Candidates are required to answer ALL questions and should note that all questions carry equal marks.

Diagrams should be used where appropriate.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which the candidates intended to convey.

PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION

1. Describe the radiographic techniques you would use to investigate a penetrating injury to a horse’s sole. What radiation safety procedures would you adopt?

2. Write short notes on:
   a) x-ray beam filtration
   b) the piezo-electric effect
   c) film identification

3. a) Define Compton scatter.
    b) Briefly discuss the adverse effects of scatter on the radiographic image.
    c) Describe the techniques and equipment available in large and small animal radiography to minimise the effects of scatter.

4. a) What is meant by the tube rating of an x-ray tube? List the design features of an x-ray machine that will influence the tube rating.
    b) What information is supplied by the characteristic curve of x-ray film?
    c) List the advantages and disadvantages of using intensifying screens.

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Candidates are required to answer **ALL** questions and should note that all questions carry equal marks.

Diagrams should be used where appropriate.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which the candidates intended to convey.

PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION

1. Describe the radiological features associated with dental disease in

   (i) the horse and
   (ii) the dog

2. Write short notes on the radiographic features of:

   a) angular limb deformity in the foal
   b) navicular disease in the horse
   c) guttural pouch disease of the horse

3. Describe the radiographic features of congenital heart disease in the dog. Briefly explain how ultrasonography might be used to assist in the diagnosis of these conditions.

4. Describe the significant radiographic features that might be found while investigating a 7-year-old bitch with haematuria. Briefly describe what additional information might be obtained by ultrasound.
The Royal College of Veterinary Surgeons

CERTIFICATE IN VETERINARY RADIOLOGY

Tuesday 22 August 2000

PAPER 1
2½ hours

Radiological Physics, Radiation Protection and Radiographic Techniques

Candidates are required to answer ALL questions and should note that all questions carry equal marks.

Diagrams should be used where appropriate.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which the candidates intended to convey.

PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION

1. What is the definition of the controlled area?

Describe features that are important in the design of a controlled area.

How can the perimeters of the controlled area be checked?

2. Describe the factors that influence:
   a. Inherent filtration
   b. Film contrast
   c. Unsharpness

3. A horse is presented for investigation following a fall while hunting. It is almost non-weight bearing lame on the left hind with a marked effusion of the tarsocrural (tibiotarsal) joint. What radiographic views would you obtain during your initial examination? For each view, list 4 anatomic structures that can be evaluated. Briefly discuss the role that alternative imaging methods might have in the investigation of this case.

4. Discuss relevant preparatory procedures required prior to intravenous urography in the dog and cat up to the point of actual injection of the contrast agent giving reasons for each stage.

Describe the radiographic technique and give clinical indications for its use.

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The Royal College of Veterinary Surgeons

CERTIFICATE IN VETERINARY RADIOLOGY

Tuesday 22 August 2000

PAPER 2

2½ hours

Candidates are required to answer **ALL** questions and should note that all questions carry equal marks.

Diagrams should be used where appropriate.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which the candidates intended to convey.

PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION

1. List 5 conditions which will result in soft tissue changes on radiographs of the equine head (including pharynx and larynx). Using diagrams describe the radiological appearance of **TWO** of these diseases.

2. Describe the radiological features of:

   a. Pneumothorax
   b. Pneumomediastinum

   List three possible causes for each and discuss the radiographic examination of suspected cases.

3. An elderly dog is presented with back pain. There are no neurological deficits noted on clinical examination. Describe the radiological features of three conditions which could cause this presentation. Discuss further diagnostic imaging procedures that may be used giving advantages and disadvantages of each.

4. Describe the radiological features you might find in the following conditions and discuss the role, if any, of ultrasound:

   a. Canine lymphoma
   b. FIP

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Candidates are required to answer **ALL** questions and should note that all questions carry equal marks.

Diagrams should be used where appropriate.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which the candidates intended to convey.

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. **Briefly** explain what is meant by “Half Wave Rectification” and “Full Wave Rectification”.

What advantages do three phase generators have in the production of a potential difference between cathode and anode?

