Arterial Blood Gases

Oxygenation

	Arterial (at sea level)	Venous (at sea level)
Normal ABG's:	PaO_2 = 90 - 95 mm Hg (on room air)	PvO_2 = 40 mm Hg
	SaO_2 = > 95 %	SvO_2 = 60 - 80 %
	pH = 7.35 - 7.45	pH = 7.36
	$PaCO_2$ = 35 - 45 mm Hg	$PvCO_2$ = 40 - 50 mm Hg
	HCO_3 = 22 - 26 mEq/L	HCO_3 = 22 - 26 mEq/L

PaO_2

1. PaO_2 is the oxygen dissolved in plasma.
2. At sea level, breathing room air, with a normal $PaCO_2$ & normal lungs, PaO_2 should be 90 - 95 mm Hg. But what should you expect the PaO_2 to be at different altitudes or on a higher FiO_2?
3. How much will dissolve in the plasma depends on:
   a. the use of supplemental oxygen
   b. the barometric air pressure
   c. the patient's $PaCO_2$
   d. the water vapor in the airways
4. Use the alveolar air equation to determine the partial pressure of O_2 dissolved in the Alveoli (PAO_2).

$$PAO_2 = (\text{Barometric pressure} - \text{Water Vapor pressure}) \times FiO_2 - \frac{PaCO_2}{\text{Resp quotient}}$$

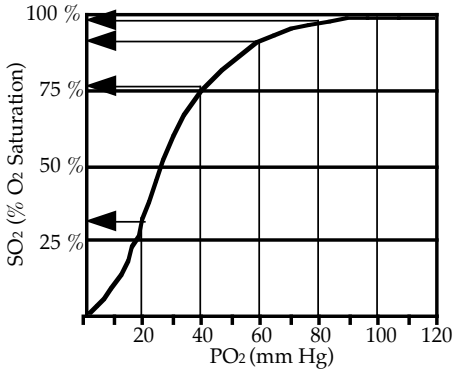
If breathing at sea level (barometric pressure = 760 mm Hg),
and breathing normal room air (FiO_2 = 21 %),
with a normal water vapor pressure (47 mm Hg),
have a normal $PaCO_2$ (45 mm Hg),
and a normal respiratory quotient (0.8),
then PAO_2 = (760 mm Hg - 47 mm Hg) x .21 - 40/.8
PAO_2 = 713 x .21 - 50
PAO_2 = 100 mm Hg

On room air, the PaO_2 should be 5-10 mm Hg below the PAO_2.
On 100 % FiO_2, the PaO_2 should be 50 mm Hg below the PAO_2

5. A quicker way to determine what the PaO_2 should be is to use the "rule of 5." Multiply your patient's FiO_2 by 5 (this is not exact, but it will give you a general idea). For example:
   FiO_2 x 5 = What the PaO_2 should be
   70 % x 5 = 350 mm Hg

SaO_2

1. SaO_2 is the percentage of hemoglobin that is saturated with O_2
2. How saturated the hemoglobin will be with oxygen depends on:
   a. The PaO_2 in the pulmonary capillary
   b. The affinity of hemoglobin for oxygen.
      The affinity is ↑ by: hypothermia, alkalosis, ↓ 2,3 DPG
      The affinity is ↓ by: hyperthermia, acidosis, ↑ $PaCO_2$
   c. The oxyhemoglobin curve describes:
      How a low PaO_2 will result in a low SaO_2.
      How a falling capillary PO_2 will prompt hemoglobin to desaturate as blood flows through the tissues.



If PO_2 is:	Then SO_2 will be:
100 mm	99 %
90	97 %
80	95 %
70	93 %
60	90 %
50	85 %
40	75 %
30	60 %
20	35 %
10	10 %