



Australian and New Zealand College of Veterinary Scientists

Membership Examination

June 2022

Veterinary Sports Medicine and Rehabilitation (Canine)

Paper 1: Core

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

Answer **all** of the following questions. Total 120 marks
Section 1: 20 Multiple choice questions (questions 1-20)
Section 2: 15 short answer questions (questions 21-35)

Section 1: Multiple Choice Questions – 1 mark per question

1. The same ultrasound unit can be used for performing both diagnostic and therapeutic ultrasounds techniques.
 - a) True
 - b) False

2. A small amount of callous seen radiographically forming around a fracture site suggests that:
- There is primary bone healing occurring at that site
 - There is a non-union likely to occur at that site
 - There is some instability at the site
 - There is contact healing at the site
3. During which phase or phases of wound healing does the application of pulsed ultrasound have a stimulatory effect by increasing protein synthesis, fibroblast formation and collagen synthesis?
- Inflammatory phase
 - Remodelling phase
 - Proliferative phase
 - Lag phase
4. The relationship between the partial pressure of oxygen in the blood and the oxygen saturation of haemoglobin is represented by the oxygen–haemoglobin dissociation curve. Exercise and training provoke which of the following shifts in the curve?
- Leftward
 - Upward
 - Downward
 - Rightward
5. What muscles *originate* on the medial aspect of the elbow?
- Elbow flexors
 - Elbow extensors
 - Carpal flexors
 - Carpal extensors
6. If the respiratory tidal volume of an animal is 0.5L, and its respiratory rate is 24 bpm, what is the animals Respiratory Minute Volume?
- 120L
 - 720L
 - 30L
 - 12L
7. Approximately what percentage change in bone mineral density must occur before it is evident radiographically?
- 20%
 - 40%
 - 60%
 - 80%
8. Both dogs and horses can suffer from laryngeal paralysis due to idiopathic laryngeal neuropathy. What muscle of the larynx is primarily affected by this condition?

- a) Cricoarytenoid dorsalis
- b) Cricoarytenoid lateralis
- c) Cricothyroid
- d) Thyroarytenoid

9. Through what method do thermography cameras operate?

- a) Detection of infrared radiation
- b) Detection of convective heat loss
- c) Detection of conductive heat loss
- d) Detection of ionising radiation

10. Which of the following characteristics are used to classify PRP products?

- a) Platelet concentration, elimination of erythrocytes, elimination of leukocytes, exogenous platelet activation
- b) Platelet concentration, volume of blood used, exogenous platelet activation, elimination of leukocytes
- c) Volume of blood used, volume of PRP, platelet concentration, elimination of leukocytes
- d) Volume of PRP, elimination of leukocytes, elimination of erythrocytes, exogenous platelet activation

11. Based on our current understanding of the action of mesenchymal stems cells (MSC) in biologic therapies, which of the following statements best describes their mechanism of action in tissue repair:

- a) MSC migrate to the injured tissues and differentiate into host tissues
- b) MSC modulate the host repair process through exocrine and endocrine actions
- c) MSC act by secreting paracrine factors to enhance regeneration of injured cells and stimulation of proliferation and differentiation of stem-like progenitor cells.
- d) MSC are unable to modulate local repair processes directly but rather inhibit destructive local inflammatory cell processes after tissue injury.

12. As a rule, rehabilitation therapy after fracture repair should be initiated when:

- a) Good radiographic healing is evident on post operative radiographs
- b) In the early postoperative period when soft tissue swelling is present, to decrease perioperative pain
- c) The patient is able to commence active range of motion exercises
- d) Weight bearing on the operated limb has commenced.

13. The therapeutic window for photobiomodulation is in the range of wavelengths:

- a) 150-550nm
- b) 650-1350nm
- c) 1450-1950nm
- d) 2150-3050nm

14. Referral and/or communication with a specialist may be necessary to enhance case management. When professionally is this communication needed?

- a) When imaging modalities not otherwise available to you are needed
- b) When the case requires reassessment by an expert in a specific field

- c) When the case has been referred to you from a specialist who has ongoing input
- d) All of the above are correct

15. Dogs have a huge range of roles in their relationships with humans. What drives the development of a treatment regimen for an injured dog?

