Australian and New Zealand College of Veterinary Scientists

Membership Examination

June 2018

Veterinary Radiology (Small Animal)

Paper 1

Perusal time: **Fifteen (15)** minutes
Time allowed: **Two (2)** hours after perusal
Section A: Answer **ALL** **TWO (2)** questions
Section B: Answer **ALL** **FOUR (4)** questions
Section C: Answer **ALL** **TEN (10)** questions

Section C is multiple choice and requires the completion of **ten (10)** multiple choice questions located in the answer booklet that you have been provided. *(Sample provided in this paper)*

Section A: **TWO (2)** essay-type questions, each worth 30 marks.....total 60 marks
Section B: **FOUR (4)** short-answer questions, each worth 10 marks.....total 40 marks
Section C: **TEN (10)** multiple choice questions, each worth 2 marks.....total 20 marks

Paper 1: Veterinary Radiology (Small Animal)

SECTION A
Answer both questions in Section A

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

a) Describe the process of X-ray photon production by answering the following questions:

i. Draw and label a diagram of an X-ray tube, including the path of the electron beam formed between cathode and anode, and the path X-rays follow once they are created. *(6 marks)*

ii. Interactions at the anode:

- Draw and label a diagram illustrating the formation of Bremsstrahlung radiation. *(4 marks)*

- Draw and label a diagram illustrating the formation of characteristic radiation. *(4 marks)*

iii. State what percentage of the energy of electrons striking the target is converted to heat and list **one (1)** method of heat dissipation. *(1 mark)*

b) For the following imaging systems, describe the process of image capture from when an X-ray photon strikes the receptor until the receptor is ready for processing:

i. Film/screen radiography *(3 marks)*

ii. Computed radiography *(3 marks)*

iii. Digital radiography including:

- indirect flat-panel detectors *(3 marks)*

- direct flat-panel detectors *(3 marks)*

c) For **each** system (film screen, computed radiography and direct digital radiography), list **one (1)** factor that is used to improve the efficiency of X-ray photon energy capture. *(3 marks)*

Section A continued over page

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

a) Describe the process of image formation by answering the following questions:

i. Explain the photoelectric effect **and** discuss its importance, with reference to the concept of differential absorption and how this results in a radiographic image. *(8 marks)*

ii. Explain the process of the production of Compton scatter, its effect on image quality and how this can be minimised. *(8 marks)*

b) Define kVp and mAs **and** discuss their effect on the number and energy of X-ray photons produced. *(8 marks)*

c) Discuss the variations in mAs and kVp required to produce radiographs with the following contrast scales:

i. Long grey scale/low contrast *(3 marks)*

ii. Short grey scale/high contrast *(3 marks)*

Section B over page

SECTION B
Answer all four (4) questions in Section B

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

   a) Define the following terms as they relate to ultrasound image formation:

      i. Acoustic impedance *(2 marks)*

      ii. Reflection *(3 marks)*

   b) Describe the formation of the mirror image artefact using the gall bladder as an example. *(3 marks)*

   c) Which type of transducer is most appropriate for echocardiography? List **two (2)** reasons why this transducer is most appropriate. *(2 marks)*

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

   a) List **two (2)** agents for use in an upper gastrointestinal contrast study **and** discuss the advantages and disadvantages of **each**. *(8 marks)*

   b) List **two (2)** possible complications when performing an upper gastrointestinal contrast study. *(2 marks)*

Section B continued over page

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

a) Answer **all** sub-parts of this question

i. List **all** radiographic projections that should be performed for a complete study to investigate otitis media **and** discuss positioning of the patient for **each** projection *(5 marks)*

ii. Comment on the use of sedation or anaesthesia. *(1 mark)*

b) List **three (3)** advantages of computed tomography (CT) for imaging the tympanic bulla. *(3 marks)*

c) Name the type of intravenous contrast medium used in CT imaging. *(1 mark)*

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

a) State the radiographic projection of the thorax which should be performed to best visualise the caudal pulmonary lobar vasculature. List **two (2)** reasons for your choice. *(3 marks)*

b) State the radiographic projection which should be performed to best visualise the cardiac silhouette in the presence of pleural effusion. List **one (1)** reason for your choice. *(2 marks)*

c) When performing thoracic radiography, list **five (5)** radiation protection principles that should be considered if a staff member is required to restrain a patient that cannot be sedated due to the severity of its illness. *(5 marks)*

