



Australian and New Zealand College of Veterinary Scientists

Fellowship Examination

June 2014

Veterinary Anaesthesia and Critical Care Paper 1

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

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

Answer **ALL SIX (6)** questions

All six questions are of equal value.

Answer **SIX** questions each worth 30 markstotal 180 marks

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Paper 1: Veterinary Anaesthesia and Critical Care

Answer all six (6) questions

1. Renal physiology

Answer **all** parts of this question:

- a) The nephron is the functional unit of the kidney. Using a diagram, label the parts of the nephron and their location in **either** the cortex or medulla. (5 marks)
- b) There are several mechanisms involved in renal tubule reabsorption from the tubule to the interstitium. Describe the following transport mechanisms involved in renal tubular reabsorption **and** give an example of a substance that is transported by **each** mechanism.

Answer **all** of the following:

- i. **two (2)** types of active transport (4 marks)
 - ii. passive diffusion (2 marks)
 - iii. osmosis (2 marks)
- c) Name a loop diuretic. Describe the site of action, mechanism of action and **one (1)** side effect. (2 marks)
 - d) Briefly describe how the renin-angiotensin-aldosterone system is activated, the events that follow this activation **and** the effects this has on renal function. (5 marks)
 - e) Describe how the kidneys regulate hydrogen (H⁺) and bicarbonate (HCO₃⁻) ions in the maintenance of acid-base balance. (10 marks)

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2. **Blood pressure equipment**

For **each** method explain the principle of measurement for monitoring arterial blood pressure, and state **one (1)** advantage and **one (1)** disadvantage:

- a) Doppler (10 marks)
- b) Automated oscillometry (10 marks)
- c) Invasive or direct. (10 marks)

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

- a) Write the alveolar gas equation. Define the parts of the equation including units of measure. Describe the utility of this equation and give examples of **two (2)** clinical factors that could significantly alter the outcome of this equation. (10 marks)
- b) Define hypoxia and differentiate it from hypoxemia. Describe the causes of hypoxia and how to differentiate between them. (20 marks)

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

- a) Describe or draw a labelled diagram of the anatomy of the pain pathway. Include in your answer all relevant neurotransmitters and synapses within the pathway **and** a list of substances known to stimulate the peripheral chemoreceptor. (16 marks)
- b) List the analgesic drugs and techniques that are effective at various locations within the pain pathway. (5 marks)
- c) Define and differentiate peripheral and central sensitisation. (9 marks)

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5. **Alpha-2 receptor pharmacology**

Answer **all** parts of this question:

- a) Describe the mechanism of action of the alpha-2 agonist class of drugs. Include in your answer the details of receptor subtypes and anatomical locations **and** the clinical effects of receptor activation. (10 marks)
- b) Define the term 'receptor specificity' and describe its clinical relevance with reference to alpha-2 agonist drugs. Include in your answer the application of this concept to the reversal of alpha-2 agonists. (6 marks)
- c) List the **four (4)** most commonly used alpha-2 agonist agents in veterinary medicine in order of **increasing** receptor specificity. Include in your answer the binding ratio for each agent. (4 marks)
- d) Describe the cardiovascular effects of intravenous alpha-2 agonists in dogs. (10 marks)

6. **Neuromuscular physiology and pharmacology**

Answer **all** parts of this question:

- a) Draw a labelled diagram of the neuromuscular junction. Describe the events that lead to depolarization and muscle contraction. (10 marks)
- b) Briefly describe the pharmacology of the non-depolarizing neuromuscular blocking agents **and** their mechanism of action at the neuromuscular junction. (10 marks)
- c) Briefly describe how the following factors alter neuromuscular blockade. Where appropriate include examples of specific neuromuscular blocking agents that will be affected:
 - i. hepatic dysfunction (2.5 marks)
 - ii. renal dysfunction (2.5 marks)
 - iii. inhalant anaesthetic drugs (2.5 marks)
 - iv. potassium and calcium abnormalities. (2.5 marks)

End of paper