- a) Your personal skill set in using the treatment modalities available to you
- b) Owner expectations for the role of their dog
- c) The ideal clinical outcome that is practically attainable for the dog
- d) All of the above are correct

16. What are the differences between a Sprain and a Strain?

- a) Sprain involves tendon. Strain involves ligament.
- b) Strain involves tendon. Sprain involves ligament.
- c) Strain requires surgical repair. Sprain can be treated conservatively.
- d) Sprain is a veterinary term. Strain is a physiotherapy term.

17. Which of the following applies to arthrokinematics?

- a) Goniometer
- b) Voluntary movement
- c) Joint mobilization
- d) Flexibility

18. If you want to start strengthening the muscles around a painful joint, what type of muscle contraction is most appropriate?

- a) Isometric
- b) Concentric
- c) Eccentric
- d) Isotonic

19. Testing for most collateral ligament laxity is performed with the joint in:

- a) The open-packed position
- b) The closed-packed position
- c) A fully extended position
- d) A partially flexed position

20. If you passively position the thoracic limb into shoulder extension with the elbow in flexion, you are testing:

- a) Shoulder flexion joint ROM
- b) Shoulder extension joint ROM
- c) Biceps Flexibility
- d) Triceps Flexibility

Section 2: Short Answer Questions

21. Using dot points, list the key stages of wound healing for a soft tissue wound. In your answer list the important cell types for each stage, their role(s) and the time frame expected for each stage. (10 marks).
22. List 3 commonly used objective gait analysis systems. (3 marks)
23. Describe the 4 basic mechanisms of heat transfer and provide one example of how each method allows for cooling of an animal. (8 marks)
24. Briefly describe how a Computed Tomography (CT) image of a patient is obtained. (5 marks)
25. Describe steps that should be taken in order to provide best practice radiation safety when using an X-ray machine. (5 marks)
26. The multimodal approach to pain management is based upon pharmacological targeting of different levels of the pain pathway. For each of the levels below, identify the specific cells or neural centre that is to be targeted and list the classes of drugs that can be used at this level of the pain pathway (12 marks).
- i. Transduction (3 marks)
Target cell/neural centre:
Drugs:
- ii. Transmission (3 marks)
Target cell/neural centre:
Drugs:
- iii. Modulation (3 marks)
Target cell/neural centre:
Drugs:
- iv. Perception (3 marks)
Target cell/neural centre:
Drugs:
27. Describe **FOUR** massage techniques and their uses in animal rehabilitation (10 marks)
28. Describe the effects, benefits, precautions and contraindications of cryotherapy in rehabilitation (9 marks)
29. List 3 characteristics of mesenchymal stem cells that are important in biologic therapy (3 marks)
30. Intra-articular medications are commonly used for the management of osteoarthritis (OA) in dogs and horses. List the advantages and disadvantages of intra-articular (IA) medications over systemic drug administration for OA treatment. (10 marks).

31. Corticosteroids are commonly used agents for intra-articular (IA) therapy in many species. Briefly discuss their mechanism of action, efficacy, duration of action and side effects when used for IA therapy. (10 marks)
32. “The most effective exercises are the ones that the patient actually does” – is a truism for sure. Discuss how you will get both your patients and their owners to comply with your “go home” instructions for exercises and treatments. What are the key elements to ensuring that your patients get the maximum benefit from all of your services? (8 marks)
33. Within the discipline of Acupuncture, acupoints are known to correspond to four neural structures. Using dot points, briefly describe the 4 acupoint types. (2 marks)
34. Joint mobilisation and Joint Manipulation are two types of induced articular movements used in manual therapy musculoskeletal rehabilitation. Please define each of these movements. (2 marks)
35. The exact mechanism by which Chiropractic techniques produce their therapeutic effect is not known. Despite this, a variety of positive outcomes can be seen post Chiropractic treatment. List 3 of these outcomes (3 marks)

