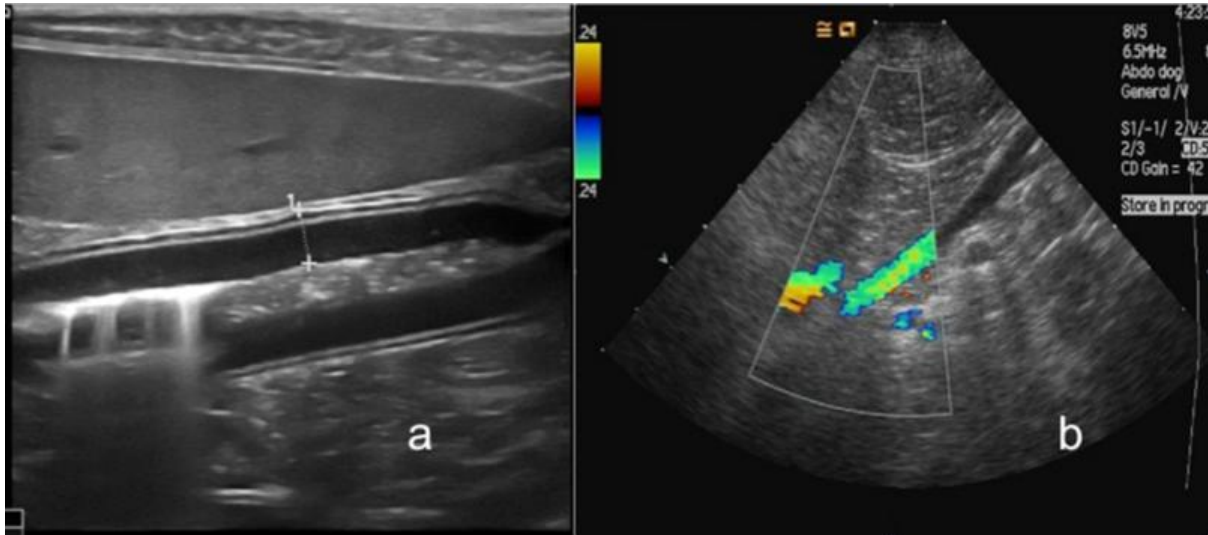
6. 'Some cats develop blindness, alone or with central neurologic deficits during procedures performed with the use of mouth gags.'
Discuss the relevant anatomy and pathophysiology behind this statement. (5 marks)
7. A veterinary radiologist who would like to monitor their personal cumulative dose over a period of three months will have a choice between a film badge and a thermoluminescent device (TLD).
Choosing **one** (1) of these detectors: describe how it works (3 marks) and list **two** (2) advantages that it has over the other (2 marks).

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8. Each of the ultrasound images (**a** and **b**) below show an artefact. Identify **each** artefact **and** briefly describe how it occurs:

a) Image 'a': the bright vertical bands on the mid-left of the image. (2.5 marks)

b) Image 'b': the apparent discontinuity of the caudal vena cava. (2.5 marks)



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

a) Briefly explain the technique of angle contrast ultrasound. (2.5 marks)

b) How can this technique be useful when examining the equine proximal suspensory ligament? (2.5 marks)

10. Explain how the Hounsfield unit of a volume of tissue in a patient is derived. (5 marks)

11. Briefly explain how radiation quality can affect the radiation-induced cancer risk. (5 marks)

12. Briefly describe the appearance and physiology of asymmetric nasal mucosal thickening as seen in normal dogs in CT and MRI studies. (5 marks)

End of paper



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Paper 2

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Paper 2: Veterinary Radiology

Section A: Answer ALL four (4) essay-style questions

1. Describe your recommendations for the use of different imaging modalities in the diagnosis and management of canine hyperadrenocorticism. *(30 marks)*
2. Discuss an imaging plan for a two-year-old German shepherd dog with acute onset of severe thoracolumbar spinal pain and upper motor neuron deficits to the hindlimbs. As part of your answer justify your recommendations of imaging modalities based on your differential diagnoses. *(30 marks)*
3. You are presented with a two-week-old foal with fever, lameness and hock swelling. Discuss your approach to imaging this patient **and** describe possible imaging findings. *(30 marks)*
4. Discuss strengths **and** weaknesses of using the different imaging modalities for differentiating benign from malignant thyroid disease in a cat with clinical hyperthyroidism. *(30 marks)*

Section B start on the next page

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

1. You receive a chest and abdomen computed tomography (CT) study (pre and post-contrast) from a referring veterinarian for a five-year-old Boxer with a cytologic diagnosis of high-grade cutaneous mast cell tumour on its left hind leg. The CT study is normal.

Write your comments and recommendations to the referring veterinarian, including any specific recommendations for further tests (imaging and sampling) for staging mast cell disease in this dog. (5 marks)

2. You are asked to perform portal scintigraphy in a dog to determine if there is a macroscopic portosystemic shunt.

Answer **both** parts of this question:

- a) Explain the advantages of performing transplenic portal scintigraphy in comparison with performing a per-rectal study. (4 marks)
- b) Which **two (2)** radiopharmaceuticals could be used for the transplenic portal scintigraphy? (1 mark)

3. Describe the possible magnetic resonance imaging (MRI) features of subacute rostral cerebellar artery infarction in dogs in different imaging sequences. (5 marks)

4. With regards to performing a CT intravenous urogram in a one-year-old, spayed female Labrador retriever with incontinence:

- a) Outline your technique for performing this contrast study including patient positioning, your anatomic scan field of view, choice of contrast media and contrast dose. (4 marks)

- b) Identify **two (2)** contra-indications for this procedure. (1 mark)

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5. Describe possible imaging features of periapical abscess of the fourth maxillary cheek tooth (M1) of a horse. (5 marks)
6. With regards to rickets in alpacas:
- a) List possible radiographic findings. (2 marks)
 - b) Briefly explain the underlying pathophysiology of rickets. (3 marks)
7. Describe imaging findings associated with *Spirocerca lupi* infection in the dog. (5 marks)
8. You are contacted by a veterinarian who has inadvertently administered **ionic-iodinated** contrast media to a dog while performing cisternal myelography. The volume of contrast given was the correct amount for the size of the dog. The patient is currently under general anaesthesia.
- Answer **both** parts of this question:
- a) What are the expected side effects of this procedure? (2.5 marks)
 - b) What would you recommend as immediate treatment? (2.5 marks)
9. List the radiographic and ultrasonographic features that you may see in a patient with a retained surgical sponge. (5 marks)
10. What are the (a) survey radiographic (1 mark) and (b) fluoroscopic (image intensifier) abnormalities (4 marks) that you may see in a dog with cricopharyngeal dysphagia?

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11. Answer **both** parts of this question:
- a) With regard to the vertebral heart score (VHS) measurement of assessing cardiac size on lateral radiographs in dogs, name **non-pathological** factors that may result in a VHS greater than the normal range established by Buchanan & Bucheler. (2.5 marks)
 - b) Briefly describe the radiographic signs of cardiogenic pulmonary oedema due to chronic myxomatous mitral valve degeneration in dogs. (2.5 marks)
12. Using echocardiography (excluding tissue Doppler imaging), how might you differentiate between dilated cardiomyopathy and chronic myxomatous degeneration of the mitral valve and insufficiency in a giant breed dog whose thoracic radiographs show significant left-sided cardiomegaly. (5 marks)

End of paper