March 2010
QUESTION 11

Describe a set of arterial blood gases in a pregnant woman at term and the reasons for these values

Pregnancy
- results in significant resipiratory changes which are
  - mechanical
    - due to the effects of a gravid uterus,
    - increased effect at term
    - decreased FRC
    - reduced O2 reserves
  - metabolic
    - higher basal metabolic rate
    - increased oxygen demands (20%)
  - cardiac
    - increased blood volume and cardiac output
    - decreased peripheral resistance
  - hormonal
    - due to the release of progesterone and estrogen throughout the pregnancy

ABG at term

pH	7.4 - 7.45 units	(7.40)
paO2	100-105 mmHg	(95)
pCO2	30-32 mmHg	(35)
HCO3	18-21 mmol/L	(24)

Progesterone
- sensitises the chemoceptors
- hypoxic ventilatory response curve is increased two fold (but not activated in normal physiology)
- there is also increased in the slope of the pCO2/ventilation curve
- the result is increased ventilation, characterised by larger tidal volumes 40% (RR is unchanged)

Increased ventilation
- is beyond the requirements of the increased metabolic demands
- results in the decreased pCO2
- the increase in pH is partially compensated for by HCO3 according to the henderson-hasselbach curve
  - $pH = 6.1 \log(HCO3/0.03 \times pCO2)$
- there is also an small increase in alveolar pO2 and arterial pO2 due to the alveolar gas equation
  - $\text{Alveolar } pO2 = FiO2(Patm - 47) - (pCO2/0.8)$

Fetal exchange
- is enhanced by the higher pO2 although most of the gas transfer is dependent on
  - the anatomy of the placental exchange capillaries
  - the different fetal and maternal Hb-O2 dissociation curves
  - the double bohr and haldance effects