

MODULE 7 L07

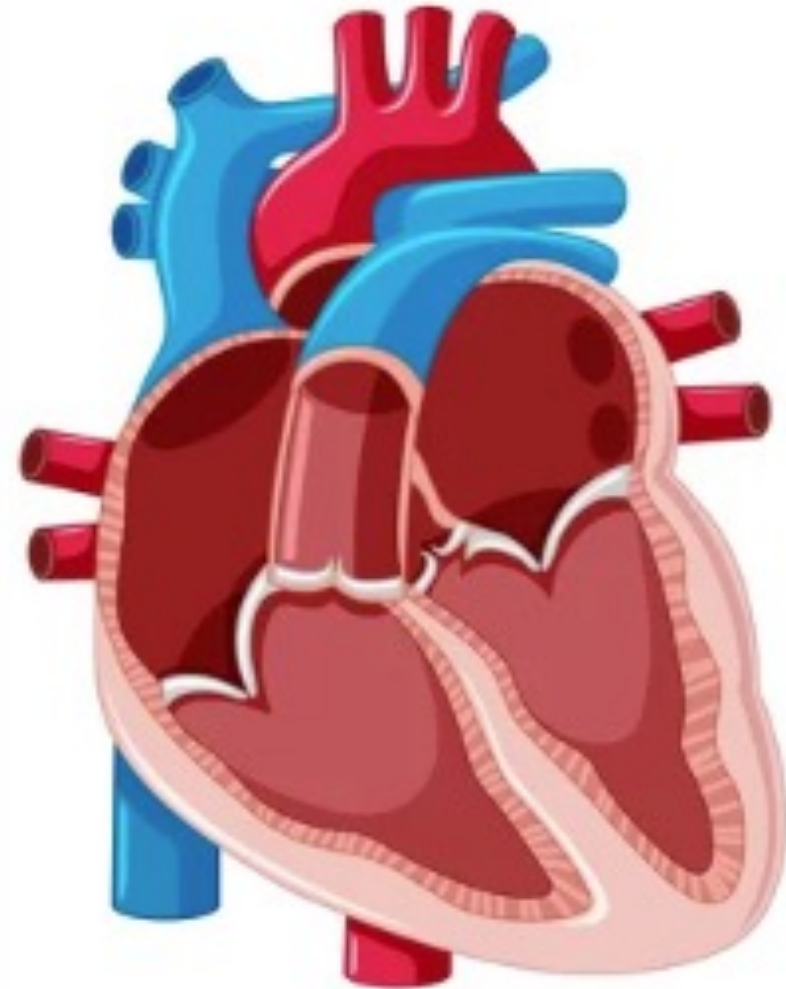
Respiratory System: Ventilation

Dr. Lisa Brinn
lbrinn@fiu.edu



2. Pulmonary Circulation

- High rate of blood flow
 - ❖ Same cardiac output as systemic circuit
- Low resistance
 - ❖ Pulmonary blood vessels:
 - Large diameter
 - Thinner walls
 - More compliant
- Low pressure
 - ❖ Right ventricle pumps less forcefully

