

Respiratory System

Corresponding textbook pages: 849–863,
865–867, 871–878, 880

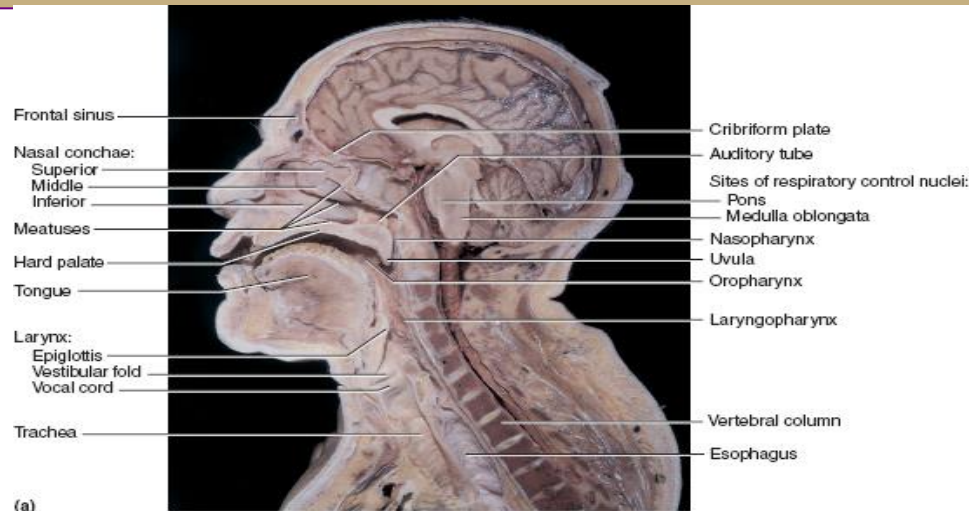


Functions

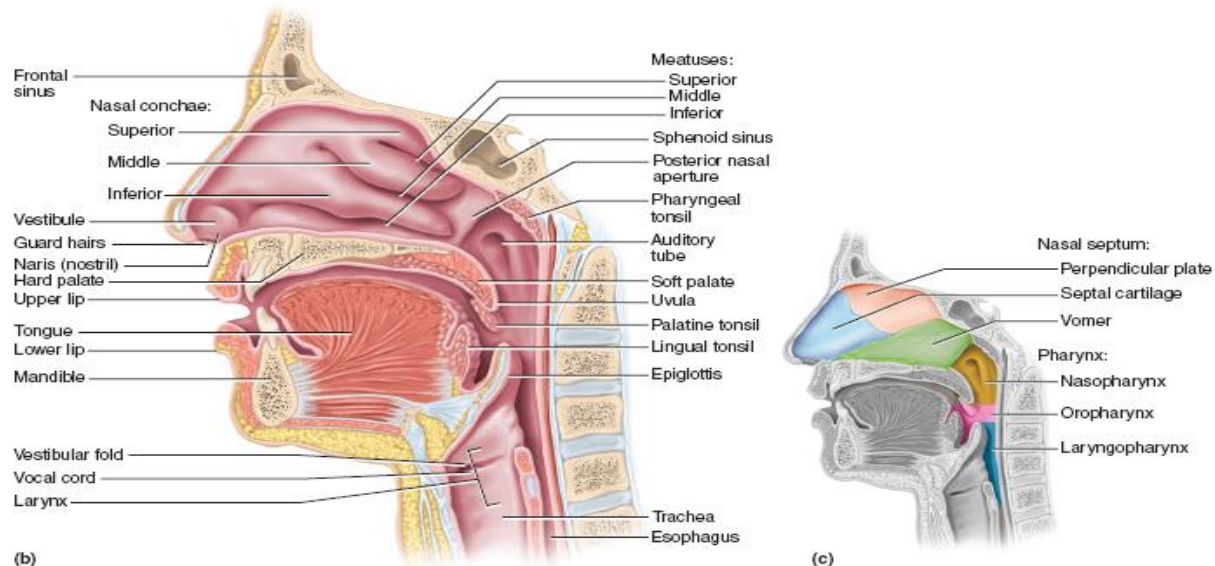
- Gas Exchange
- Speech
- Smell
- pH regulation



