



# Australian and New Zealand College of Veterinary Scientists

## **Fellowship Examination**

June 2013

# **Veterinary Anaesthesia and Critical Care**

## **Paper 1**

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

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

Answer **ALL SIX (6)** questions

Answer **SIX** questions each worth 30 marks .....total 180 marks

# Paper 1: Veterinary Anaesthesia and Critical Care

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Answer all six (6) questions

1. Answer **all** the following questions related to capnography.
  - a) Describe the principles of measurement involved in capnography. (10 marks)
  - b) Describe the differences between mainstream and side-stream measurement systems including a discussion of the relative advantages and disadvantages of each system. (10 marks)
  - c) Briefly describe physiological factors that influence the value of end-tidal CO<sub>2</sub> measured in a clinical patient. (10 marks)
  
2. Answer **all** the subpart questions regarding surfactant.
  - a) State where pulmonary surfactant is produced. (2 marks)
  - b) Outline the functions of pulmonary surfactant. (10 marks)
  - c) Briefly describe how surfactant alters surface tension within the alveoli. (10 marks)
  - d) Describe the alterations that acute lung injury (ALI) has on lung function. (8 marks)

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3. Answer all question parts below. Define **each** of the following physiological reflexes. For **each** reflex, briefly describe **one (1)** clinical example.
- a) Bainbridge reflex (6 marks)
  - b) Bezold-Jarisch reflex (6 marks)
  - c) High-pressure baroreceptor or presso-receptor reflex (6 marks)
  - d) Hering-Breuer reflex (6 marks)
  - e) Cushing's reflex. (6 marks)
4. The following table outlines the physico-chemical properties of fictitious inhalational anaesthesia agents. Use the information provided to answer **all** of the following questions.

**Table of physico-chemical properties**

Agent	Physico-chemical properties					
	Oil/ gas coefficient	Blood /gas coefficient	Rubber /gas coefficient	Boiling point °C	Sat Vapour pressure 20°C	Molecular Weight
<b>Snooze Easy</b>	750	90	100	48	252	170
<b>Slumber Delight</b>	1.4	0.76	3	-50	–	45
<b>Sleep Heaven</b>	18	47	50	50	240	230
<b>Siesta Devine</b>	800	96	190	59	386	185

- a) In general terms, outline the relevance of physico-chemical properties of any inhalation gas in clinical anaesthesia. (4 marks)
- b) Briefly explain the physico-chemical properties listed in the chart above. (6 marks)
- c) Discuss the concept of solubility as it relates to inhalational anaesthesia and include the gas law(s) that describe solubility and partition coefficients. (10 marks)

**Question 4 continued over page**

- d) Using the information in the above table of physico-chemical properties of inhalational anaesthesia agents answer **all** the following sub-questions and justify your choice.
- i. Identify the agent that has the fastest onset of action. (2 marks)
  - ii. Identify the agent(s) that (s) would be most useful if only rubber circuits and rebreathing bags were used. (2 marks)
  - iii. Identify the agent(s) that can be used in a refurbished isoflurane vaporizer. (2 marks)
  - iv. Identify the physico-chemical property that influences minimum alveolar concentration (MAC). (2 marks)
  - v. Identify the agent that is least potent. Explain whether this least potent agent would be useful as an anaesthetic agent. (2 marks)

5. Answer **all** of the following questions regarding receptors involved in analgesia.

a) NMDA (*N*-methyl-*D*-aspartate) receptor:

- i. Describe the location and structure of the NMDA receptor. (5 marks)
- ii. Describe the function of the NMDA receptor including the ligands that regulate receptor function. (5 marks)
- iii. Discuss the importance of the NMDA receptor in pain perception. (5 marks)

b) Opioid receptor and drugs:

- i. Describe the structure and function of the basic opioid receptor. Include a description of cellular mechanism. (5 marks)
- ii. Outline the classification of opioid receptors. (3 marks)
- iii. Briefly describe examples of the adverse effect(s) of opioid drugs. Include temporal effects and examples of species differences. (7 marks)

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6. Answer **all** of the following questions relating to cardiovascular physiology.
- a) Draw a pressure volume curve for the left ventricle. Label the diagram with the following: (5 marks)
    - i. opening of mitral valve
    - ii. opening of aortic valve
    - iii. stroke volume.
  - b) Define and briefly discuss preload and using the diagram from question 6 a), label the site that represents preload. (10 marks)
  - c) Draw a second pressure volume curve in which preload is increased but afterload and contractility remains the same. (5 marks)
  - d) Preload cannot be measured directly. List which indices can be measured to provide an indirect measure of preload. Describe how these indices can be measured clinically in a live animal and include both the advantages and disadvantages of each method. (10 marks)

**End of paper**