



The Hong Kong College of Anaesthesiologists

Intermediate Fellowship Examination

Written Paper in Physiology

10 July 2020 (Friday)

09:00 - 11:00 hours

Instructions:

- There are twelve pre-labelled answer books. Please make sure you answer the questions in the respective answer book.
- Write your candidate number on the cover of each answer book.
- Use ink or ball-point pen.
- Answer ALL questions. They are worth equal marks and you should spend approximately **ten minutes** for each question. For questions with multiple parts, allocation of marks is indicated in the brackets.

- 1. Explain the physical principles of cardiac output measurement using echocardiography (70%). Outline the potential sources of error (30%).**
- 2. Outline the main differences between the fetal and neonatal circulations (50%). Explain how the transition between the two circulations occurs at birth (50%).**
- 3. Outline the similarities and differences between myoglobin and adult haemoglobin (50%). Explain the physiological implications of the differences (50%).**
- 4. Outline how plasma potassium is maintained at its normal level (70%). Describe the effects of hyperkalaemia on cardiac muscle cells (30%).**
- 5. What is hypoxic pulmonary vasoconstriction (HPV) (30%)? Outline the biochemical mechanism(s) involved, and the factors affecting HPV. Include in your answer, the effects of anaesthesia on HPV (70%).**
- 6. Explain how hypothermia occurs during general anaesthesia (70%). Explain how preoperative warming prevents perioperative hypothermia (30%).**
- 7. Explain the physiological mechanisms that may result in oliguria during hypovolaemic shock.**
- 8. Outline how anaesthesia, surgery and the associated stress response affect the immune system.**
- 9. Describe the structure of the Blood Brain Barrier (BBB) (30%). Outline its major functions, and describe the transportation of various substances across the BBB (70%).**
- 10. Draw and explain the normal tracing obtained from thromboelastography (50%). Discuss the advantages and disadvantages of using thromboelastography over standard laboratory tests in assessing hemostasis (50%).**
- 11. Draw a labelled diagram, describe and explain the pattern of blood flow in the left coronary artery during a cardiac cycle (50%). Explain why a patient with severe aortic stenosis may develop myocardial ischaemia in the presence of normal coronary arteries (50%).**

12. Using the graphs printed in the answer sheet, draw a flow-volume loop diagram for a forced vital capacity breath and briefly describe the flow pattern for each of the following circumstances:

- A. Normal patient (25%);
- B. A patient with chronic obstructive pulmonary disease (25%);
- C. A patient with restrictive pulmonary disease (25%);
- D. A patient with neuromuscular weakness (25%).

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