Breathing III

**Medical physiology   
seminar & practical**

Home preparation, study materials and learning objectives

**Objectives – what you will learn**

* Explain the principle of FRC measurement and calculate FRC from the values measured during plethysmography
* Calculate the partial pressure of gas at a given altitude and account for water vapour saturation when calculating alveolar pO2
* Learn to apply compensatory mechanisms of chemical regulation of respiration
* Interpret the causes and impact of changes in the Hb dissociation curve for O2
* Explain the relationship between tidal volume and frequency and alveolar ventilation

**Study materials**

* Physiology lectures from the topic of respiration
* Costanzo: Lung volumes and capacities, Gas Exchange, oxygen transport, control of breathing – chemoreceptors, adaptation to high altitude, plethysmography
* Plethysmography: <https://www.youtube.com/watch?v=aKmvSLG1c8Q&ab_channel=AMBOSS%3AMedicalKnowledgeDistilled>

**Prepare before the seminar:**

**Case study I**

The unconscious patient has a respiratory rate of 30 breaths/min, shallow breathing (TV tidal volume 250ml). His estimated dead space (DV) is 200ml, CO2 output 180ml/min and oxygen consumption 200ml/min. The patient is intubated and connected to a ventilator.

1) Assess the initial respiratory rate, and tidal volume. What effect will they have on the patient's gas exchange? Calculate the initial pAO2 (alveolar partial pressure of oxygen).

2) How will a reduction in respiratory rate to 15 breaths per minute with minute ventilation maintained affect alveolar ventilation? How will it be reflected in the pAO2 value?

**Case study II**

An elderly gentleman with chronic obstructive disease is planning a transatlantic flight. His blood gas values at normal altitude (atmospheric pressure 760 mmHg) are: pH 7.37, PaO2 60, PaCO2 52.

1) Assess the patient's blood gas values

2) What is the most likely cause of these values?

3) Explain the concept of alveolo-arterial difference and calculate its value for this case.

4) How will flight in a cabin with lower barometric pressure affect the patient's PaO2 value? Justify.