2. Write **short notes** on:
   a. Methods to reduce darkroom film fogging in small animal practice.
   b. Radiographic examination of the stomach.
   c. Sector transducers.

3. **List** the radiographic factors which can alter the radiographic appearance of the normal canine thorax prior to processing.

Based on your own experience, describe how you minimise the effects of these factors in your practice.

**P.T.O. FOR QUESTION 4**
4. You have been requested to perform a radiographic examination of a 3-year old Thoroughbred horse with femoropatellar joint pouch effusion.

a. What radiographic views would you obtain on the initial examination? Describe the equipment and technique you would use.

b. The examination must be carried out on the trainer’s yard. With reference to the relevant regulations, describe the precautions you would take to ensure the radiation protection of all personnel during this procedure.
THE ROYAL COLLEGE OF VETERINARY SURGEONS

CERTIFICATE IN VETERINARY RADIOLOGY

TUESDAY 7 AUGUST 2001

PAPER II
(2½ hours)
(Radiographic anatomy and radiological interpretation)

Candidates are required to answer ALL questions and should note that all questions carry equal marks.

Diagrams should be used where appropriate.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which the candidates intended to convey.

PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION

1. Describe the radiological features you would be likely to encounter in:
   a. A 2-year old cat presented with bilateral renal enlargement.
   b. A middle-aged dog with splenomegaly.

   Briefly describe how ultrasonography might be used to assist in the diagnosis in both cases.

2. Write short notes on the radiological features of:
   a. Pericardial effusion
   b. Patent ductus arteriosus (PDA)
   c. Pulmonic stenosis
   d. Dilated cardiomyopathy

   Briefly describe how ultrasonography would help achieve a diagnosis in TWO of these conditions.
3. A lame 6-month old Labrador is presented for examination, with pain localised to the elbow joint:
   
   a. **List** the conditions which may be detected in this dog using radiography;
   
   b. Using diagrams, describe and **illustrate** the radiological features of **TWO** of these conditions.

4. Describe and **illustrate**, using diagrams, the radiological features of the following:
   
   a. Degenerative joint disease of the distal interphalangeal joint in the horse;
   
   b. Septic arthritis of the metatarsophalangeal joint in a three-month old calf;
   
   c. Root infection of the first maxillary molar (4th cheek) tooth in a 10-year old horse.

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1. In Diagnostic Ultrasound, briefly describe what is meant by:
   a) The "Doppler Effect" and its importance to Diagnostic Ultrasound. You may use diagrams if appropriate.
   and
   b) Distal Acoustic Enhancement.

2. Explain what is meant by the Photoelectric Effect in diagnostic radiology, and how it can be used to alter radiographic image quality.

3. Briefly discuss the technique of horizontal beam radiography in small animal practice. List possible projections and their uses. How do the Ionising Radiations Regulations 1999 (IRR) affect the use of horizontal beam radiography under these circumstances?

4. List the developmental conditions affecting the canine elbow joint. Describe the radiological features of any THREE of these conditions.

P.T.O. for questions 5 - 10
5. **List** the sites of OCD (osteocondrosis) in the horse. **Briefly** describe the radiological findings of OCD in one of these sites.

6. **List** the causes of renomegaly in the dog and cat. **Briefly** describe the ultrasonographic appearance of one of these conditions.

7. **Briefly outline** the benefits of a dual focus system in the design of an x-ray tube.

8. **List** the views required for a complete radiographic examination of the navicular (distal sesamoid) bone of the horse. **Outline** the radiographic changes that might be visible with an animal suspected of having navicular syndrome. **Diagrams may be useful.**

9. **Briefly** describe how a lumbar puncture myelogram would be performed in the assessment of a paraplegic Dachshund and explain its advantages over cisternal puncture in this situation.

10. Describe the technique of vertebral heart score (vertebral scale system) for assessing cardiac size in the dog and the cat.
Candidates are required to answer **FOUR** of the following **FIVE** questions.

Diagrams should be used where appropriate.

Allow 30 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

*If insufficient time is available to answer a question fully, it will be acceptable to complete in note form.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. A two-year-old Thoroughbred horse with a suspected carpal bone fracture requires a full radiographic examination. Describe how you would take the views required and what each view would contribute to the radiological evaluation of the carpal region. **Use diagrams** to illustrate your answer.

