

Respiratory Dynamics

(Text Pg 125 - 126)

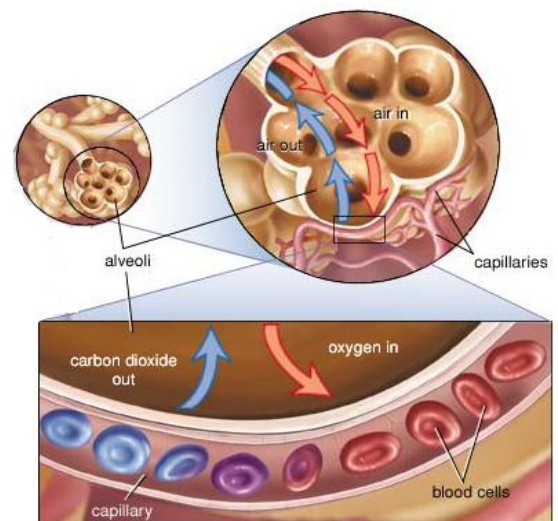
Mechanisms of Breathing

Inhalation	Exhalation
<ul style="list-style-type: none">• Active process• Diaphragm contracts (moves down).• Intercostals contract pushing the ribs up.• Volume of chest cavity ↑'s.• Pressure ↓'s in the lungs• $P_{out} > P_{in}$• Air rushes in.• Alveoli fill with air.	<ul style="list-style-type: none">• Passive or forced process• Diaphragm relaxes.• Intercostals relax.• Volume of chest cavity ↓'s.• Pressure ↑'s in the lungs• $P_{in} > P_{out}$• Air rushes out.• Alveoli recoil and empty.

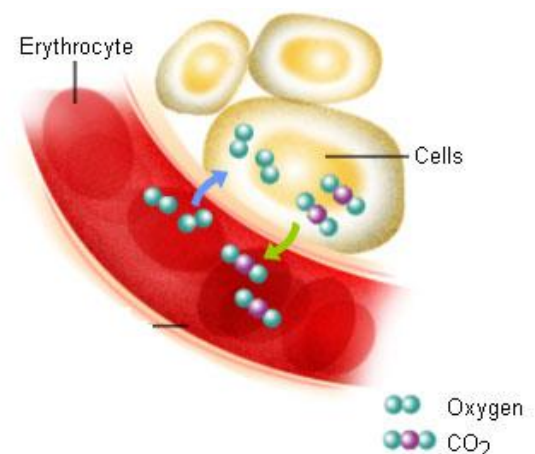
External Vs Internal Respiration

Two main types of respiration (movement of gasses) that occur in the body that occur in distinct locations.

- **External Respiration:**
 - The gas exchange that occurs at the **lungs**.
 - Getting the gasses **in and out of the body!**
 - O_2 enters body (alveoli → blood)
 - CO_2 leaves the body (blood → alveoli)



- **Internal Respiration:**
 - The gas exchange that occurs at the **tissue level**
 - Getting the gasses **in and out of our cells**.
 - O_2 is delivered (blood → tissue)
 - CO_2 is removed (tissue → blood)



How do we know how hard we are breathing?

- Pulmonary Ventilation (V_E)
 - Volume of air moved by lungs in one minute (L/min)

$$V_E = V_T \times F$$

- V_T = Tidal Volume: Volume/breath (L)
- F = Frequency: Breaths/minute

Typical V_E Values

- **Resting V_E** ~ 6L/min (V_T ~0.5 & F ~12)
- **Exercise V_E** ~100-200 L/min (V_T ~3-4 & F ~30-40)

Pulmonary Ventilation (V_E) and Workrate

- V_E Adjusts rapidly to changes in WR and is closely matched to exercise intensity (WR).
- This ensures sufficient gas exchange rates (i.e. maintains PO_2 & PCO_2 in lungs and at tissue level). O_2 supply = O_2 demand