

Second 2010
VIVA 3

Interpret this Arterial Oxygen Tension $\text{PaO}_2 = 24.6\text{mmHg}$
This viva tested the candidates' knowledge of hypoxaemia, associated respiratory physiology and oxygen measurement. Specifically measurement of oxygen tension, the alveolar gas equation and physiological responses to hypoxia. Measurement of oxygen tension, in particular the principles behind the Clark electrode, was well done. The area candidates struggled the most was explaining and integrating arterial blood gases and the physiological principles surrounding them.

“Could you describe the most common causes of hypoxaemia?”

hypoxaemia defined as an arterial blood PO_2 less than normal value,
different texts use different values, 70 mmHg represents the start of the ODC steep section

inspired air causes

- reduced atmospheric partial pressure - altitude, flying
- reduced partial pressure of O_2 - anaesthetic machine failure

lung causes

- pathological shunt - pneumonia, collapse, obstruction, $\text{FRC} < \text{closing capacity}$, extrathoracic shunt
- increased VQ mismatch - PE

decreased delivery to the periphery

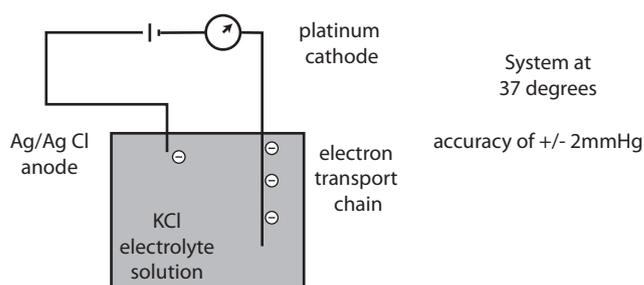
- according to the equation $\text{O}_2 \text{ flux} = \text{CO}(\text{Hb} \times \text{sats} \times 1.34 + \text{dissolved O}_2)$
- decreased CO or Hb
- abnormal Hb

increased O_2 extraction

- due to hyper-metabolic states - sepsis, seizures, MH

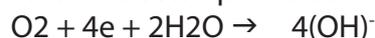
“What is the Clark electrode and what is it used to measure?”

also known as the polarographic electrode



at the anode silver reacts with KCl to create electrons

basically the platinum cathode sets up an electron transport chain like in the mitochondria



the more oxygen the more electrons that can be taken up and therefore the greater the current
protein deposits would render the cathode ineffective if it was inserted into blood

a plastic membrane is therefore set up which is permeable to O_2 and the same set up is used

“How is the Clark electrode calibrated and what are its limitations?”

calibration is via standardised gas mixtures

- limitations O_2 electrode must be clean and free from contamination
- blood sample must be recent, anaerobic and heparinised
- plastic membrane must be intact