2. You have been presented with a nine week pregnant, middle aged, medium-sized dog that has been straining to whelp for several hours, and as yet no pups have been passed. Describe what radiographic findings might help in determining fetal viability. What advantages and disadvantages might ultrasonography have over radiography in this instance?

3. Discuss the diagnostic imaging investigation of dyspnoea in the cat. Discuss in detail the radiological findings in **TWO** of the conditions you mention.

**P.T.O. for questions 4 and 5**
4. Describe the types and radiographic appearance of non-skeletal mineralized shadows within the canine abdomen. Briefly comment on their significance.

5. Write an essay comparing the BVA/KC HD (hip dysplasia) scoring scheme and the BVA/KC ED (elbow dysplasia) grading scheme.
1. In Diagnostic Ultrasound, briefly describe:
   a) How the ultrasound beam is attenuated.
   b) What is meant by Reverberation Artefact.

2. Write short notes on performing contrast radiography of the oesophagus.

3. List the sites of osteochondrosis dissecans (OCD) in the dog. Briefly describe the radiological findings of OCD in one of these sites.

4. Briefly describe the responsibilities of a Radiation Protection Supervisor (RPS) and a Radiation Protection Advisor (RPA) as required by the UK Health and Safety Executive in their Guidance Notes for the Protection of Persons against Ionising Radiations arising from Veterinary Use.
5. **Briefly** explain the difference between the stochastic effects of radiation and the non-stochastic effects of radiation, giving an example of each. What is the currently recommended Annual Dose Limit (whole body dose) for veterinary employees aged 18 years or over?

6. Describe with the aid of diagrams the views which may be used to image the nasal chambers in the dog and cat and indicate their relative usefulness.

7. **Outline, with the aid of diagrams**, the radiographic investigation of the tarsus (hock) in the horse. **List** the main radiological features of bone spavin (osteoarthritis of the hock) in the horse. On which projection are the radiographic changes usually most apparent?

8. **Outline, with the aid of diagrams**, the radiographic investigation of a pony with suspected laminitis. What are the radiographic changes that may be visible in laminitis?

9. **Outline** the relative advantages and disadvantages to the use of ionic versus non-ionic contrast agents. Which agent would you choose and why for positive contrast arthrography in a horse?

10. Describe what is meant by an interstitial lung pattern. **List** the conditions that may cause such a pattern.

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Candidates are required to answer **FOUR** of the following **FIVE** questions.

Diagrams should be used where appropriate.

Allow 30 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. You have been presented with an eight month-old, female, neutered, Golden Retriever with a history of urinary incontinence since purchased three months ago. Discuss how you would use diagnostic imaging to investigate this patient. **List** the differential diagnoses you would expect in this case, and describe the radiological findings in **TWO** of these conditions.

2. You are presented with a dog that has chronic otitis externa and suspected otitis media. With the aid of diagrams, describe how you would take the views required to allow a full radiographic evaluation of the relevant structures and comment on the relative benefits or limitations of each view. Discuss the radiographic findings you might expect to encounter in this dog and further complications that may be identified.

P.T.O. for questions 3, 4 and 5
You have been asked by a neighbouring small animal practice to give advice on improving the quality of their thoracic radiographs. You notice that their main problems are movement blur, film fogging, and occasionally gloved fingers in the primary beam. What advice do you give?

Describe the radiological features of congenital heart disease in the dog. **Outline** the role that ultrasound may have in reaching a diagnosis in these conditions. Describe in detail the ultrasound findings in **TWO** of the conditions you mention.

You have been asked to perform a radiographic investigation of a 5 year-old thoroughbred with a metacarpophalangeal (fetlock) joint effusion. Describe how you would obtain the views required to thoroughly examine this region discussing what each would contribute to the radiological evaluation of the fetlock region.
Candidates are required to answer **ALL TEN** questions.

Diagrams should be used where appropriate.

Allow 12 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. Write **short notes** (with diagrams if necessary) on:
   a. Thermoluminescent devices.
   b. Anode heel effect.
   c. Solarization.

