Breathing Mechanism Introduction

Read the box on page 455 about "non-respiratory movements" and complete the following:

1. What are five non-respiratory movements we experience?
2. Describe functioning and purpose of these non-respiratory movements.

Breathing Mechanism Explicit Instruction

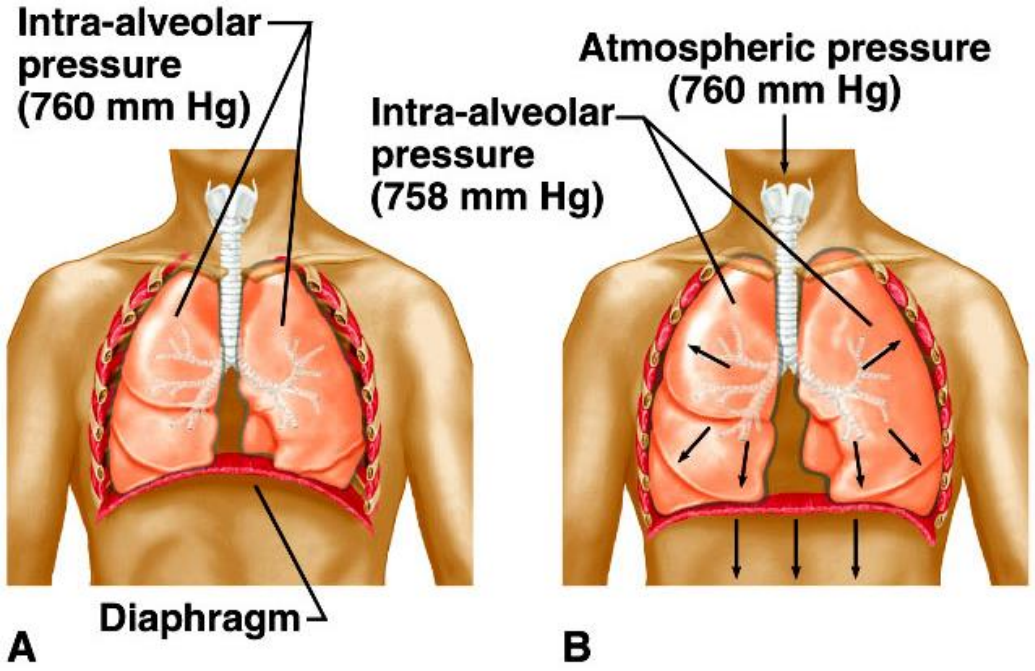
Ventilation (breathing), the movement of air in and out of the lungs, is composed of inspiration and expiration.

During inspiration atmospheric pressure forces air into the lung.

- The diaphragm and external intercostal muscles expand the thoracic cavity, decreasing the air pressure in the lungs by increase the size of the cavity, causing higher pressure air to flow in from the outside.
- Surfactant keeps the alveoli from sticking to each other so they do not collapse when internal air pressure is low.

The forces of expiration are due to the elastic recoil of lung and muscle tissues and from the surface tension within the alveoli.

