Respiratory System – I

Partial pressures of gases

1. All of the air on earth is ~21% oxygen, ~79% nitrogen, and less than 1% carbon dioxide. In any given place on earth, we can figure out the *partial pressure* of a gas by multiplying its percentage by the total atmospheric pressure at that elevation. **Try this on your whiteboard.**

ATM pressure	PO_2	PCO_2	PN_2
760 (sea level, ~ Sacramento)			
649 (Lake Tahoe)			
295 (Mt. Kilimanjaro)			

BUT, that is just the amount in the surrounding air. We are usually more concerned with how much is in the alveoli (air sacs). As the air enters your lungs, it takes on some moisture (water) from your airways, and it also mixes with "old" air within the alveoli….this will drop the PO_2 and increase the PCO_2. (Note: we won't discuss PN_2 any more, as it's normally inert).

2. We know that at sea level (normal conditions), the PO_2 in the alveoli will be a constant 100 mm Hg; PCO_2 will be 40 mm Hg. This assumes normal breathing, with higher levels of oxygen coming in with each breath, and oxygen constantly leaking into the capillaries. **Draw an alveolus on your whiteboard, showing the normal values for oxygen and carbon dioxide.**

Then, **draw a capillary near your alveolus, and indicate the values of PO_2 and PCO_2 in the pulmonary capillary.** *Which values below should be at the beginning of the capillary, and which should be at the end?* **Place them on your drawing, and indicate how gases are moving.**

PO_2 = 100 mm Hg PO_2 = 40 mm Hg PCO_2 = 40 mm Hg PO_2 = 46 mm Hg

3. What causes the gases to move in either direction?

4. What could you do (medically) to increase the movement of oxygen into blood?

5. Go back to your first table. 649 (Lake Tahoe) is 85% of 760. So, what is the PO_2 in the alveoli at Lake Tahoe? What kind of an effect might this have on someone?