2. **Briefly** describe the measures that can be taken to reduce movement blur whilst taking thoracic radiographs.

3. **Briefly** describe the design features that aid in the dissipation of heat from an X-ray tube during a radiographic exposure.

4. In diagnostic ultrasound, **briefly** describe what is meant by:
   a. Side-Lobe artefact.
   b. Mirror-Image artefact.

5. **With the aid of diagrams, briefly** describe the parameters used for assessment of the BVA/KC Hip Dysplasia scoring scheme.

P.T.O. for Questions 6, 7, 8, 9 and 10
6. Describe **briefly, with the aid of a diagram**, how the air gap technique reduces the amount of scatter reaching the radiographic cassette. How does this technique compare with using a conventional grid?

7. **List** the **THREE** basic principles of radiation protection, describing **briefly** what is meant by each. What is the currently recommended Annual Dose Limit (whole body dose) for veterinary employees aged 18 years or over?

8. **Outline** the relative advantages and disadvantages to the use of ionic versus non-ionic contrast agents. Which agent would you choose, and why, for myelography in the horse?

9. **Outline, with the aid of diagrams**, the radiographic investigation of a horse with suspected osteochondrosis of the stifle. **List** the main radiological features of osteochondrosis of the equine stifle.

10. **List** the conditions that must be met (in veterinary radiography) whereby the Controlled Area will exist between the ceiling and the floor in a vertical direction extending 1 metre out from each edge of the radiography table.
Candidates are required to answer **FOUR** of the following **FIVE** questions.

Diagrams should be used where appropriate.

Allow 30 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. You are presented with a 2 year-old, small, male cross-breed dog with acute onset tetraparesis localised to C1-C5. **Discuss** how you would use radiography to investigate this patient. **List THREE** differential diagnoses you might expect in this case, and describe the radiological findings in each of these conditions.

2. You are presented with a nine year-old entire male Scottish Terrier with a history of worsening dysuria over the previous three weeks. **Discuss** how you would use diagnostic imaging to investigate this patient. **List** the differential diagnoses you would expect in this case, and describe the radiological findings in **TWO** of these conditions.

3. A five year-old show jumper is presented to your clinic with a history of chronic lameness. On clinical examination you note him to be lame on both front feet. Nerve blocks are performed and indicate that the problem is in the palmar portion of the feet. **Describe** how you would obtain the radiographic views to adequately examine the region of interest. Name the most likely diagnosis you would expect in this case, and describe the radiological findings in this condition.

 **P.T.O. for Questions 4 and 5**
4. **Briefly** describe the technique of vertebral heart score (vertebral scale system) for assessing cardiac size in dogs. **Discuss** how the use of this method of cardiac mensuration (i.e. the art or process of measuring) has affected the reliability of the radiographic detection of cardiac disease in dogs.

5. You have been asked by a neighbouring small animal practice to give advice on improving the quality of their abdominal radiographs. You notice that their main problem is poor film contrast. What factors do you need to consider and what advice do you give?
Candidates are required to answer **ALL TEN** questions.

Diagrams should be used where appropriate.

Allow 12 minutes per question.

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**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

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1. Write **short notes** *(with the use of diagrams if necessary)* on:
   
   a. The inverse square law.
   
   b. Quantum mottle (noise).

2. Briefly describe **how you would assess the pulmonary vasculature in the dog**.

   List the patterns of vascular change that may be observed giving **TWO** examples of each.

3. a. List the radiographic contrast techniques useful in investigation of lower urinary tract disease mentioning in **each** case the type of contrast agent suitable.

   b. Which contrast technique is best, and why, for examination of the urinary bladder in a dog with chronic cystitis? What potential side effects may be seen with this technique?

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P.T.O. for Questions 4 – 10
4. a. Write short notes on the Doppler effect.

   b. List the reasons why no Doppler signal may be detectable within a blood vessel.

5. You are presented with a 6 month-old Labrador Retriever with forelimb lameness and elbow pain.

   a. List the radiographic projections you would obtain in this dog.

   b. Give reasons why elbow radiographs in this dog may be normal.

