

[Video Recording Link](#)

# MODULE 8 L02

# Respiratory System: Ventilation

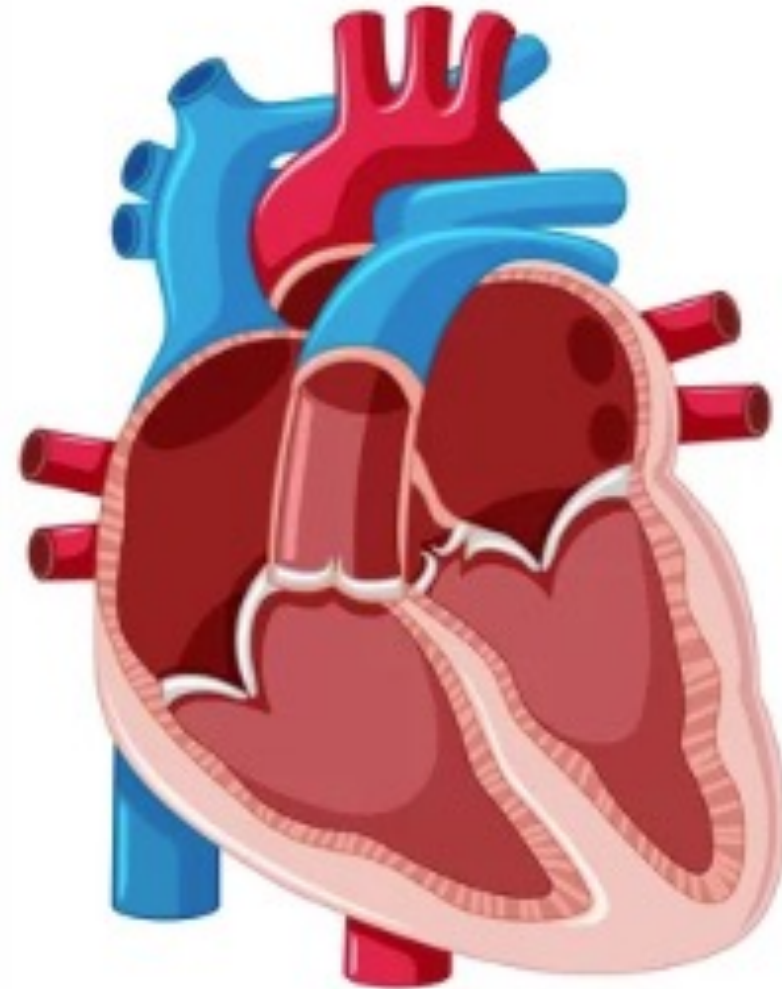
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# 2. Pulmonary Circulation

