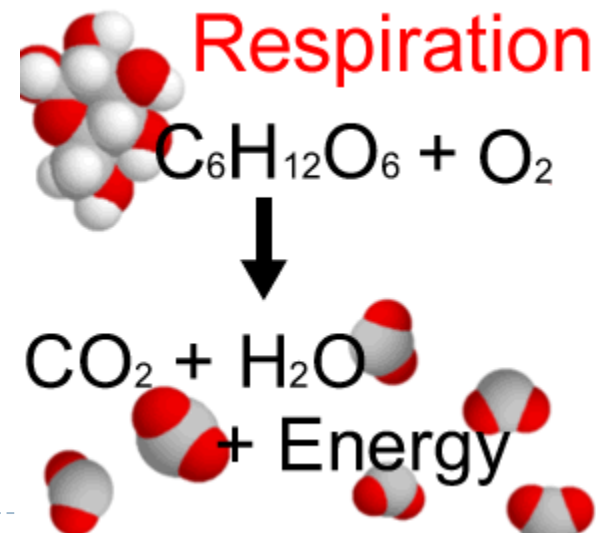




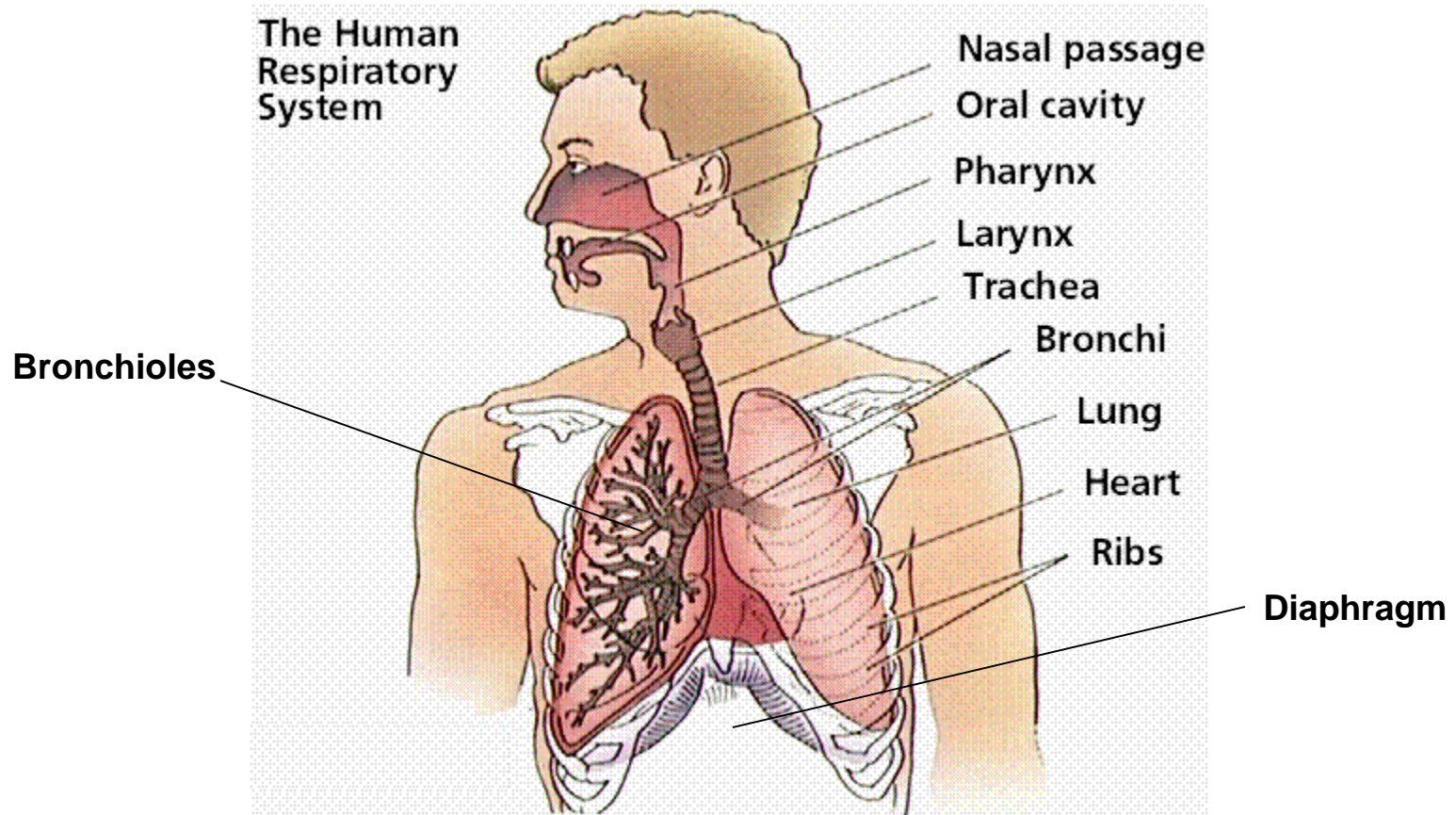
RESPIRATORY SYSTEM

RESPIRATION:

- ▶ Humans take in oxygen and release carbon dioxide in a process called respiration
- ▶ Oxygen then reacts with nutrients in the mitochondria to release energy