6. List the radiographic views you might employ in order to fully image the proximal sesamoid bones in the horse.

   For each projection state the parts of the sesamoid bones that are highlighted.

7. Briefly describe the radiographic findings in hypertrophic osteopathy in the dog.

8. By means of an annotated diagram, write short notes on the characteristic curve for typical X-ray film.

9. Briefly explain the difference between the stochastic effects and the non-stochastic effects of radiation, giving an example of each. What is the currently recommended Annual Dose Limit (whole body dose) for veterinary employees aged 18 years or over?

10. a. Briefly outline the relative advantages and disadvantages of manual processing versus automatic processing.

    b. A practice rings you for advice as they have just noticed that the single emulsion films coming out of the automatic processor are streaky and milky in appearance (they do not appear to have fully cleared).

    What advice do you give regarding the possible causes?
THE ROYAL COLLEGE OF VETERINARY SURGEONS

CERTIFICATE IN VETERINARY DIAGNOSTIC IMAGING

WEDNESDAY 19 JULY 2006

PAPER II
(2 hours)
Radiographic Anatomy and Radiological Interpretation

Candidates are required to answer FOUR of the following FIVE questions.

Diagrams should be used where appropriate.

Allow 30 minutes per question.

Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.

PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION

1. You are presented with an unvaccinated 2 year-old Labrador Retriever with acute onset vomiting and abdominal pain. Describe your approach to imaging this patient. List THREE likely differential diagnoses and describe the imaging features of TWO of these conditions.

2. Thoracic radiographs of a dog show a generalised increase in opacity within the left cranial lung lobe. Discuss the mechanisms and potential causes of an increase in opacity of a single lung lobe. Discuss your approach to imaging this case and how the imaging findings can help in the differentiation of the potential causes. Describe the imaging features of any TWO of the potential causes of opacification of a single lung lobe.

3. A 2 year-old warmblood gelding is presented with 3/10ths left hind limb lameness. A tarsocrural joint effusion is present in the left hind limb. Intra-articular anaesthesia localises the lameness to this joint. Outline your radiographic investigation of this case. List the likely differential diagnoses in this case describing in detail the radiological findings in three of the conditions you mention. Which radiographic projections are best for demonstrating the lesions in the conditions you mention?

P.T.O. for Questions 4 – 5
4. You are presented with a 10 year-old female Boxer with a pendulous abdomen. **Outline** your imaging investigation of this case discussing the relative merits of the techniques you mention. Describe in detail the imaging findings in **TWO** of the conditions that you mention.

5. A 7 year-old working Labrador Retriever is presented with inspiratory stridor. Clinical examination reveals a soft tissue swelling adjacent the larynx. **Discuss** how you would use diagnostic imaging in the investigation of this patient. **List** the differential diagnoses you would expect in this case and describe in detail the imaging findings in **TWO** of these conditions.
1. Outline with the aid of diagrams the radiographic views you might employ in order to fully image the navicular bone in the horse.

2. In relation to diagnostic ultrasound, write short notes on:
   a) phased array probes.
   b) convex probes.

3. Describe how the image is obtained with a computed radiography (digital CR) system. List three advantages and three disadvantages of digital computed radiography systems compared with conventional film systems.

4. Describe with the aid of diagrams the radiographic projections you would obtain in a case of suspected middle ear disease in a dog and a cat, highlighting any differences.

5. Outline the physical processes that lead to the production of scattered radiation. List ways in which the effect of scatter on a radiographic image may be reduced.

6. Outline the information that should be included in ‘Local Rules’ covering work with ionising radiation in a veterinary practice. How often should the content of the ‘Local Rules’ be reviewed?

P.T.O. FOR QUESTIONS 7 - 10

7. With respect to diagnostic ultrasound, write short notes on:
8. **Briefly describe** the necessary radiation safety requirements during the use of the horizontal beam in large animal radiography.

9. **Describe:**
   
a) the different types of filtration used in an X-Ray tube
   
b) *with the aid of a diagram* the construction of a rotating anode and **LIST** the advantages of its use compared with a stationary anode.