Section C continued in provided answer booklet

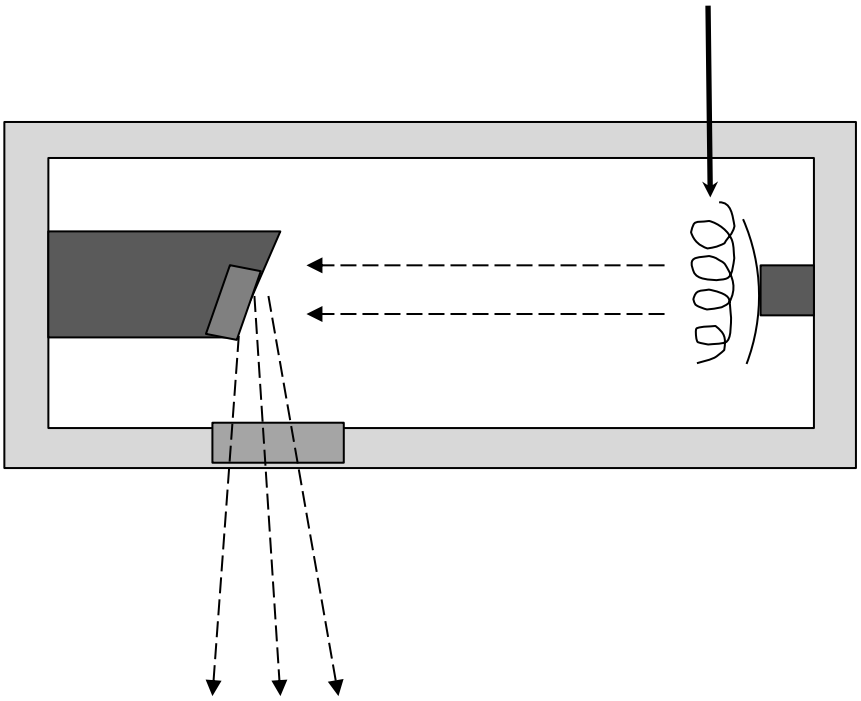
Paper 1: Veterinary Radiology (Small Animal)

Section C: Answer all ten (10) multiple choice questions in this section on printed pages 6 to 9 in this answer booklet.

Answer all ten (10) questions on the examination paper. This section is worth 20 marks. Each question is worth two (2) marks. Circle the letter corresponding to your chosen answer. There is no negative marking.

(10 multiple choice questions will be part of this examination located in a separate answer booklet that will be provided. Two examples for each paper have been made available.)

1. In the diagram below, which of the following options is the correct name for the component of an X-ray tube indicated by the solid arrow? *(2 marks)*



a. tungsten target

b. anode

c. tube port

d. cathode filament

2. Which of the following actions can a radiographer take to reduce the amount of scatter radiation produced by a patient? *(2 marks)*

a. collimate the beam

b. reduce mAs

c. use a grid

d. increase kVp

End of paper

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Paper 2

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Section A: Answer **ALL** **TWO (2)** questions
Section B: Answer **ALL** **FOUR (4)** questions
Section C: Answer **ALL** **TEN (10)** questions

Section C is multiple choice and requires the completion of **ten (10)** multiple choice questions located in the answer booklet that you have been provided. *(Sample provided in this paper)*

Section A: **TWO (2)** essay-type questions, each worth 30 marks.....total 60 marks

Section B: **FOUR (4)** short-answer questions, each worth 10 marks.....total 40 marks

Section C: **TEN (10)** multiple choice questions, each worth 2 marks.....total 20 marks

Paper 2: Veterinary Radiology (Small Animal)

SECTION A
Answer both questions in Section A

1. A dog presents with dyspnoea and a heart murmur:

   a) What are the advantages of thoracic radiography over echocardiography in investigating this case? *(3 marks)*

   You perform a three-view thoracic radiographic series including a right lateral, left lateral and ventrodorsal projection.

   b) What subjective and objective assessments should be used to assess the cardiovascular structures in this case? *(9 marks)*

   You identify an alveolar lung pattern.

   c) Discuss the radiographic appearance of the four principal characteristics of an alveolar lung pattern **and** why each characteristic has this appearance. *(12 marks)*

   d) Describe how to differentiate between the features of a caudodorsal alveolar pattern caused by cardiogenic pulmonary oedema secondary to left-sided heart failure and a pulmonary mass. *(3 marks)*

   e) Describe how to differentiate between a cranioventral alveolar pattern caused by pneumonia and pleural effusion due to right-sided heart failure. *(3 marks)*