- ▶ Unlike food and water, gases cannot be stored in living tissues, therefore, animals must exchange gases with the atmosphere continually



THE RESPIRATORY SYSTEM STRUCTURES:



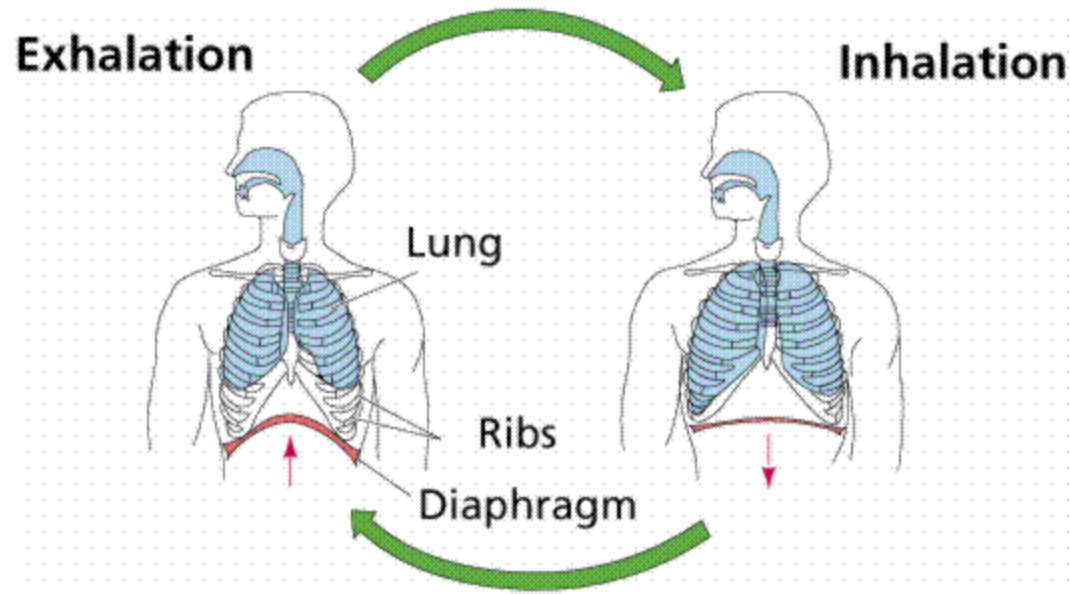
FUNCTIONS:

