**Seminar physiology: Breathing II**

**Student protocol**

**1. Functional residual capacity**

A lifelong heavy smoker, Mrs. M. has long-term problems with shortness of breath. Because of the suspicion of emphysema, her doctor (among other things) sent her for an FRC examination (FRC is usually increased due to the destruction of lung tissue in emphysema). For a while, she calmly breathed into and out of a 5 L spirometer, which initially contained 10 % helium. After a few calm breaths, the helium concentration dropped to 6 %. Has emphysema been suspected?

FRC Mrs. M.:

Typical FRC value:

**2. Detective - The case of a murdered rapper**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Suspects | [Hb](g/l) | [Hb](g/dl) | PaO2(torr) | Sat(%) | Max Q**.**(l/min) | CaO2(ml/dl) | Max Del(ml/min) |
| Davenport Deadspace | 150 | 15 | 97 | 98 | 20 |  |  |
| Daphne Deadspace | 120 | 12 | 95 | 97 | 16 |  |  |
| Victor Ventilation |  80 |  8 | 98 | 98 | 30 |  |  |
| Aldo Alveolus |  80 |  8 | 70 | 90 | 12 |  |  |

CaO2 = maximum capacity of blood transfer O2

Max Del = maximum rate of oxygen delivery

Can any of the suspects be ruled out based on this data?

|  |  |  |
| --- | --- | --- |
| Suspects | Maximum deliveryml O2/min | 75% maximumml O2/min |
| Davenport Deadspace |  |  |
| Daphne Deadspace |  |  |
| Victor Ventilation |  |  |
| Aldo Alveolus |  |  |

Remember that an oxygen supply of 2300 ml/min is required to complete the run.

Can any of the suspects be ruled out based on this data?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Davenport Deadspace | Daphne Deadspace | Victor Ventilation | Aldo Alveolus |
| CONTROL TERMS |  |  |  |  |
| Mixed exhaled PCO2 (mmHg) | 27 | 29 | 23.6 | 22 |
| Arterial (= alveolar) PCO2 (mmHg) | 40 | 39 | 40 | 38 |
| Tidal volume (ml) | 510 | 450 | 487 | 400 |
| Respiratory rate (breaths/min) | 10 | 12 | 12 | 15 |
| Total ventilation (ml/min) |  |  |  |  |
| Physiological dead space (ml) |  |  |  |  |
| Dead space ventilation (ml/min) |  |  |  |  |
| Alveolar ventilation (ml/min) |  |  |  |  |
| ADDED DEAD SPACE 135 ml(respiratory rate remains constant) |  |  |  |  |
| Snorkel + physiological dead space (ml) |  |  |  |  |
| Dead space ventilation (ml/min) |  |  |  |  |
| Total ventilation (ml/min) |  |  |  |  |

VD = VT (PACO2 - PECO2) / PACO2

He is a murderer ……………………….

**3. Effect of differences in V/Q on PO2 and PCO2 (Rahn-Fenn diagram)**