

#### Q4 Describe the respiratory changes during pregnancy (March 2014)

- ANATOMICAL
  - Capillary engorgement
  - Oedema and friability of the upper airway and pharynx
  - Increase in chest diameter due to release of relaxin from corpus luteum
  - Increase in breast size (alters chest wall compliance)
  - Cephalad displacement of the diaphragm by the gravid uterus
  - Nasal polyposis may occur
- PHYSIOLOGICAL
  - Decrease in RV (20%) and ERV (20-30%) due to diaphragm displacement
  - 20% reduction in FRC due to this
  - Increase in minute ventilation:
    - Increase in  $V_T$  by 40%
    - Increase in respiratory rate by 10-15% due to progesterone mediated central hypersensitivity to CO<sub>2</sub>
  - Increase in anatomical dead space due to splinting open of larger airways by the increase in thoracic cage diameter (however, because of the concurrent increase in  $V_T$ ,  $V_D/V_T$  remains unchanged)
  - Vital capacity remains unchanged
  - At term, O<sub>2</sub> consumption and CO<sub>2</sub> production are 60% above non-pregnant values (due to higher metabolic rate)
  - Oxygen flux at term increases by ~10%
    - $DO_2 = CO \times CaO_2$
    - $CaO_2 = (1.34 \times Hb \times SaO_2) + (0.003 \times PaO_2)$
    - Hb in pregnancy drops from ~140 to ~120 and CO rises from 5L/min to 6.5L/min
    - $DO_2$  in non pregnant woman =  $5 \times [(1.34 \times 140 \times 100\%) + (0.003 \times 100)] = 940\text{ml/min}$
    - $DO_2$  in pregnant woman =  $6.5 \times [(1.34 \times 120 \times 100\%) + (0.003 \times 105)] = 1047\text{ml/min}$
- ARTERIAL BLOOD GAS
  - PaO<sub>2</sub> 100-105mmHg → slightly higher than usual due to hyperventilation
  - PaCO<sub>2</sub> 28-32mmHg → due to hyperventilation. Physiologically provides a better gradient favouring transfer of CO<sub>2</sub> from fetus to mother
  - pH 7.4-7.45 → compensated respiratory alkalosis
  - HCO<sub>3</sub> 18-21mmol/L → renal compensation for respiratory alkalosis (note this means the mother has a reduced buffering capacity)