- 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

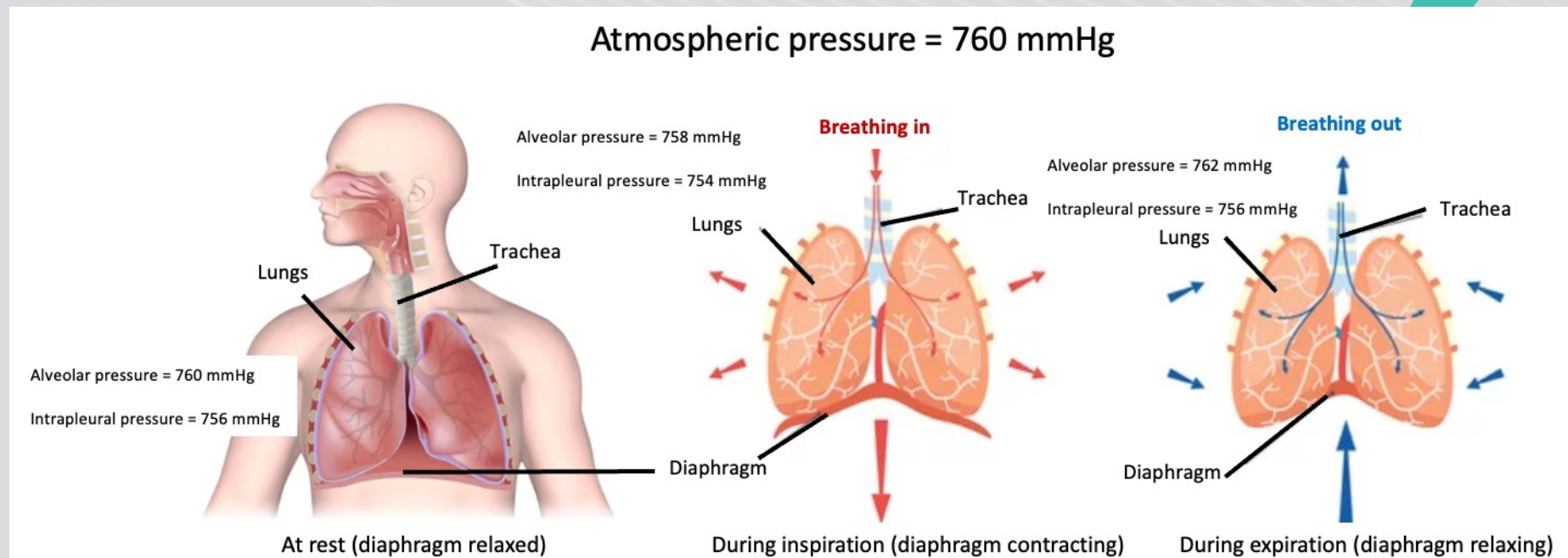


# Ventilation

- 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

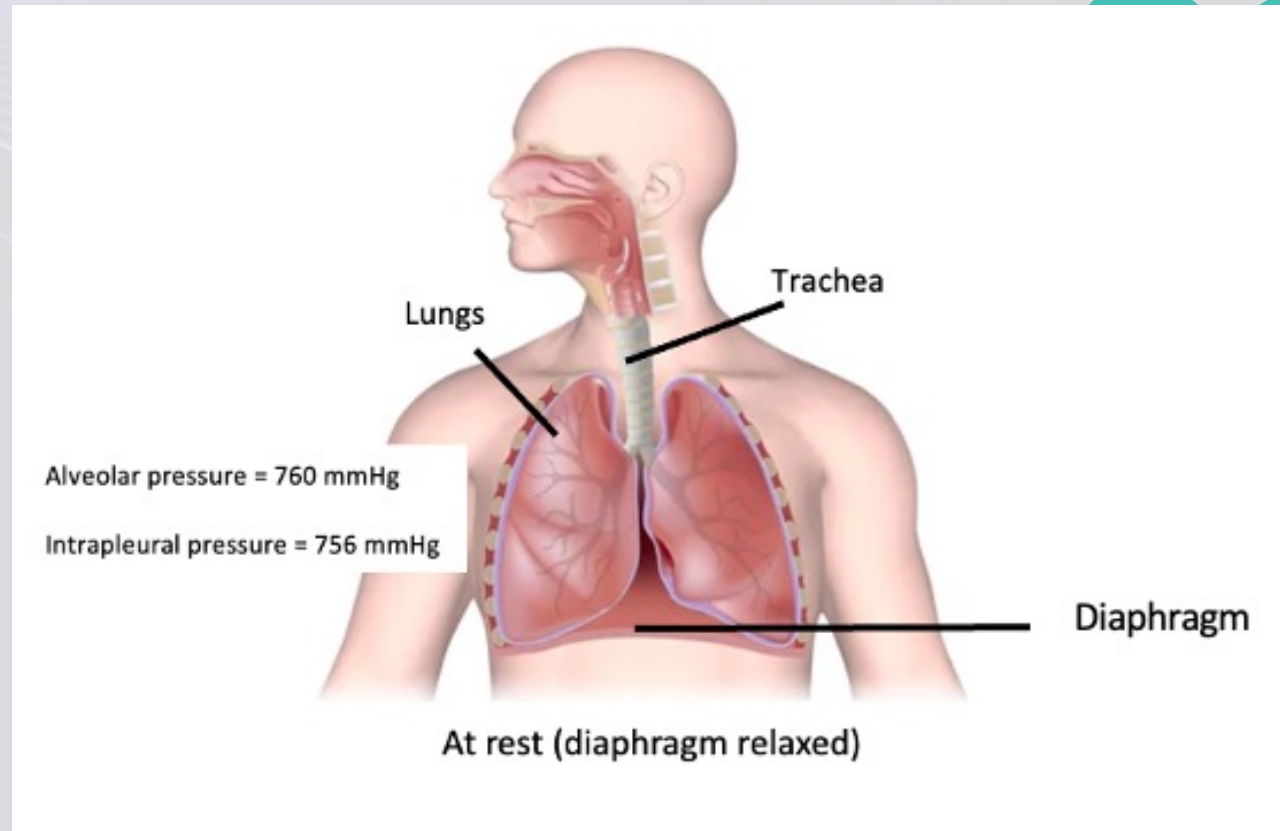
- Phases:
  - A. Rest
    - ❖ Alveolar pressure = atmospheric pressure
  - B. Inspiration
    - ❖ Alveolar pressure < atmospheric pressure
  - C. Expiration
    - ❖ Alveolar pressure > atmospheric pressure