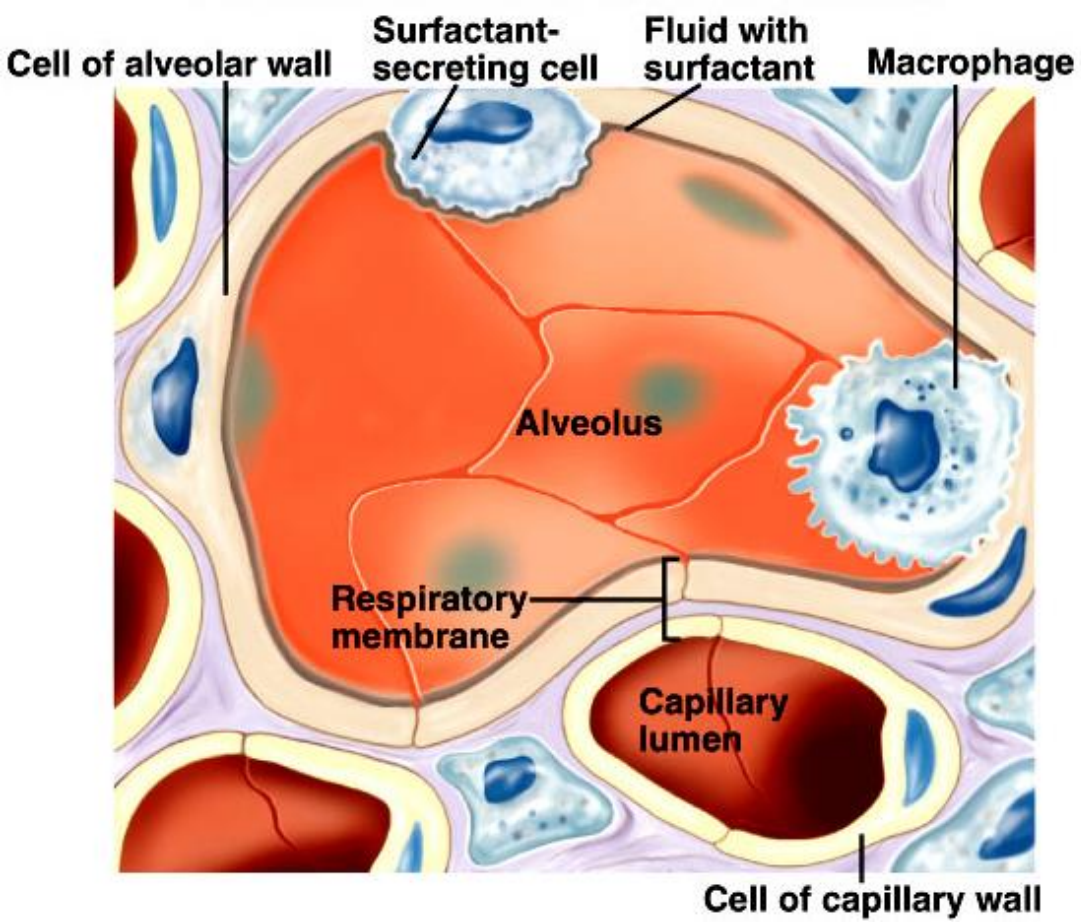
- Forced expiration is aided by thoracic and abdominal wall muscles that compress the abdomen against the diaphragm.



Breathing Mechanism Explicit Instruction

The alveoli are the only sites of gas exchange between the atmosphere and the blood.

- The respiratory membrane consists of the epithelial cells of the alveolus, the endothelial cells of the capillary, and the two fused basement membranes of these layers.
- Gases diffuse across the respiratory membrane from areas of higher pressure to areas of lower pressure.