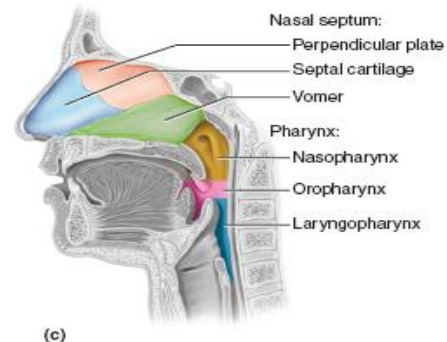
Nose and Nasal Cavity



(a)



(b)



(c)



Pharynx

- Function
- Structure
 - Nasopharynx
 - Oropharynx
 - Laryngopharynx



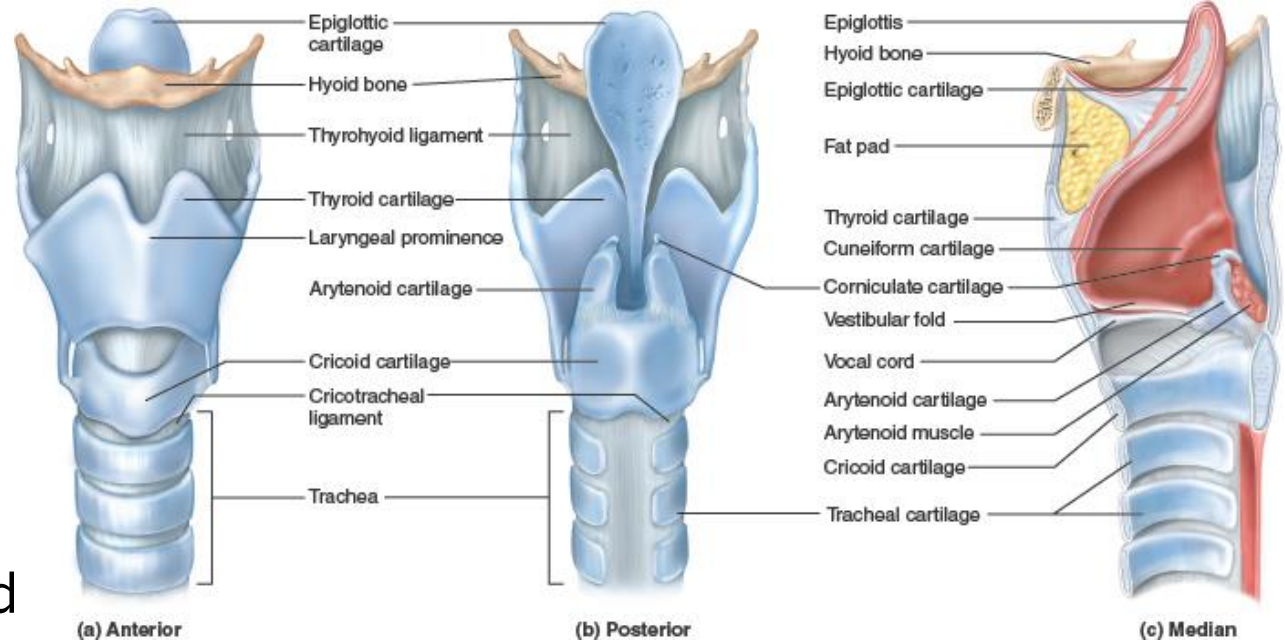
Larynx

- “Voice Box”