# A. At Rest

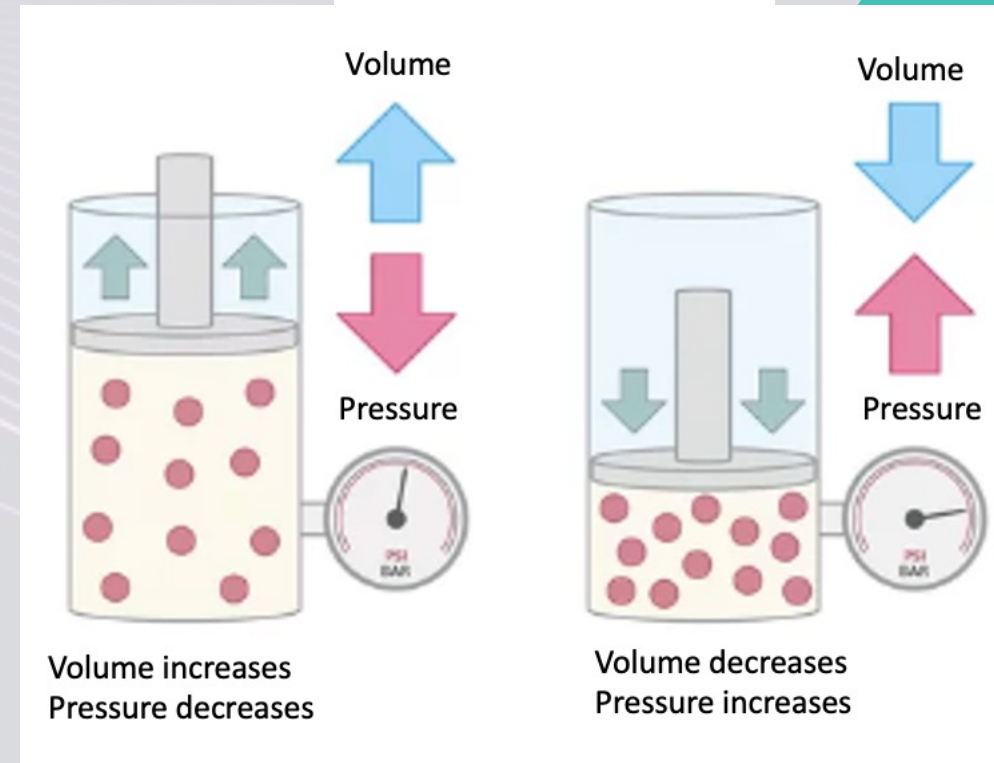
- Pressure gradient non-existent
- Air does not flow in or out of lungs