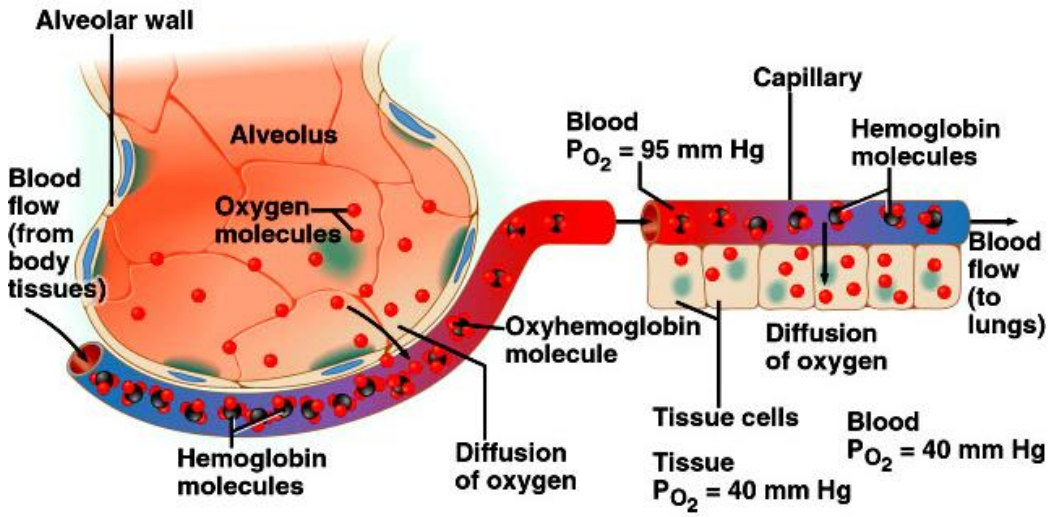


Breathing Mechanism Explicit Instruction

Gases are transported in association with molecules in the blood or dissolved in the plasma.

Over 98% of the oxygen is carried in the blood bound to hemoglobin of red blood cells, producing oxyhemoglobin.

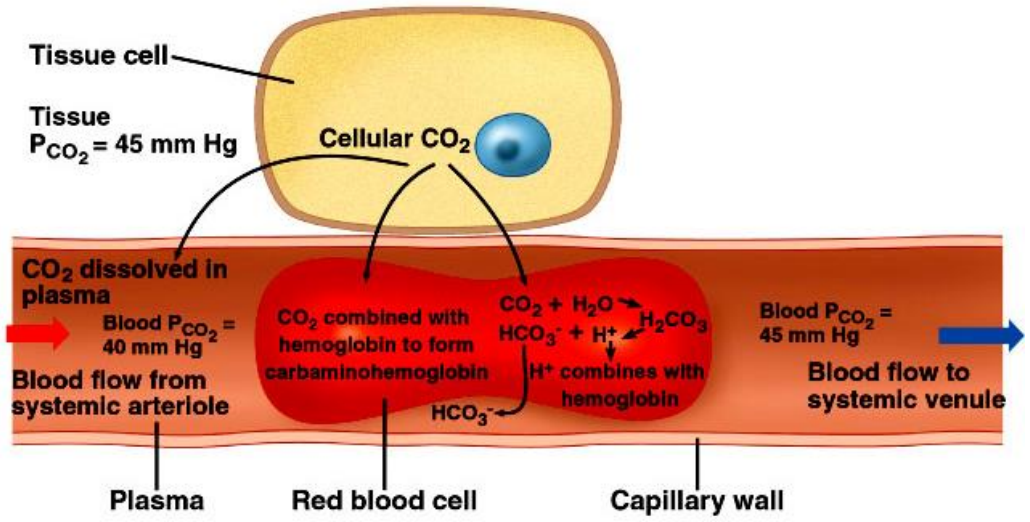
- Oxyhemoglobin is unstable in areas where the concentration of oxygen is low, and gives up its oxygen molecules in those areas.
- More oxygen is released as the blood concentration of carbon dioxide increases, as the blood becomes more acidic, and as blood temperature increases.
- A deficiency of oxygen reaching the tissues is called hypoxia.



Breathing Mechanism Explicit Instruction

Carbon dioxide may be transported dissolved in blood plasma, as carbaminohemoglobin, or as bicarbonate ions.

- Most carbon dioxide is transported in the form of bicarbonate.
  - When carbon dioxide reacts with water in the plasma, carbonic acid is formed slowly, but instead much of the carbon dioxide enters red blood cells, where the enzyme carbonic anhydrase speeds this reaction.
  - The resulting carbonic acid dissociates immediately, releasing bicarbonate and hydrogen ions.
- Carbaminohemoglobin also releases its carbon dioxide which diffuses out of the blood into the alveolar air.



Breathing Mechanism Independent Practice

1. Describe the events of inspiration.
2. Describe the forces behind expiration (both passive and active forces).
3. Explain the force behind the movement of oxygen and carbon dioxide across the respiratory membrane.
4. How is oxygen transported from the lungs to the cells? What stimulates the blood to release oxygen to tissues?
5. How is carbon dioxide transported from the cells to the lungs? What stimulates the blood to release carbon dioxide to the lungs?