10. **Describe** the techniques you would use to obtain an ultrasound guided sample of, and **list** any potential complications/limitations for:
   
a) a liver nodule
   
b) a pleural effusion.
Candidates are required to answer **FOUR** of the following **FIVE** questions.

Diagrams should be used where appropriate.

Allow 30 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. A 7 year-old national hunt thoroughbred racehorse is presented to you with left fore-limb lameness the day after a race. On examination you discover heat and swelling palmar to the third metacarpal bone, in the distal third region. **Outline** your diagnostic imaging investigation for this case. **LIST** the most likely differential diagnoses. With the help of diagrams, **describe** the possible imaging findings of **TWO** of the likely differential diagnoses.

2. You are presented with a 2 year-old male Rottweiler with a history of left hind lameness of 2 months duration. The orthopaedic examination localises the origin of the lameness to the hock. **Describe** with the aid of diagrams the radiographic investigation of the canine hock. **LIST** the conditions that may be detected on the radiographs of this dog. **Describe** the imaging features of **TWO** of these conditions.

3. A 9 year-old Springer Spaniel is presented with a history of lethargy and exercise intolerance. On clinical examination, heart sounds are muffled. **Describe** how you would use diagnostic imaging techniques to further investigate this case. **LIST THREE** likely differential diagnoses and, for **TWO** of these, **describe** the imaging findings you would expect.

4. You are presented with an 8 year-old neutered male Dobermann with chronic progressive hindlimb ataxia and the likely lesion localised to C1-C7. **Discuss** your approach to imaging of this case and the imaging findings of **TWO** of the most likely differential diagnoses.
You are presented with a 1 year-old Bichon Frise that has failed to grow as well as its litter mates. The owner describes the dog as having vague intermittent neurological signs, worse after eating, and intermittent vomiting and diarrhoea. Routine blood tests are indicative of hepatic encephalopathy. **LIST** the likely differential diagnoses for this dog. **Describe** the imaging investigations you would perform and the radiographic and ultrasonographic abnormalities that may be seen with **TWO** of the differential diagnoses.
1. List all the radiographic views that you would use to image fully a horse in which lameness has been localised to the carpus. For each view state which aspects of which bones are optimally imaged.

2. What is meant by an alveolar lung pattern? Give a list of differential diagnoses for such a pattern.

3. List the types of grid available and briefly describe their use.

4. Briefly describe, with the aid of diagrams, the ultrasonographic artefacts that are commonly seen whilst imaging the liver in the dog.

5. Outline how you would perform an intravenous urogram (IVU) in a dog.

6. Write short notes on:
   (i) Designation of a controlled area for veterinary radiography.
   (ii) Thermoluminescent dosemeters (TLDs).
   (iii) Non-stochastic effects of radiation.

P.T.O. for Questions 7 - 10
7. You are presented with a six year-old German Shepherd Dog with a three month history of right sided nasal discharge and recent onset of occasional epistaxis. With the aid of diagrams, describe the radiographic investigation of this dog and indicate the normal structures that can be identified on each projection.

8. Describe step by step how you would perform a retrograde vagino-urethrogram in a female neutered dog. List the indications and discuss the appropriate safety measures you would undertake in this case.

9. What ultrasonographic probe would you choose to investigate the following structures, justifying the reasons of your choice?:
   
   a. The abdomen of a large sized dog.
   
   b. The suspensory ligament of a Thoroughbred horse.

10. Define scattered radiation. What effect does scattered radiation have and what can you do to reduce these effects?
Candidates are required to answer **FOUR** of the following **FIVE** questions.

Diagrams should be used where appropriate.

Allow 30 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. A colleague asks your opinion regarding a lesion in the proximal humerus of a 9 year-old Golden Retriever with acute lameness, identified on radiographs of the shoulder. **Describe** the radiological features which would allow you to classify the lesion as probably benign or likely to be aggressive.

2. At a routine check-up, you palpate a mid-dorsal abdominal mass in an 8 year-old entire female Labrador Retriever. **Discuss** how imaging techniques may assist in the further investigation of this case. **List** the differential diagnoses you would consider and describe the imaging features of **THREE** of these conditions.