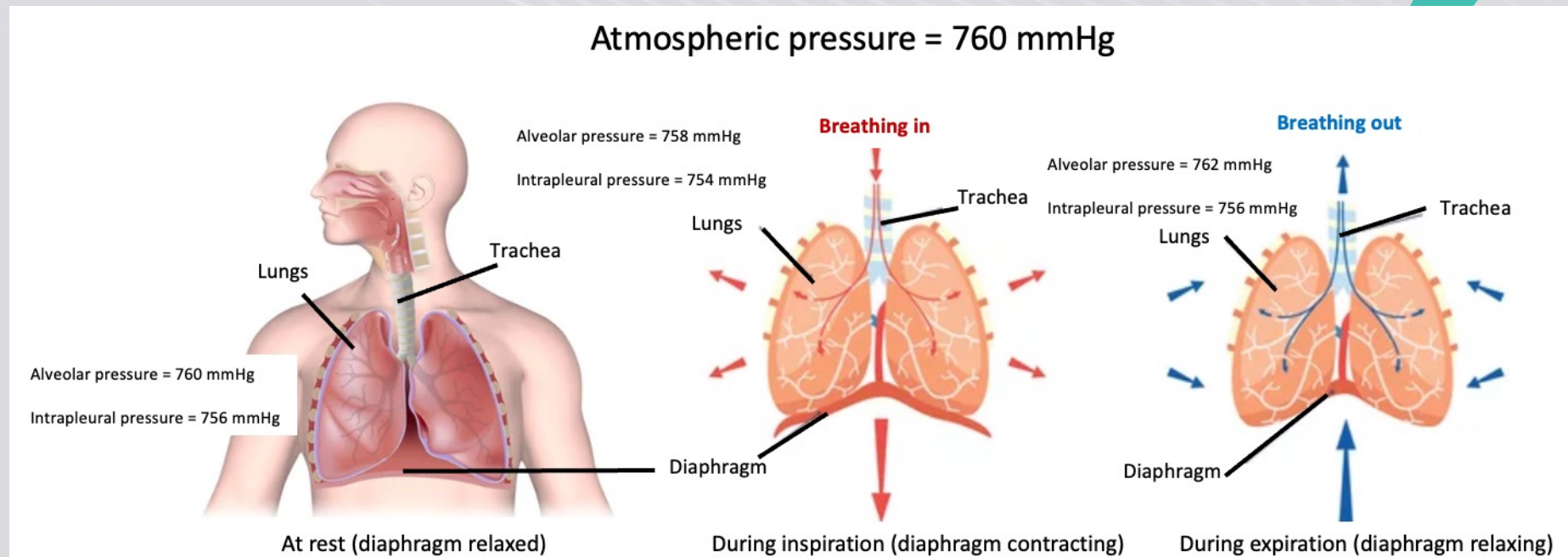


Ventilation

- Same as breathing
- Definition:
 - ❖ Mechanical flow of air into and out of the lungs
- Three pressures are important to ventilation
 1. Atmospheric pressure
 - Pressure of air in atmosphere
 - At sea level = 760 mmHg (1 atmosphere)
 2. Alveolar pressure
 - Pressure of air within alveoli
 - → lungs = alveolar pressure is ↓ atmospheric pressure
 - ← lungs = alveolar pressure is ↑ atmospheric pressure
 3. Intrapleural pressure
 - Pressure within pleural cavity
 - ✓ Pleural cavity has negative pressure
 - Functions as a vacuum