- Functions

- Anatomy

- Glottis
- Epiglottis
- Vocal Chord



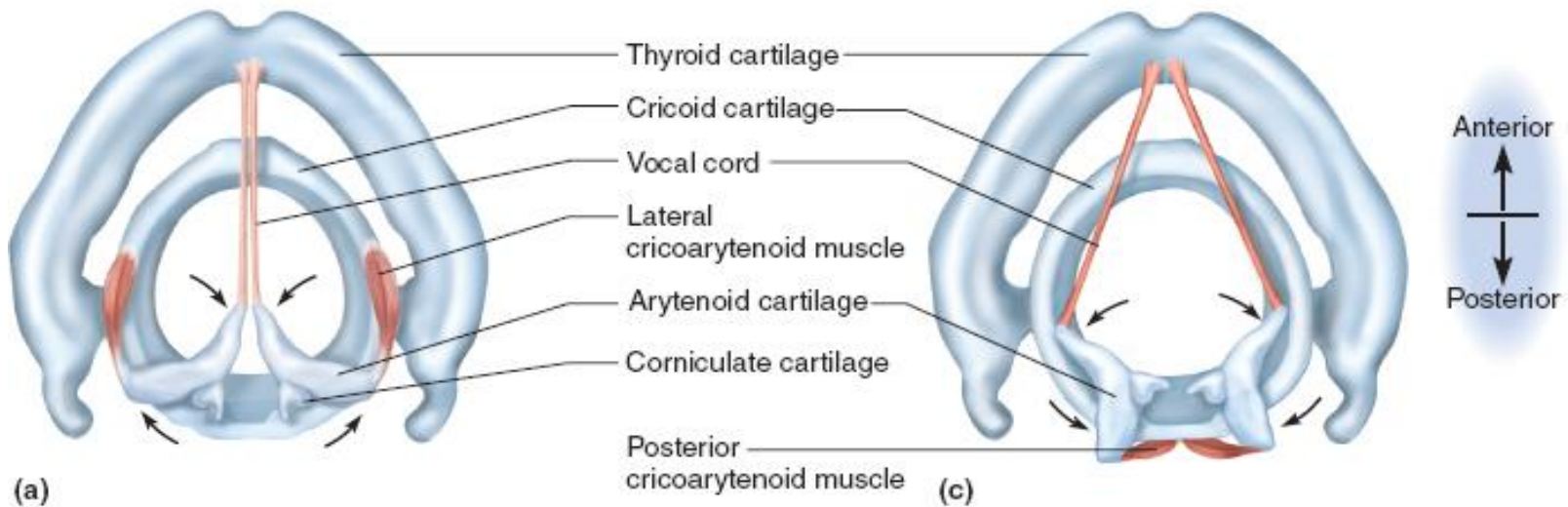
- Sound Production



Vocal Cords

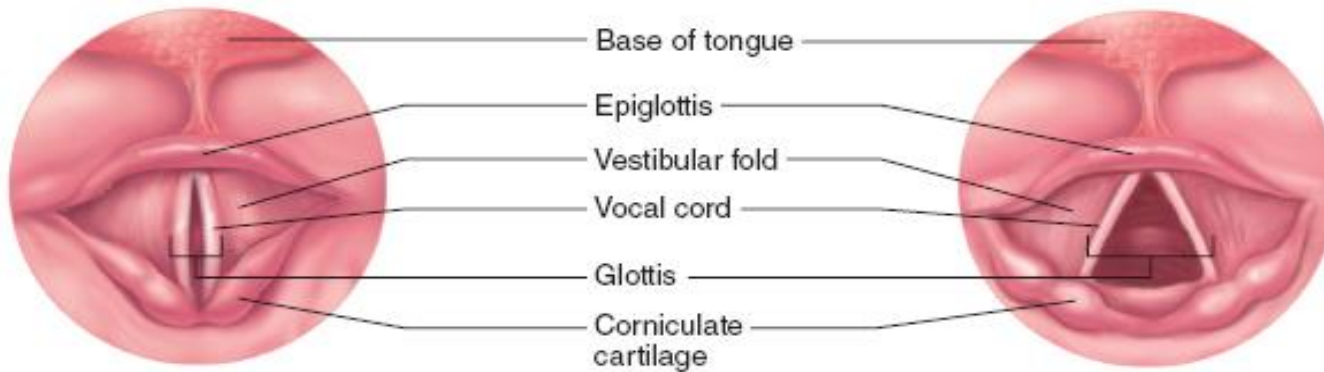
Adduction of vocal cords

Abduction of vocal cords



(a)

(c)



(b)

(d)



Trachea

- “Windpipe”
- C-shaped cartilage rings
- Pseudostratified Columnar Epithelial
- Connection between Larynx and Bronchial Tree