# B. Inspiration

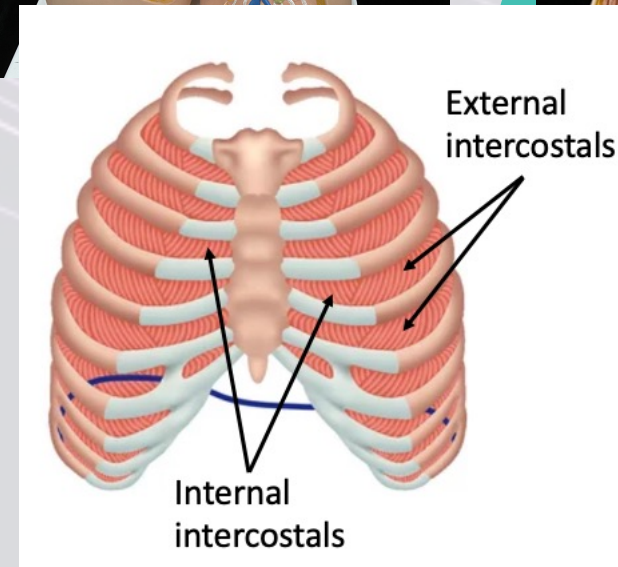
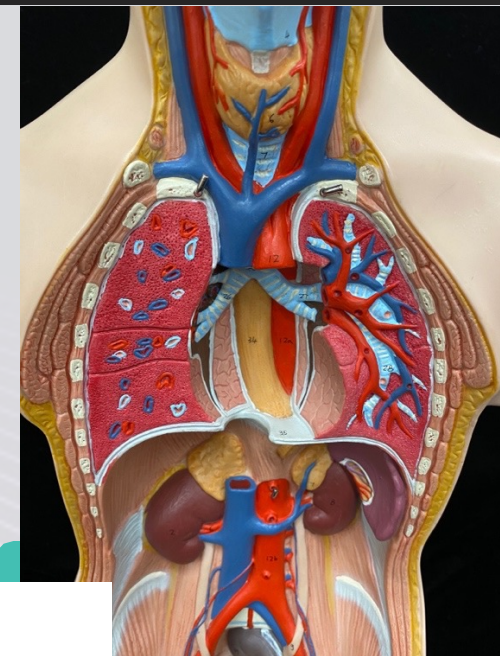
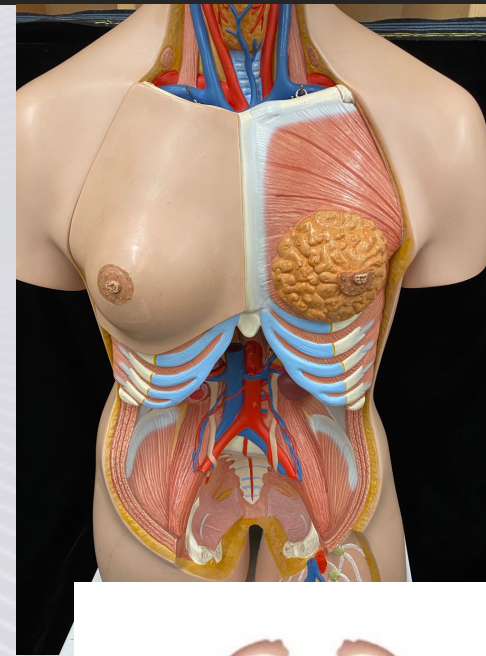
- Condition is achieved by increasing the volume of the lungs
  - ❖ Lungs must expand
    - ↑ lung volume
    - ↓ alveolar pressure below atmospheric pressure