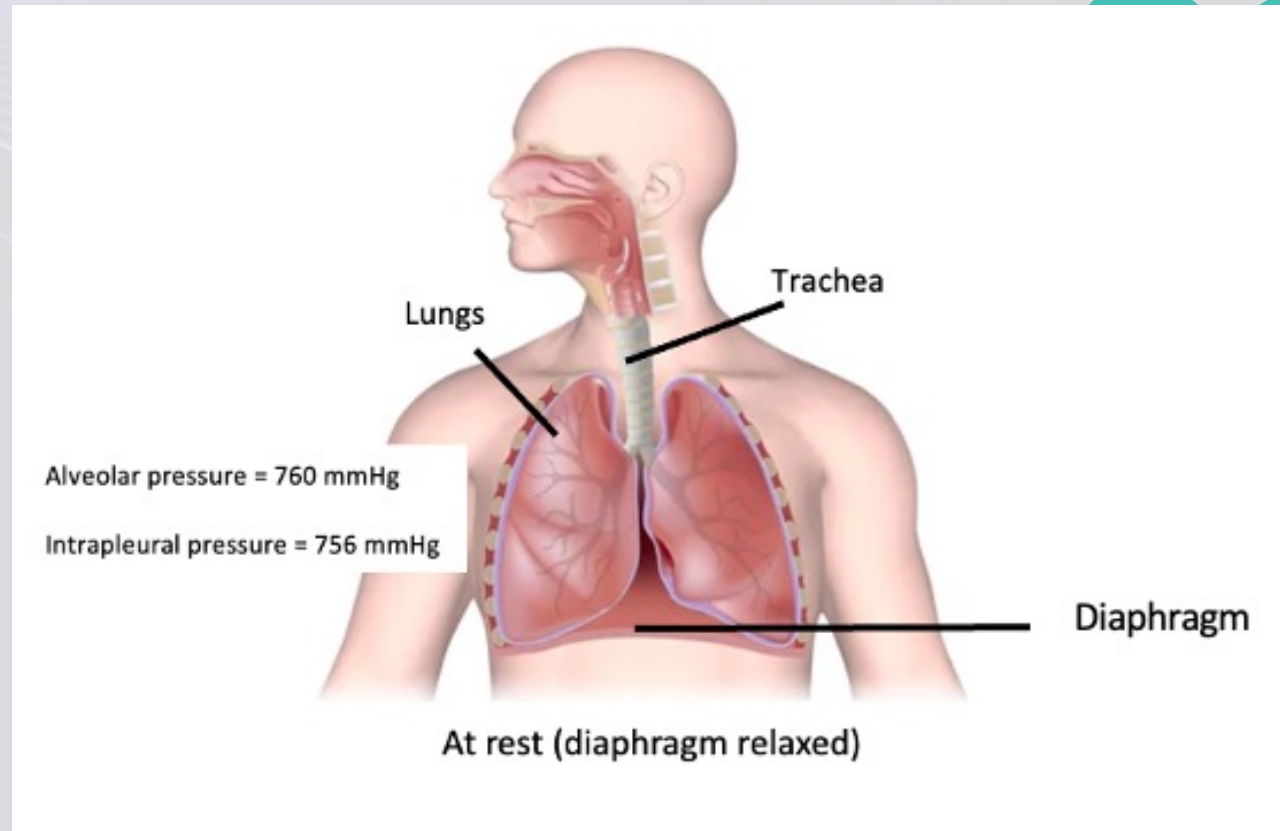
Breathing Cycle

- Phases:
 - A. Rest
 - ❖ Alveolar pressure = atmospheric pressure
 - B. Inspiration
 - ❖ Alveolar pressure < atmospheric pressure
 - C. Expiration
 - ❖ Alveolar pressure > atmospheric pressure



A. At Rest

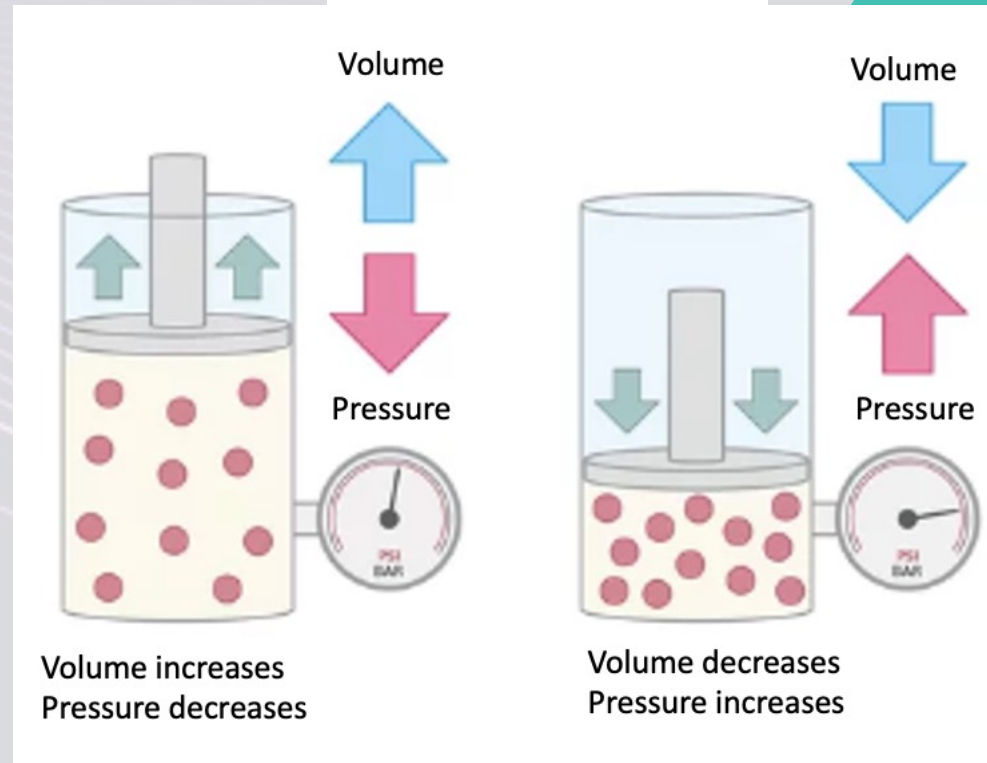
- Pressure gradient non-existent
- Air does not flow in or out of lungs