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

   a) Compare the pathophysiology of type I and type II intervertebral disc disease in dogs, including reference to breed and age predispositions. *(10 marks)*

   b) List the radiographic features of intervertebral disc extrusion *(5 marks)*, discospondylitis *(5 marks)* and vertebral body osteosarcoma *(5 marks)* **and** briefly compare these features *(5 marks).*

Section B over page

SECTION B

Answer all four (4) questions in Section B

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

   a) List the key features of the following gastrointestinal conditions in the dog which increase suspicion of their presence in comparison to the other **two (2)** conditions:

      i. linear foreign body in the duodenum *(3 marks)*

      ii. complete foreign body mechanical obstruction in the mid-jejunum *(3 marks)*

      iii. gastroenteritis (with clinical signs of vomiting and diarrhoea). *(3 marks)*

   b) Which of these conditions may be present with normal abdominal radiographs*?* *(1 mark)*

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

   a) Describe the sonographic features that would help to distinguish between pregnancy and pyometra in a bitch with a potential accidental mating four weeks previously. *(4 marks)*

   b) List the advantages and disadvantages of radiography and ultrasound for assessing litter size, foetal viability and potential use with dystocia. Include in your answer the stage of pregnancy at which **each** modality is most useful. *(6 marks)*

Section B continued over page

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

a) Describe the radiographic approach to a Labrador dog with suspected coxofemoral osteoarthritis under the following headings:

i. patient restraint *(1 mark)*

ii. projection(s) *(1 mark)*

iii. positioning. *(3 marks)*

b) List the radiographic features of osteoarthritis of the coxofemoral joint, secondary to hip dysplasia. *(5 marks)*

4. A nine-year-old, male, neutered German Shepherd presents with chronic haematuria.

Answer **both** parts of this question:

a) Describe how to perform a double-contrast cystogram. *(7 marks)*

b) Describe the radiographic findings that would be expected with the study in question 4 a) if the dog had chronic cystitis from radiolucent cystic calculi. *(3 marks)*

Section C continued in provided answer booklet

Paper 2: Veterinary Radiology (Small Animal)

Section C: Answer all ten (10) multiple choice questions in this section on printed pages 5 to 7 in this answer booklet.

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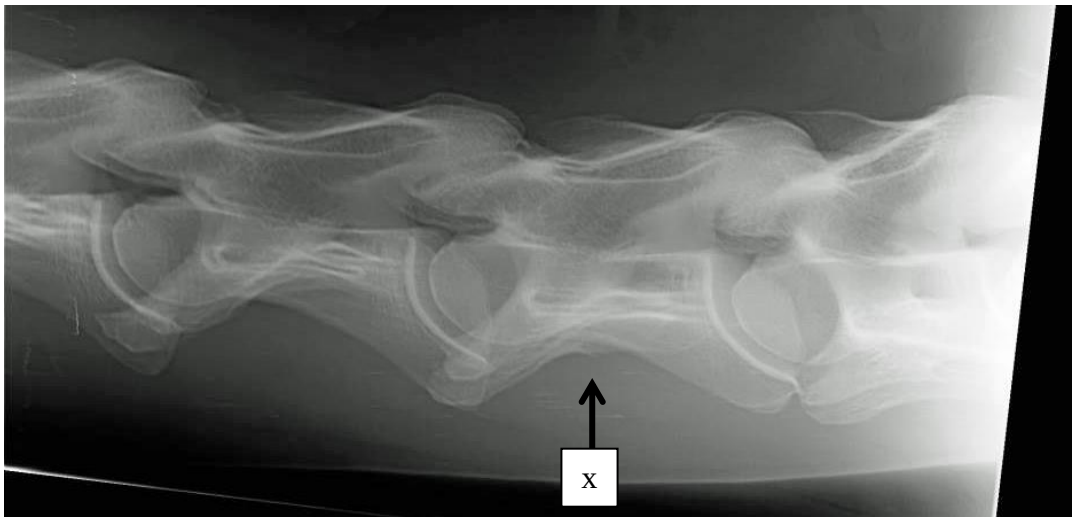

1. On the radiograph provided above the cervical vertebra labelled (x) is: *(2 marks)*

- **a.** C4
- **b.** C5
- **c.** C6
- **d.** C7

2. Which surface of the equine carpus will be projected in an unobstructed manner ('free projected') in a dorsolateral-palmaromedial radiograph?

- **a.** Dorsomedial
- **b.** Dorsolateral
- **c.** Lateral
- **d.** Dorsal

End of paper