3. A horse is presented with an acute and severe forelimb lameness. The owners have removed a large nail which had penetrated the centre of the frog. **Describe** the role diagnostic imaging plays in assessing the consequences of this injury and how you would image this case.

4. You are presented with a 15 year-old vomiting cat suspected of intestinal obstruction. Explain your imaging approach to the patient and describe the radiological features that will help you to confirm and characterise the obstruction. **Describe** the ultrasonographic features of any two possible causes of small intestinal obstruction in this cat.

5. An elderly entire Flatcoated Retriever bitch is presented with signs of lethargy and moderate dyspnoea. On auscultation of her thorax you discover the lung sounds are bilaterally muffled and she is tachycardic. **List** the differential diagnoses at this stage and describe the diagnostic imaging features of **THREE** of these conditions.
Candidates are required to answer **ALL TEN** questions.

Diagrams should be used where appropriate.

Allow 12 minutes per question.

*Illegible handwriting or failure to answer the question in the form requested may result in examiners being unable to award marks for information which candidates intended to convey.*

**PLEASE USE A SEPARATE ANSWER SHEET FOR EACH QUESTION**

1. **List** reasons why a radiographic image may appear unsharp. For **each** of the reasons you give, **briefly outline** how you could address the problem to improve radiographic quality.

2. In relation to diagnostic ultrasound, write **short notes** on:
   
   (a) Acoustic enhancement.
   (b) Principles of pulsed wave (PW) Doppler.
   (c) Phased array transducers.

3. **Outline** the ways in which radiographic contrast studies may be performed to aid the investigation of suspected oesophageal disease.

4. **Describe** the display modes on ultrasound machines and their main use.

5. With the **aid of diagrams**, **compare** the exposure latitude of a slow conventional film-screen combination with a fast combination and the impact it has on image contrast.

6. **Describe** your imaging approach to a dyspnoeic cat including any special view or techniques that may be useful.

   **P.T.O. for Questions 7 - 10**
7. a) **Draw and label a diagram** of a continuous X-ray spectrum.

    b) **Describe** the effect changing the kV has on the continuous X-ray spectrum.

8. You have been asked to radiograph a horse on a farm. **Describe** how you would establish a controlled area on this farm and **outline** the necessary radiation safety requirements in obtaining a diagnostic radiograph of this horse.

9. **Outline** how you would image the canine prostate gland. **Briefly describe** the imaging findings of the common diseases that affect the prostate gland.

10. A neighbouring practice has recently been having problems with radiographs appearing very dark, despite using an exposure chart. What advice would you give?
1. A two year-old thoroughbred horse presents to you with left forelimb lameness. Intra-articular anaesthesia localises the lameness to the carpus joint. Outline your radiographic investigation of this case. List the likely differential diagnoses in this case describing in detail the radiological findings in THREE of the conditions you mention. Which radiographic projections are best for demonstrating the lesions in the conditions you mention?

2. You are presented with an 8 year-old Irish Setter; the owners report that the dog scavenges and they have recently found pools of frothy vomit containing small amounts of food around the house. They have not witnessed the dog vomiting. Discuss how imaging techniques may assist in the further investigation of this case. List the differential diagnoses you would consider and describe the imaging features of TWO of these conditions.

3. You are presented with a 3 year-old male Springer spaniel with a history of right forelimb lameness of 2 weeks duration. The orthopaedic examination localises the origin of the lameness to the elbow. Describe with the aid of diagrams, the radiographic investigation you would perform on this dog. Highlight the main anatomical structures identified. Describe the imaging features of TWO of the conditions that may be detected on the radiographs.
4. A six year-old Cairn terrier is rushed into the surgery following a suspected road traffic accident. The dog is depressed and tachypnoeic. Describe your approach to imaging this case. List the changes commonly seen on plain thoracic radiographs following trauma. For THREE of these changes, describe in detail the radiological features you would expect to see and any further imaging that may be helpful in the diagnosis and/or management of this case.

5. A five year-old male German Shepherd with severe caudal lumbar back pain, inability to jump, anorexia, and depression presents to your clinic. No neurological signs are present at this time. Describe your approach to this case, listing differential diagnoses. Discuss the imaging findings for THREE of your differential diagnoses.