- ▶ Trachea: windpipe, where air passes from pharynx to lung
 - ▶ Epiglottis: flap that covers the opening of the trachea when swallowing
 - ▶ Larynx: voice box, where vocal cords are
 - ▶ Bronchi: air passages that go from the trachea to the right or left lung (2 bronchi – right and left bronchi)
 - ▶ Bronchioles: branch off the bronchi, small air passages located within and throughout each lung
 - ▶ Goblet cells: cells that produce mucus
 - ▶ Alveoli: air sacs in your lungs in which gas exchange happens between the air and the blood
 - ▶ Pleural membranes: surrounds the lung and lines the inner wall of the chest cavity
 - ▶ Diaphragm: sheet of muscle that separates the organs of the chest cavity from those in abdominal cavity
-



HOW DO WE BREATHE?

- ▶ Two main stages:
 - ▶ Inspiration: inhaling – air moves into the lungs
 - ▶ Expiration: exhaling – air is forced out of lungs



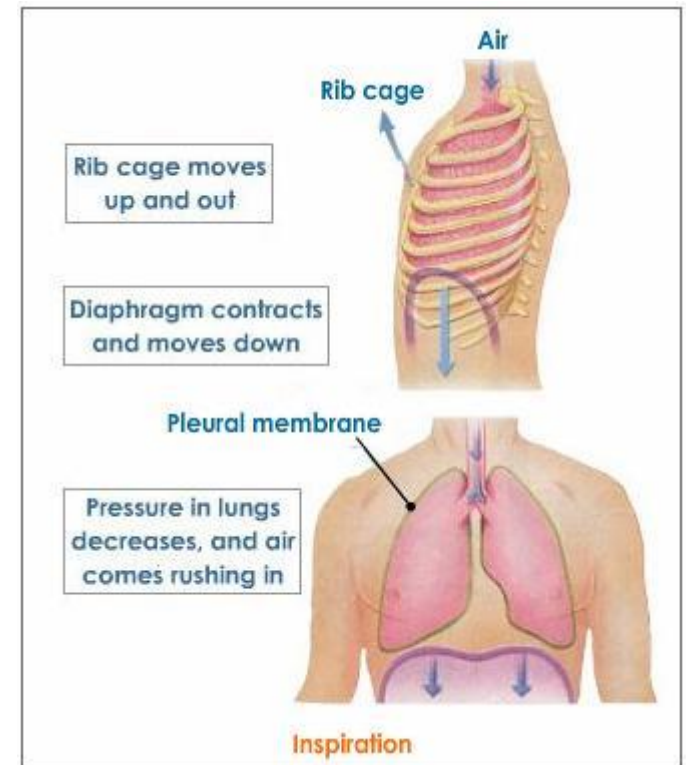
AIR MOVEMENT:

- ▶ Air always moves from high pressure to low pressure
- ▶ Therefore, if air in the lungs is lower pressure than the outside air will move into the lungs
- ▶ If air pressure in lungs is higher than outside, air moves out of lungs
- ▶ How does the body change the pressure in the lungs??