B. Inspiration

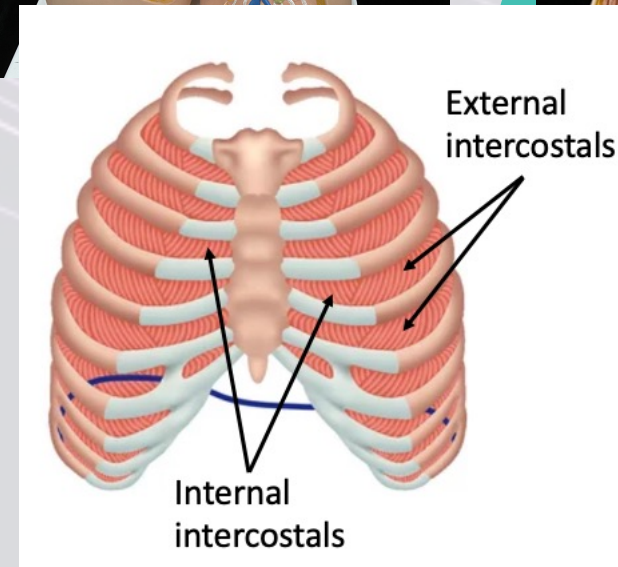
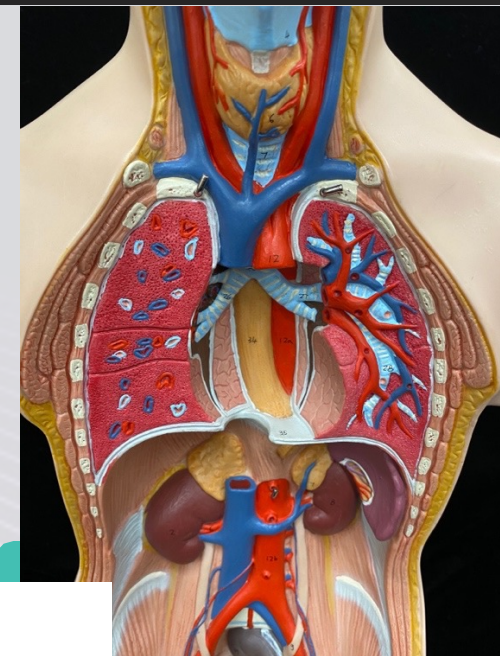
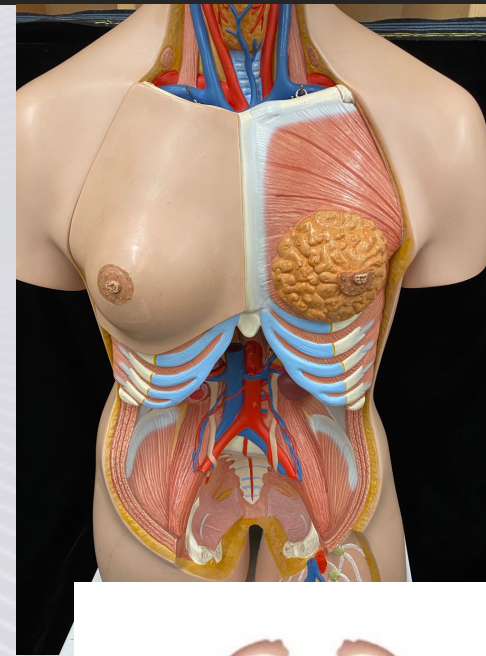
- Condition is achieved by increasing the volume of the lungs
 - ❖ Lungs must expand
 - ↑ lung volume
 - ↓ alveolar pressure below atmospheric pressure

