



ROYAL AUSTRALASIAN COLLEGE  
OF  
DENTAL SURGEONS  
INCORPORATED  
ABN 97 343 369 579

PRIMARY EXAMINATION IN  
**PHYSIOLOGY**

Tuesday 27 November 2007

Time allowed: **Two hours**

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**INSTRUCTIONS TO CANDIDATES**

- Answer any **FOUR (4)** of the following six (6) questions. If you answer more than four questions, only your *first four* answers will be marked.
- Each question is of equal value, namely, 25% of the total for the written paper.
- Ample time is allowed for your answers, so you should strive to present them in a well-organised manner.
- Diagrams may be used to illustrate your answers where appropriate
- Allow time at the end of the examination to read your answers *carefully*.

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**Question 1**

**(30 minutes: 25 marks)**

After a prolonged treatment session during which your patient, Mr X, was recumbent in the dental chair he reports feeling very dizzy and faint when he tries to stand up. He recovers quickly when he lies down flat.

- a. Explain with appropriate physiological detail the reasons for his feelings of faintness.
- b. What physiological signs would you be able to observe in Mr X at the time he reported feeling faint?
- c. Explain the body's responses that underpinned his recovery. Give details of the physiological mechanisms involved.
- d. Would Mr X's heart rate when standing again *after his recovery* be higher or lower than when he was lying on the dental chair? Explain your choice.



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Written paper continued

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**Question 2**

**(30 minutes: 25 marks)**

- Describe the receptors and neural pathways involved in the perception of dental pain.
- What stimuli could have triggered each pathway?
- What are the typical characteristics of the pain conveyed by each pathway?
- Name three different classes of analgesic agents that you could use to alleviate pain of dental origin, and describe briefly how each works.

**Question 3**

**(30 minutes: 25 marks)**

- Describe, with appropriate physiological detail, how vascular fluid volume is replenished in the short term after moderate blood loss, for example after donating a unit of blood or after a moderate dental haemorrhage.
- Explain why adrenaline rather than noradrenaline is given as part of the urgent management of acute anaphylaxis.
- Explain why noradrenaline rather than adrenaline is administered alongside dental local anaesthetics in the same injection. What consequences could you expect if noradrenaline was omitted from the injected local anaesthetic solution?

**Question 4**

**(30 minutes: 25 marks)**

Write brief notes on:

- negative and positive feedback physiological control mechanisms, giving an example of each;
- the role of the hypothalamus in coordinating the body's response to a stressful situation;
- endogenous opiates, their sites of action and the mechanisms by which they act.



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**Question 5**

**(30 minutes: 25 marks)**

At sea level the partial pressure of oxygen in atmospheric air ( $pO_2$ ) is approximately 160 mmHg.

- At the end of inspiration will the  $pO_2$  in the trachea be the same, higher or lower than that in atmospheric air? Explain your choice.
- At the end of inspiration will the  $pO_2$  in the alveoli be the same, higher or lower than that in the trachea? Explain your choice.
- In the period between inspiration and expiration in a normal lung, will the  $pO_2$  in the pulmonary capillaries be the same, higher or lower than that in the alveoli? Explain your choice.
- If you gave your patient nitrous oxide ( $N_2O$ ) as an admixture to atmospheric air to breathe during treatment would the pulmonary capillary oxygen tension be the same, higher or lower than normal. Explain your choice.

**Question 6**

**(30 minutes: 25 marks)**

Write brief notes on:

- The sensations other than pain that can arise from structures within the oral cavity, the receptors responsible and their location
- The differences between skeletal and smooth muscles in respect of the sequence of events that starts in the central nervous system and culminates in contraction.
- Water soluble and fat soluble hormones, giving an example of each and explaining what difference to their biological function does their water versus fat solubility make.

**This is the last page of this examination paper**