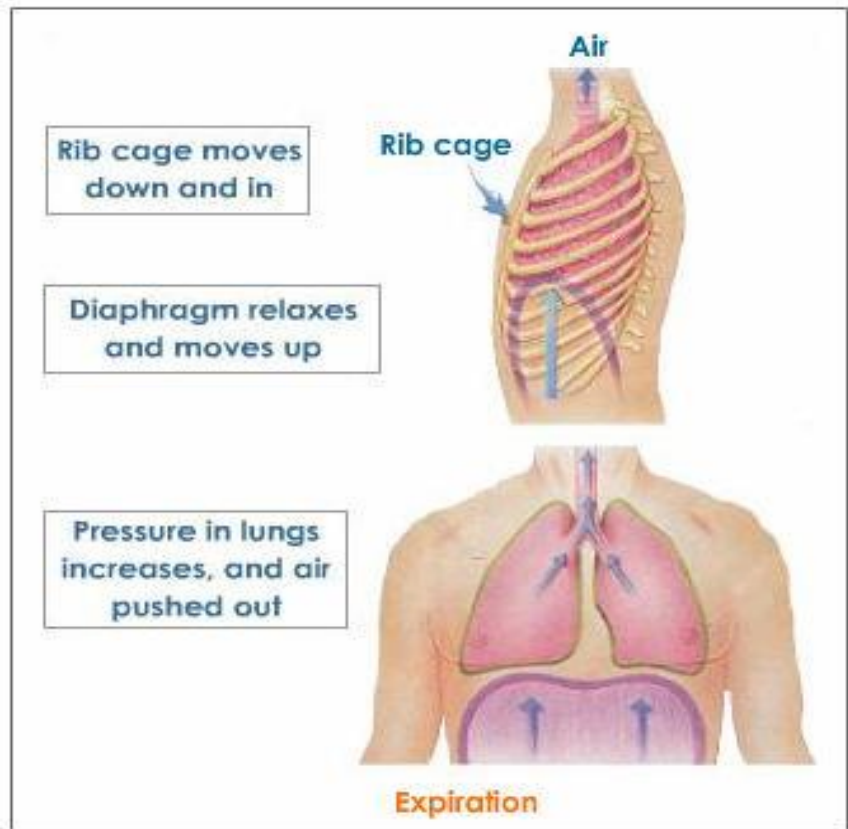
INSPIRATION/INHALING:

- ▶ Diaphragm (muscle) contracts → moves downward
- ▶ Rib muscles contract → rib cage moves up and out
- ▶ **Result:**
 - ▶ Volume of chest cavity increases
 - ▶ Lowers air pressure in the chest
 - ▶ Air moves down trachea into lungs filling extra space



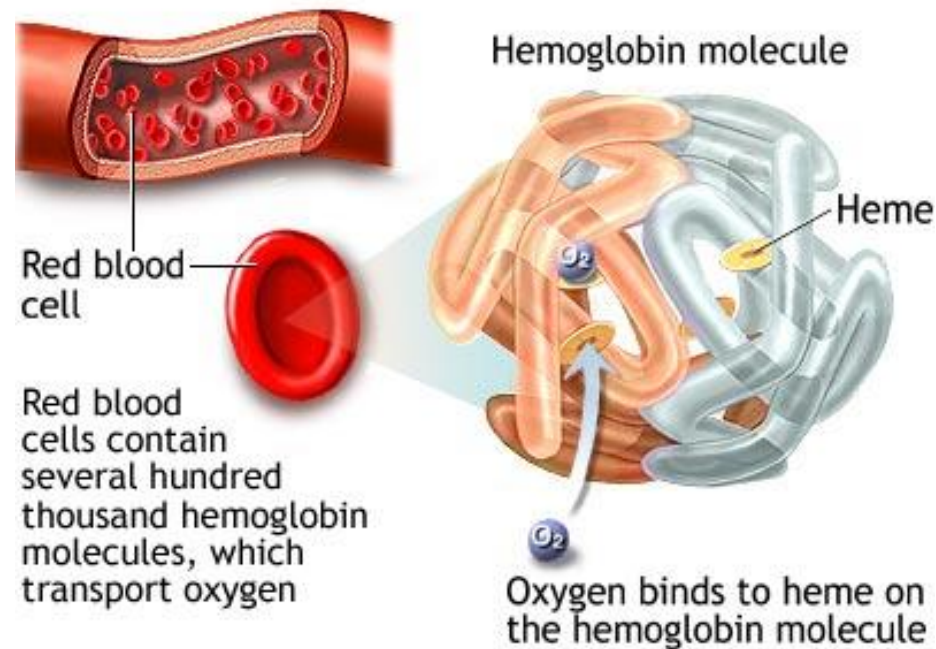
EXPIRATION/EXHALING:

- ▶ Diaphragm relaxes → moves upward
- ▶ Rib cages relaxes → moves inward and down
- ▶ Result:
 - ▶ Decreases volume
 - ▶ Increases pressure in chest
 - ▶ Air moves out of lungs