Boyle's Law



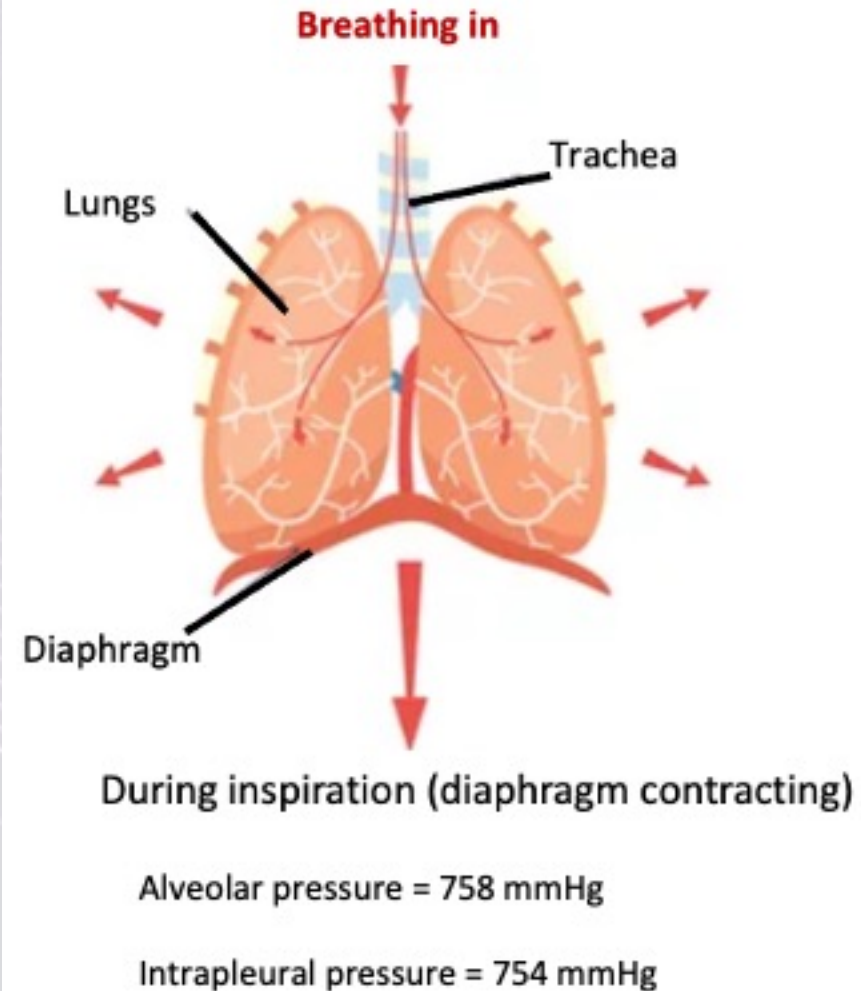
Muscles for Inspiration

- Quiet inspiration involves contraction of:
 - ❖ Diaphragm
 - Phrenic nerve innervation
 - Contraction
 - ↑ thoracic cavity volume
 - ❖ External intercostals
 - ❖ Extend between ribs
 - ❖ Intercostal nerve innervation
 - ❖ Contraction
 - Pull ribs upward and outward
 - ↑ thoracic cavity volume



