



Gas Transfer

(Diffusion of O₂ and CO₂)

OBJECTIVES

- Define partial pressure of a gas, how is influenced by altitude.
- Understand Dalton's Law
- Understand Henry's Law
- Describe the factors that determine the concentration of a gas in a liquid.
- Describe the components of the alveolar-capillary membrane (i.e., what does a molecule of gas pass through)
- Knew the various factors determining gas transfer
- State the partial pressures of oxygen and carbon dioxide in the atmosphere, alveolar gas, at the end of the pulmonary capillary, in systemic capillaries, and at the beginning of a pulmonary capillary

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COLOR INDEX:

- **Red = important**
- Grey = additional notes

After ventilation of the alveoli with fresh air the next step is the **DIFFUSION** process of O₂ and CO₂

The rate of diffusion of each gas is directly proportional to the partial pressure of the gas

1-PARTIAL PRESSURE :

Is defined as the Pressure caused by one gas alone , due to constant impact of kinetically moving molecules against surface.

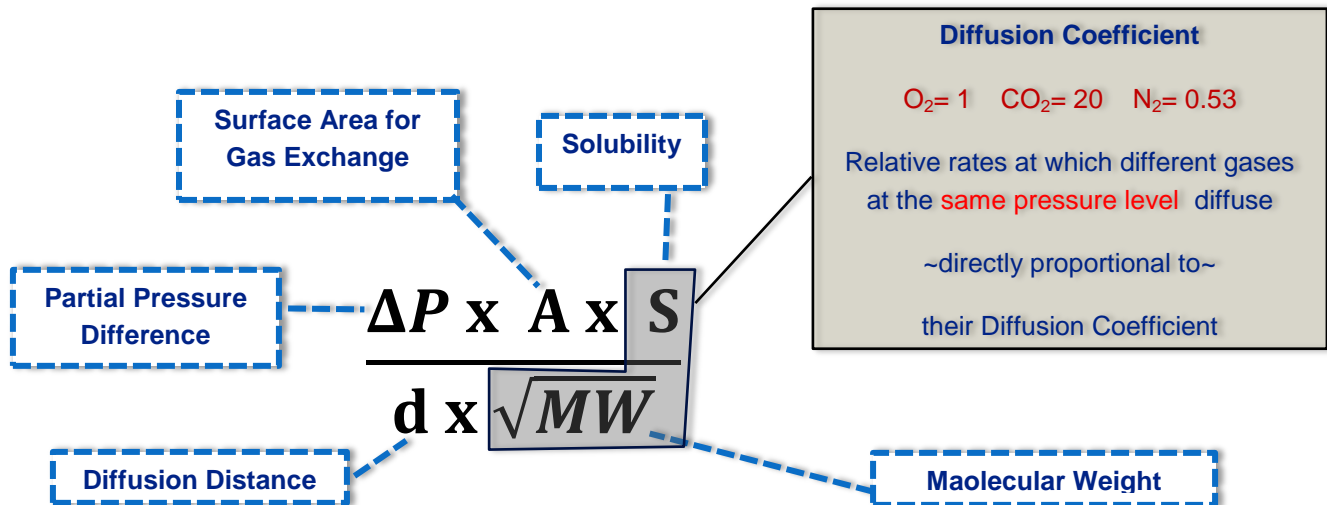


Dalton's law : the pressure exerted by each gas in a mixture of gases is dependent of the pressure exerted by the other Gases



Henry's law : gases in a liquid diffuse from higher partial pressure to lower partial pressure

2-FACTORS AFFECTING GAS DIFFUSION :





N.B

- O₂ has lower MW than CO₂
- CO₂ is 24 times more soluble than O₂

Net Result: CO₂ diffusion *approx. 20 times faster* than O₂

3-O₂ AND CO₂ CONCENTRATION IN ALVEOLI :

OXYGEN	 Resting	 Exercising
Entering pulmonary capillaries/min	250 ml/min	1000 ml/min
Ventilatory rate	4.2 L/min	16.8 L/min (increased 4 times to maintain alveolar PO ₂ = 104 mmHg)

CARBON DIOXIDE (normal):

- Rate of excretion= 200 ml/min
- Alveolar ventilation= 4.2 L/min

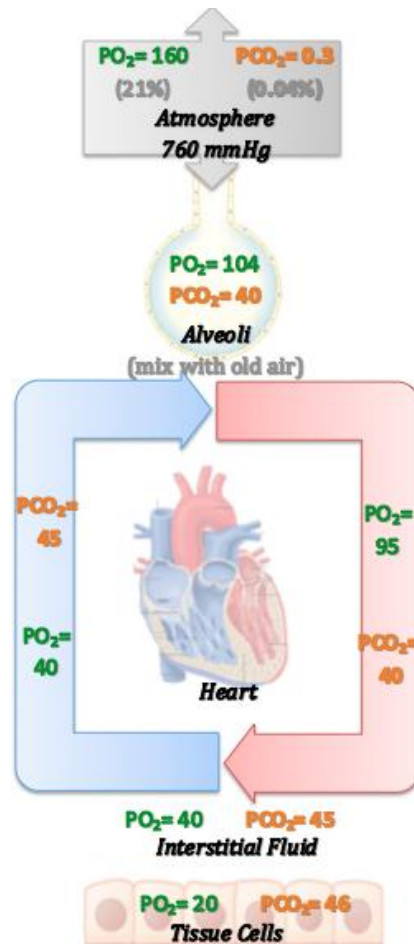
4-PARTIAL PRESSURE OF O₂ AND CO₂ (IN MMHG) :

PO₂ in atmosphere :

$$21\% * 760 \text{ mmHg} = 160 \text{ mmHg}$$

PCO₂ in atmosphere :

$$0.04\% * 760 \text{ mmHg} = 0.3 \text{ mmHg}$$





Gas Exchange



Gas Exchange During Respiration

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