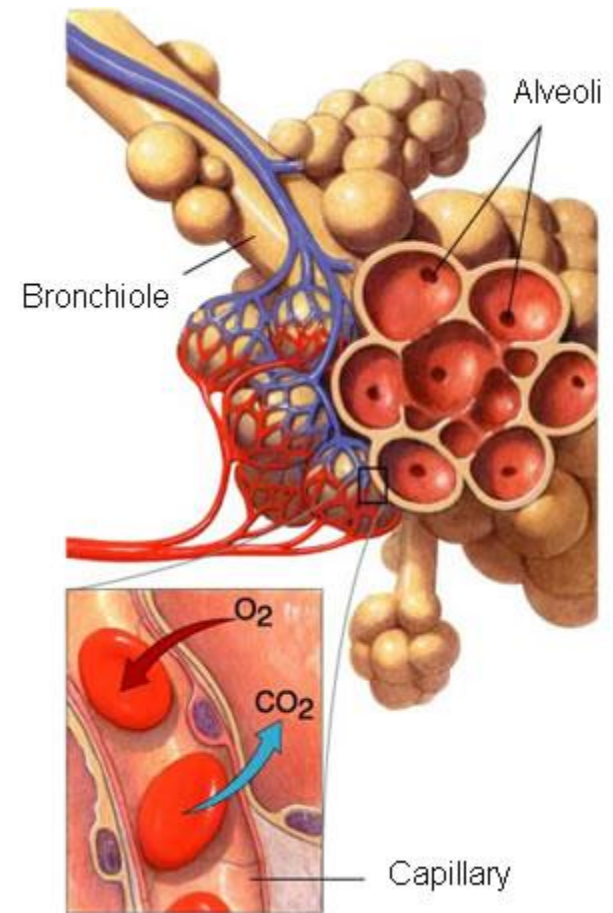
OXYGEN TRANSPORT:

- ▶ Red blood cells contain hemoglobin
- ▶ Hemoglobin contains 4 atoms of iron and each atom binds a molecule of oxygen



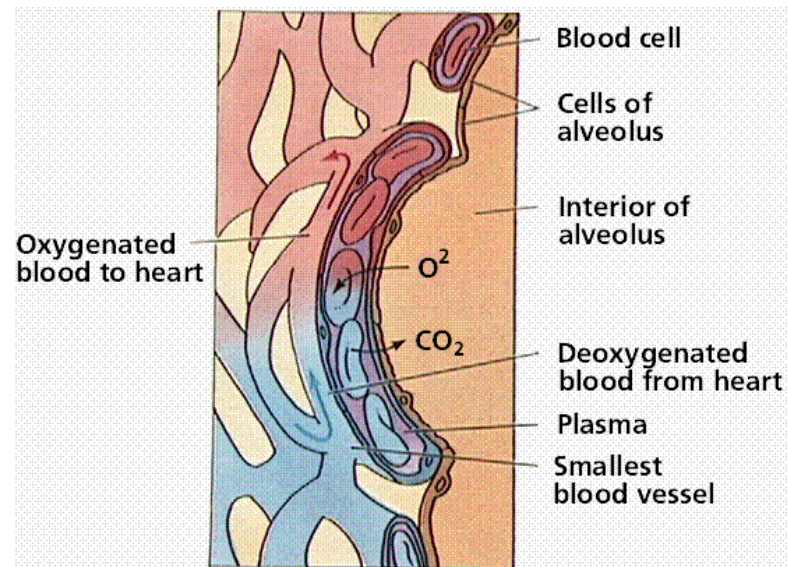
OXYGEN TRANSPORT: AT TISSUES:

- ▶ Oxygen in lungs diffuses from alveoli to red blood cells in capillaries
- ▶ Oxygenated blood travels to the heart
- ▶ Heart pumps blood to tissues
- ▶ Oxygen diffuses from RBC to tissues
- ▶ CO₂ moves from tissues to hemoglobin in RBC