Inspiration Takes Place

- \uparrow thoracic cavity volume
- \uparrow lung volume
- \downarrow alveolar pressure
 - ❖ $760 \text{ mmHg} \rightarrow 758 \text{ mmHg}$



C. Expiration

- Inspiratory muscles relax

- ❖ Diaphragm – moves \uparrow

- ❖ External intercostals – \downarrow ribs

\downarrow thoracic cavity
volume

\downarrow lung volume

\uparrow alveolar pressure
= 762 mmHg



Air moves from alveoli
to atmosphere

- Active expiration

- ❖ Forceful breathing

- Contraction of accessory muscles

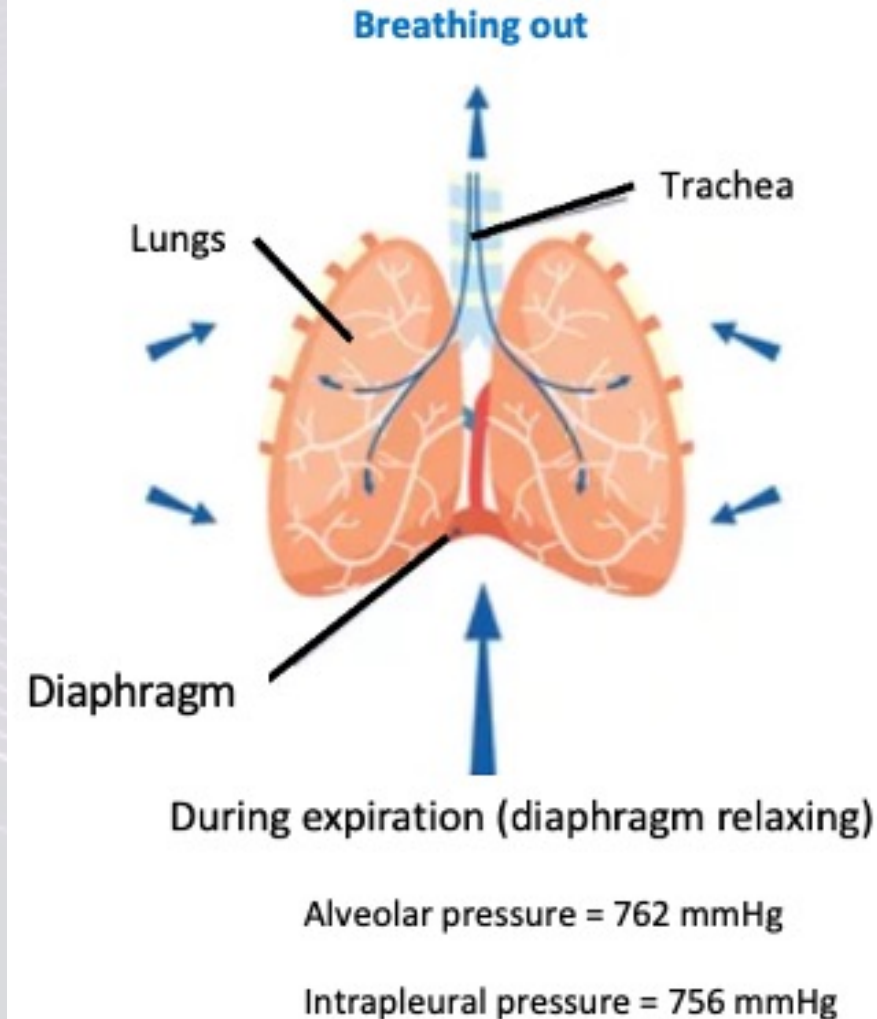
- Rectus abdominis

- External oblique

- Internal oblique

- Transversus abdominis

- Internal intercostals



Accessory Muscles of Inspiration

