The Hong Kong College of Anaesthesiologists

Intermediate Fellowship Examination

Written Paper in Physiology

5 March 2021 (Friday)

09:00 - 11:00 hours

1. An elderly patient with ruptured abdominal aneurysm is in hypovolaemic shock and is breathing on a 10L/min oxygen mask. His arterial blood gas shows:

pH 7.21 pO_2 20 kPa pCO_2 3.5 kPa HCO_3 20mmol/L

(1) Describe and explain the biochemical abnormalities. (50%)

(2) Outline the physiological consequences of the abnormalities on various organ systems. (50%)

2. Illustrate, with examples, the transport mechanisms of hydrophilic substances across the cell membrane.

3. Explain the effects of central neural blockade on stroke volume, heart rate and cardiac output.

4. List the factors that leads to a DROP in myocardial oxygen supply and an INCREASE in myocardial oxygen demand.

5. List both the exocrine and endocrine substances secreted by the pancreas. Include in your answer their sites of secretion and one of their functions for each substance.

6. Describe the adverse physiological consequences following the transfusion of 10 units of packed red cells over 2 hours.

7. Outline the differences in the respiratory system of a neonate compared to an adult. State the corresponding anaesthetic implications.

8. Why is humidification of the inspired gas important to the mechanically ventilated patient (30%)? What are the passive and active methods of humidification of inspired gas (70%)?

9. Concerning cerebral blood flow, explain

(1) The physiological process and mechanism of "flow-metabolism coupling" (30%)

(2) The effect of acute hypercapnia on cerebral blood flow (40%)

(3) The effect of acute normalisation of arterial carbon dioxide tension ($PaCO_2$) on cerebral blood flow after 24 hours of hyperventilation (30%)

10. Explain the physiological processes that cause oliguria in response to hypovolaemic shock.

11. Discuss the factors affecting pulmonary vascular resistance.

12. Describe the physiological factors which affect the respiratory rate.

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