End of Examination



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Rehabilitation (Canine)**

Paper 2

Perusal time: **Fifteen (15)** minutes

Time allowed: **Two (2)** hours after perusal

Answer **ALL** questions. Total 120 Marks

Section 1: Multiple Choice Questions

1. What is the suggested percentage of metabolizable energy supplied by fat, protein and carbohydrates (CHO) in racing greyhounds?
 - a) 24% fat, 30% protein, 46% CHO
 - b) 30% fat, 24% protein, 46% CHO
 - c) 28% fat, 26% protein, 46% CHO
 - d) 26% fat, 28% protein, 46% CHO
2. Which vitamin or mineral when supplemented for 4 weeks in greyhounds has been reported to result in slower race times by 0.3km/hr?
 - a) Calcium
 - b) Magnesium
 - c) Vitamin C
 - d) Vitamin D
3. Which 2 blood parameters tend to decrease with training and racing as a result of over-training in dogs?
 - a) Haematocrit and phosphorous
 - b) Haematocrit and albumin
 - c) Albumin and phosphorous
 - d) Albumin and white cell count
4. The action of the canine iliopsoas muscle is:
 - a) hip flexion, external femoral rotation, lumbar flexion
 - b) hip extension, internal femoral rotation, lumbar extension
 - c) hip flexion, internal femoral rotation, lumbar flexion
 - d) hip extension, external femoral rotation, lumbar extension
5. The action of the cranial cruciate ligament in the dog is:
 - a) Limit stifle external rotation, hyper-extension and cranial tibial translation
 - b) Limit stifle internal rotation, hyper-extension and caudal tibial translation
 - c) Limit stifle external rotation, hyper-flexion and caudal tibial translation
 - d) Limit stifle internal rotation, hyper-extension and cranial tibial translation
6. A canine patient has suffered an injury to the proximal sciatic nerve associated with an acetabular fracture. Which of the following clinical findings associated with this nerve injury are expected:
 - a) Reduced patella reflex, reduced withdrawal reflex, loss of tarsus and stifle flexor function, normal stifle extensor function
 - b) Reduced patella reflex, normal withdrawal reflex, normal tarsus and stifle flexor function, loss of stifle extensor function
 - c) Normal to increased patella reflex, reduced withdrawal reflex, loss of tarsus and stifle flexor function, normal stifle extensor function
 - d) Normal to increased patella reflex, reduced withdrawal reflex, normal tarsus and stifle flexor function, loss of stifle extensor function.

7. Fragmented coronoid process disease is seen more in young male large breed dogs and clinical signs seen initially as early as x months with mean age of diagnosis at y months. The correct values for x and y are as below. Choose one answer.
- a) Initial signs can be seen when the dog is x =4 months old and mean diagnosis is at y=8 months
 - b) Initial signs when the dog is x=4 months old and mean age at diagnosis y=13 months
 - c) Initial signs when the dog is x=10 months old and mean diagnosis at y=18 months
 - d) When osteoarthritic change is seen at x=12 months of age and mean diagnosis at y=15 months
8. Infraspinatus muscle contracture is a condition seen in hunting dogs and is characterised by which of the following clinical signs?
- a) Adduction of the limb from the shoulder with internal rotation of the distal thoracic limb
 - b) Abduction of the limb from the shoulder with external rotation of the distal thoracic limb
 - c) Abduction of the limb from the shoulder with internal rotation of the distal thoracic limb
 - d) Adduction of the limb from the shoulder with external rotation of the distal thoracic limb
9. For most dog breeds, the weight distribution at rest is:
- a) 40% weight on forelimbs and 60% on hindlimbs
 - b) 45% weight in forelimbs and 55% on hindlimbs
 - c) 55% weight on forelimbs and 45% on hindlimbs
 - d) 60% weight on forelimbs and 40% on hindlimbs
10. Injury to the distal ulnar growth plate in a 4-month old Labrador pup may lead to which of the following conditions:
- a) Radial valgus and cranial bowing deformity
 - b) Radial varus and caudal bowing deformity
 - c) Ulnar shortening and radial valgus and cranial bowing deformity
 - d) Ulnar shortening and radial varus deformity
11. An agility dog is presented to your clinic following onset of a right thoracic limb lameness noticed during recent competition and training. On gait evaluation the patient has a shortened right thoracic limb stride length with moderate right thoracic limb lameness. On orthopaedic examination, there is discomfort on right shoulder flexion and on direct palpation over the greater tubercle of the right humerus. The remainder of the orthopaedic exam is unremarkable.

