

UNIVERSITY OF OSLO

Faculty of Mathematics and Natural Sciences

Exam in: MBV3050

Day of exam: Friday 11. january

Exam hours: 0900 - 1200

This examination paper consists of 2 page(s)

Appendices: None

Permitted materials: None

Make sure that your copy of this examination paper is complete before answering.

You may answer in English or any Scandinavian language. The answers to question II-IV is limited to a maximum of 200 words, drawings may be used.

Question I:

Please respond to each of the following statements with "true", "false" or "do not know". A correct answer gives 1 point, an incorrect answer gives -1 point, while no answer (or "do not know") gives 0 points.

- A) If you breathe a gas-mixture containing 40 % O₂ and 60 % N₂, your blood oxygen content would increase by 40%.
- B) If you breathe air where all CO₂ is removed, your blood CO₂ level would fall drastically
- C) If you are in an accident and lose 2.5 liters of blood, which at the site of the accident is replaced by 2.5 liters of NaCl solution to stabilize your blood pressure, your blood O₂ content would fall by about 50%.
- D) If you breathe pure O₂, the partial pressure of O₂ in your blood would increase several times.
- E) Your ventilation rate is primarily guided by the O₂ content in blood
- F) Blood chemoreceptors on the lung artery are particularly sensitive to O₂.
- G) O₂ sensitive chemoreceptors react to the concentration of O₂ in blood, but are relatively insensitive to blood pO₂
- H) Hyperventilation will result in an increased O₂ affinity of hemoglobin in arterial blood.

I) If you put your cold feet in a warm bath, the average O₂ affinity of the hemoglobin passing through your feet will increase

J) Lactate production in your muscles will increase the O₂ affinity of the blood passing through the muscles

Question II:

Compare the excitation-contraction coupling in the heart and in skeletal muscles. What is similar and what is different? Speculate briefly why the EC coupling have evolved differently in skeletal muscle. Answer the questions directly, a mere description of the EC coupling in the two systems will not be honoured. (Answer max. 200 words)

Question III:

Below is a quote from the medical textbook "Davidson's principles and practice of medicine" 13. ed. 1981 that seems to contain mistakes. Please indicate what you find wrong or misleading. (Answer max. 200 words)

"The normal resting cell is polarised as a result of an ionic gradient across the cell wall produced by the sodium pump, which reduces the intracellular and increases the extracellular sodium concentration; the ionic balance is preserved by a high intracellular potassium concentration, compared with the extracellular. It is the potassium gradient across the cell membrane which is mainly responsible for the electrical potential difference across it. When the membrane is electrically stimulated, the pump is inactivated. As a result there is a sudden inrush of sodium ions, and the cell becomes depolarised. The sodium pump subsequently repolarises the cell, but this process is slower."

Question IV:

List the mechanisms that the body uses in the regulation of plasma H⁺ concentration. (Answer max. 200 words)