## Boyle's Law



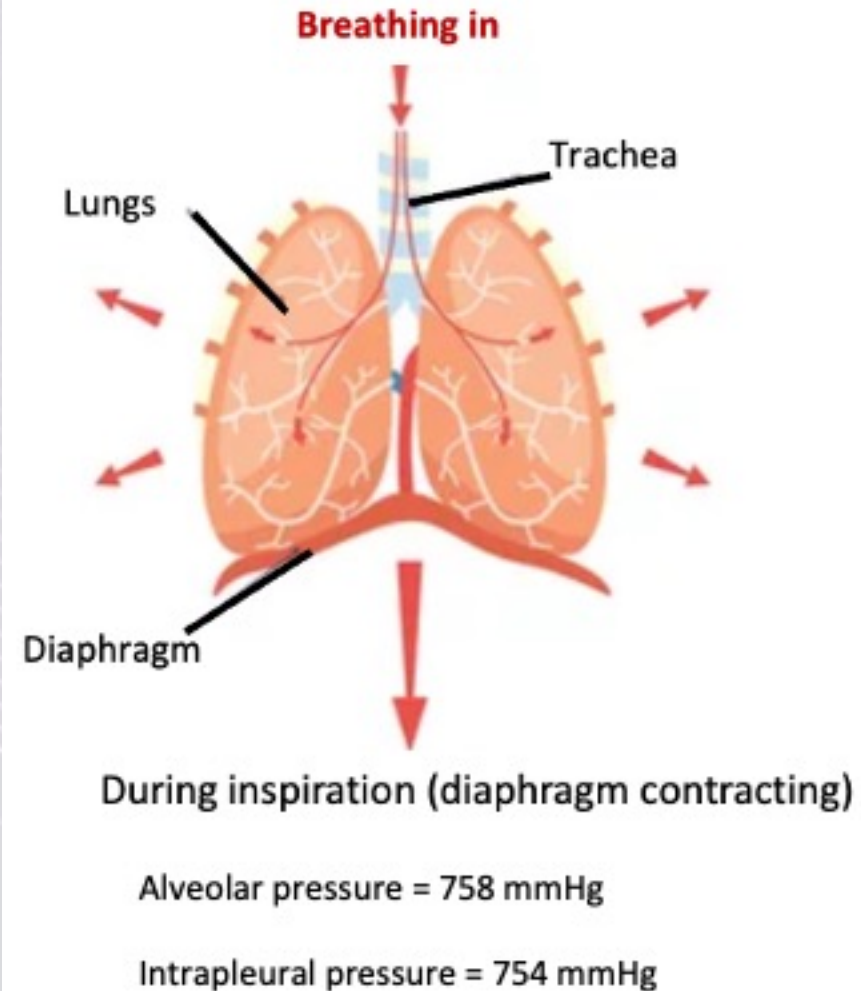
# Muscles for Inspiration

- 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

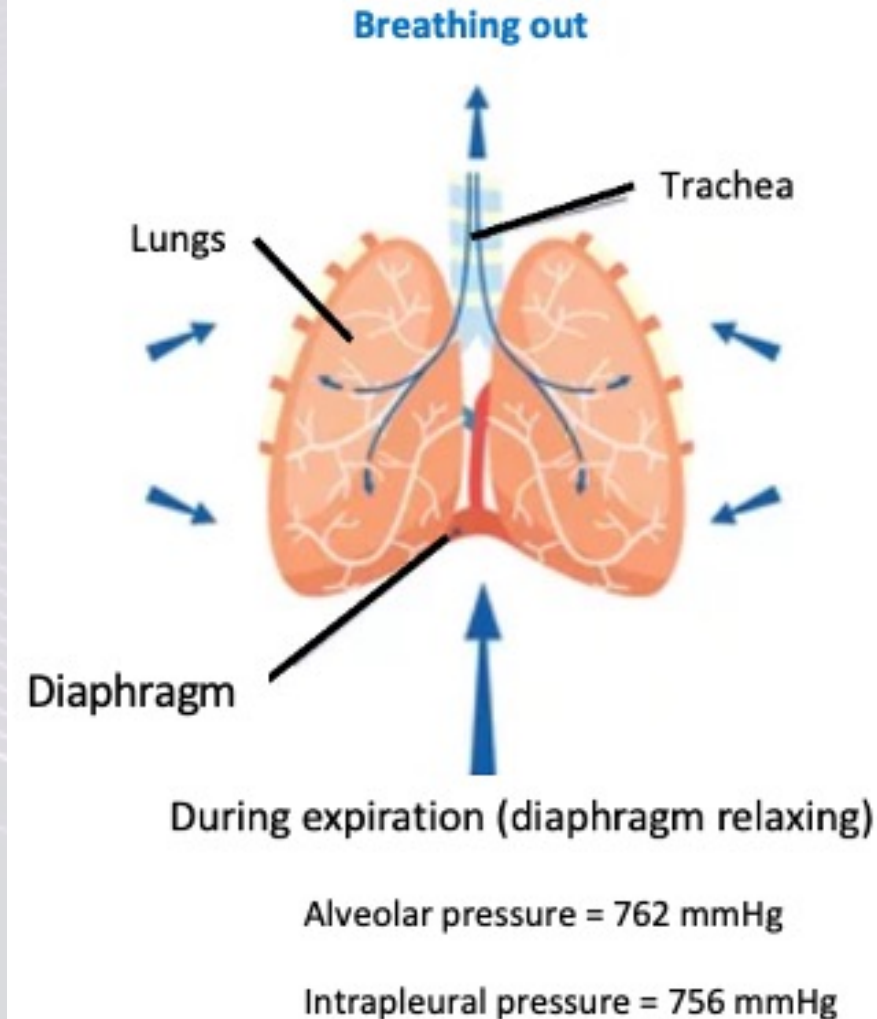
- Rectus abdominis

- External oblique

- Internal oblique

- Transversus abdominis

- Internal intercostals



# Accessory Muscles of Inspiration