In order of most likely to least likely, what are the potential differential diagnoses for this patient? Choose the best answer

- a) Contracture of the infraspinatus muscle, supraspinatus tendinopathy, medial shoulder instability, proximal biceps tendinopathy
- b) Supraspinatus tendinopathy, proximal biceps tendinopathy, medial shoulder instability, contracture of the infraspinatus muscle
- c) Proximal biceps tendinopathy, supraspinatus tendinopathy, contracture of the infraspinatus muscle, medial shoulder instability
- d) Medial shoulder instability, proximal biceps tendinopathy, contracture of the infraspinatus muscle, supraspinatus tendinopathy.

12. A 3-year old miniature Schnauzer is presented for your assessment following a peracute onset of monoparesis to the left pelvic limb, that occurred whilst the patient was competing in an agility contest 12 hours earlier. At the time of the incident the patient yelped but has been comfortable since. On examination, there is a significant paresis in the limb with reduced spinal reflexes and proprioception. Superficial and deep pain sensation and some movement is maintained. The patient is not painful on examination. The other limbs are normal.

The **most likely** diagnosis for this condition is:

- a) Fibrocartilaginous embolism of the lumbar intumescence
- b) Spinal fracture
- c) Thoracolumbar intervertebral disc extrusion
- d) Degenerative lumbosacral stenosis.

13. What is the best conditioning gait for dogs and why?

- a) The trot because it forces the dog to bear all its weight on one thoracic limb and the contralateral pelvic limb at a time
- b) The trot because it forces the dog to bear all its weight on one thoracic limb and the ipsilateral pelvic limb at a time
- c) The gallop because it forces the dog to bear all its weight on one thoracic limb and the contralateral pelvic limb at a time
- d) The gallop because it forces the dog to bear all its weight on one thoracic limb and the ipsilateral pelvic limb at a time

14. Which of the following is considered an abnormal gait in the dog?

- a) A pacing gait
- b) A cantering gait
- c) A trotting gait
- d) A galloping gait

15. Wobble boards and rocker boards are good exercise equipment for older dogs with orthopaedic or neurological problems to keep them active and self-assured. Which of the following statements is correct?

- a) A rocker board is supported on a hemispheric base
- b) Wobble boards are less challenging than rocker boards for neurologic patients.
- c) The patient's impaired limb(s) should be placed on the rocker board rather than the more stable surface
- d) Rocker boards can be used to challenge proprioception and balance

16. Which meniscus, the medial or the lateral, is most commonly injured in the cruciate deficient stifle and why?

- a) Medial. It has firm attachment to the medial collateral and joint capsule but lacks a femoral meniscal ligament
- b) Medial. It has minimal attachments, so it can move more freely
- c) Lateral. It had firm attachments to the lateral collateral and tibia
- d) Lateral. It has an extra ligament attaching it to the femur.

17. It's a busy day. Your next patient is recovering from a severe mid-shaft humeral fracture, repaired using pins and wires. The surgeon notes that the radial nerve looked "OK, not great" at the time of the repair. Which of the following muscles would likely be impacted?

- a) Extensor carpi radialis
- b) Biceps brachialis
- c) Flexor carpi ulnaris
- d) Deep digital flexor

18. Mugzy is a 3-year old, male, neutered black Labrador. He enjoys a life of romping around the farm, chasing the cats and sheep. You are seeing him 3 hours post-op L TPLO. Prior to starting your treatment, you are considering the goal(s) of today's treatment. Which of the following should be your top priority for today's treatment?

- a) Decrease pain and swelling
- b) Increase strength
- c) Increase stifle range of motion
- d) Promote weight bearing

19. If your patient has difficulty performing a **stand-to-sit** transfer due to weakness, you will best re-train this activity by strengthening the:

- a) Quadriceps and Hamstrings, concentrically
- b) Quadriceps and Gluteals, eccentrically
- c) Hamstrings, isometrically
- d) Iliopsoas concentrically

20. Lilly is a 5 y.o. female neutered Vizsla cleared for an agility conditioning program. During her evaluation you notice in standing her lumbar spine is kyphotic, she has a dorsal pelvic tilt and her right pelvic limb is externally rotated; at a walk she remains kyphotic and has equal hip extension. As she moves into a trot her lumbar kyphosis increases and her RHL extension is significantly decreased. If this abnormal movement during gait is caused by a tight muscle, the muscles most likely to cause this particular movement abnormality include:

Choose the best answer.