CARBON DIOXIDE TRANSPORT:

- ▶ CO_2 diffuses from tissues and attaches to hemoglobin on RBC
- ▶ Deoxygenated blood travels to the heart
- ▶ Heart pumps blood to the lungs
- ▶ In the lungs CO_2 diffuses from RBC in the capillaries to the alveoli
- ▶ CO_2 is exhaled



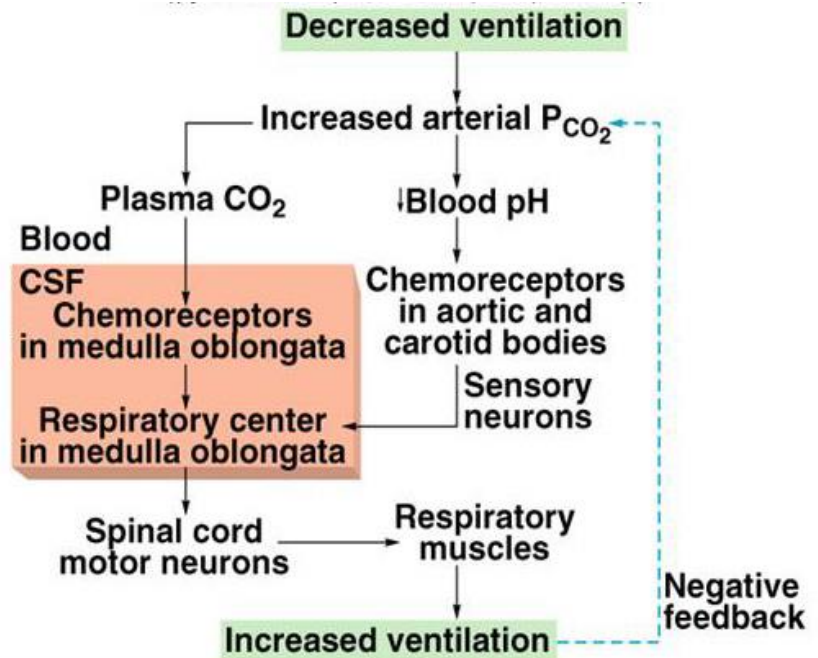
CARBON MONOXIDE:

- ▶ Colourless, odourless, tasteless gas
- ▶ Binds with hemoglobin to replace oxygen, 230x more affinity for hemoglobin compared to oxygen
- ▶ No oxygen is being transported to tissues
- ▶ Symptoms:
 - ▶ Fatigue, headache, nausea, dizziness, hallucinations, death
- ▶ Sources:
 - ▶ Generators, heaters, house fires, faulty furnaces, vehicle exhaust
 - ▶ Generally used in an area with poor ventilation
- ▶ Prevention:
 - ▶ Carbon monoxide detectors
- ▶ Responsible for possible haunted houses....



CONTROLLING BREATHING:

- ▶ Breathing is controlled by nerve impulses from brain
- ▶ Brain does not monitor oxygen levels, only CO₂ levels
- ▶ Greater CO₂ levels in blood → faster breathing
- ▶ Brain sends signals to rib muscles and diaphragm to contract faster or slower



FACTORS THAT AFFECT BREATHING:

- ▶ Exercise
- ▶ Stress
- ▶ Pain
- ▶ Fear



BREATHING IN EXTREMES:

- ▶ **High altitude: less oxygen in air**
 - ▶ Breathing rate increases
 - ▶ Number of red blood cells eventually increases
 - ▶ Mountain climbers carry oxygen tanks
- ▶ **Scuba divers:**
 - ▶ Always carry oxygen
 - ▶ Use regulators to compensate for pressure changes at different depths
 - ▶ Use mixture of nitrogen and oxygen for safety and extend dive time
 - ▶ Pure oxygen deadly when breathed at depths below 7m