- a) Iliopsoas, Sartorius, Rectus femoris
- b) Latissimus dorsi, Iliocostalis lumborum, Sartorius
- c) Middle gluteal, Iliocostalis lumborum, Iliopsoas
- d) Biceps femoris, Semitendinosus, Semimembranosus

Questions continued on next page

Section 2: Short Answer Questions

21. List the muscles, whose tendons combine to insert on the tuber calcanei as the common calcaneal tendon (4 marks)

22. Describe the characteristic pelvic limb posture that results from a common calcaneal tendon rupture, but with an intact superficial digital flexor tendon (2 marks).

23. You are asked to evaluate a 48kg 3-year old Labrador with an acute cruciate ligament rupture. He is scheduled for at TTA surgery in 3 weeks. His BCS is 4.5/5. He is otherwise well with no other orthopaedic conditions

Discuss the **prehabilitation** plan for this dog for the next three weeks (before surgery) and then how you will advise and manage him ongoing for the first 10 weeks **after** surgery. Outline your treatment goals at the various stages as well as what modalities and exercises you might use. (14 Marks)

24. In relation to joint mobilisations in canine patients, describe the convex-concave rule. Provide examples to support this description. (10 marks)

25. The use of mesenchymal stem cell therapy in canine sports medicine is evolving rapidly. Discuss the sources of mesenchymal stem cells currently available in canine sports medicine, their effects, uses and limitations (10 marks).

26. Rehabilitation medicine has been driven by an inter-professional team who manage the individual needs of the patient. Describe the make-up of this team, and the roles that that each member plays. (10 marks)

27. Cavaletti or 'ground poles' can be used to help retrain the trot in dogs who tend to pace. They can also be applied to reconditioning programs for canine patients. Describe, using dot points, how you would set up and apply the poles to retrain trot and to recondition a rehabilitation patient. (6 marks)

28. A racing greyhound is presented to you acutely with a torn gracilis muscle following a racetrack injury. Discuss an appropriate treatment plan, both immediate and ongoing, for this patient and what would you advise the client in terms of prognosis for return to racing (8 marks).

29. A 12-year-old Labrador was professionally trained and used for the first part of his life as a field trial retriever at competition level before becoming a pet when he was six years old. You are presented with this dog as a patient, that weighs 35 kg and has a body score of 3/5. He is a large-framed dog. He developed SARDS (sudden acquired retinal degeneration syndrome) about a year ago but is still keen to walk on leash with the other dogs in the household and navigates the home environment without incident. His owner is concerned that he is getting sarcopaenia as he is not as active as the other dogs anymore due to his visual impairment. He is slightly wobbly on his hind limbs when stair climbing. He does not have proprioceptive deficits in any of his four limbs.

On clinical examination he has pain on hip extension and a positive tail jack response. His neck is held stiffly but he does not apparently have pain through its full gentle range of motion. He can do stairs unaccompanied from the back deck of the house to the garden. He is capable of jumping on furniture to sleep. His radiographs are below.

Describe the radiographic findings relevant to the observations above and presumptive diagnoses for each radiographic view (6 marks).

What other assessments/views would you like to have before you discuss an exercise regimen for him and why? (4 marks).

Given his disability, what modalities might suit him better for a rehab programme and why (6 marks)?

Questions continued on next page





30. In the dog, for each of the following reflexes, describe how the reflex is tested (procedure), what section of the spinal cord and relevant nerves are being tested and what response should be expected with an intact reflex. (12 marks). 3 marks per question

- a) Flexor/withdrawal reflex for the pelvic limb
- b) Patella reflex
- c) Biceps reflex
- d) Flexor/withdrawal reflex for the thoracic limb

31. Describe the characteristic gait, physical examination and diagnostic modality findings typically associated with biceps tendinopathy in the dog (8 marks)

End of paper