Bronchial Tree

- ▶ Network of highly branched air tubes
- ▶ Lots of elastic cartilage
- ▶ Structures
 - Main Bronchi
 - Lobar Bronchi
 - Segmental Bronchi



Bronchial Tree cont'd

- Terminal Bronchioles
- Respiratory Bronchioles
- Alveolar Ducts
- Alveoli



Lower Respiratory Tract

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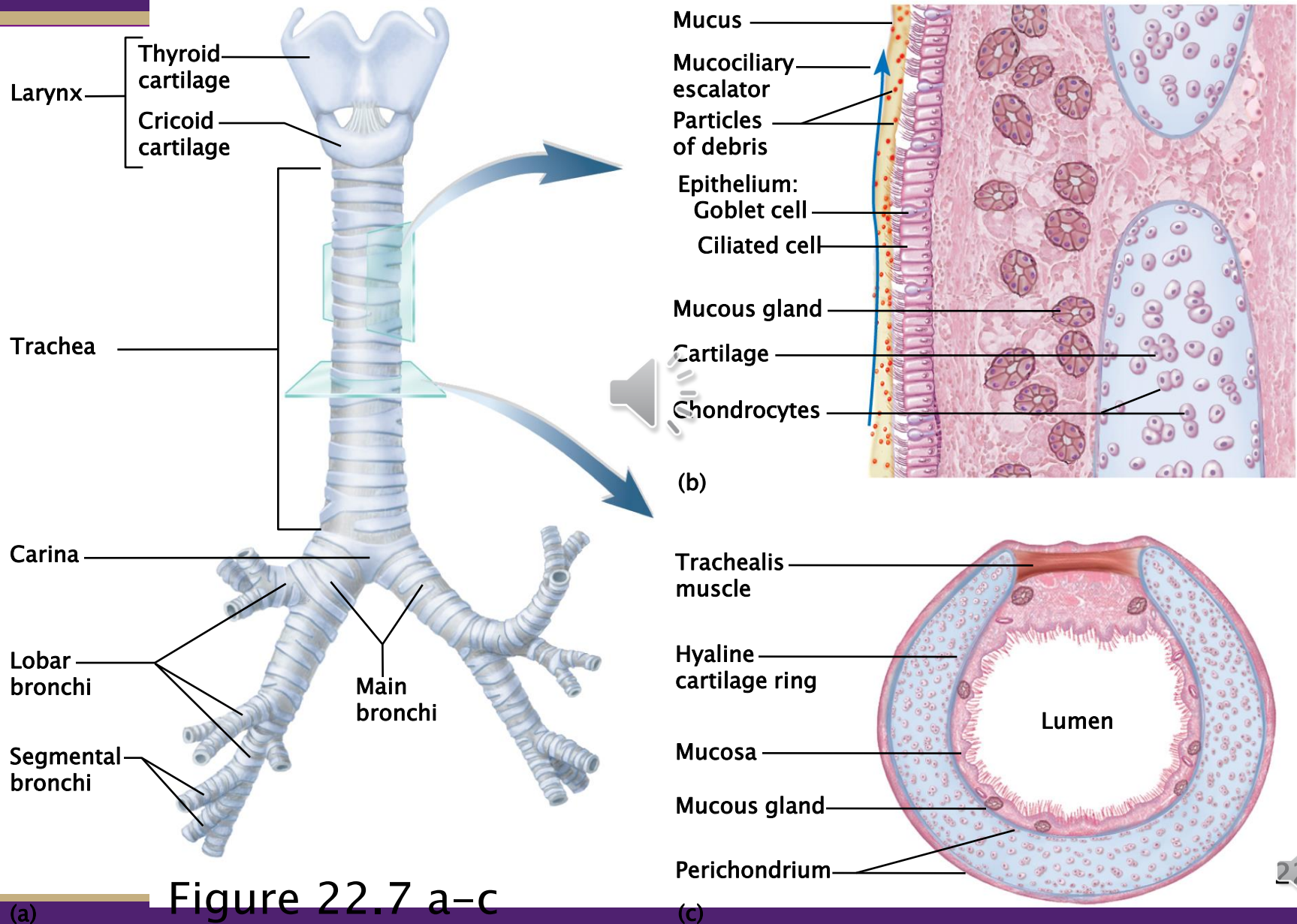
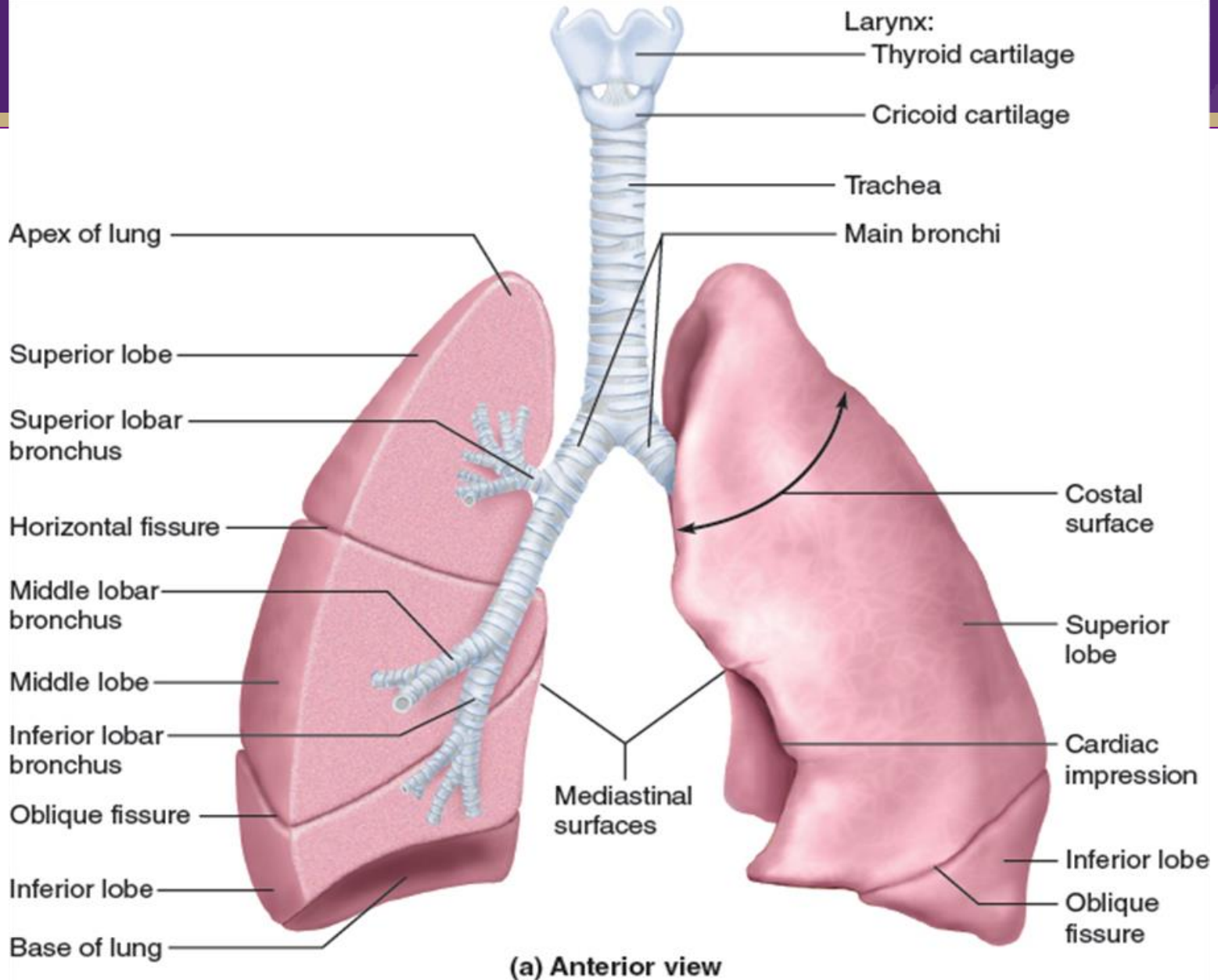


Figure 22.7 a-c

Lungs

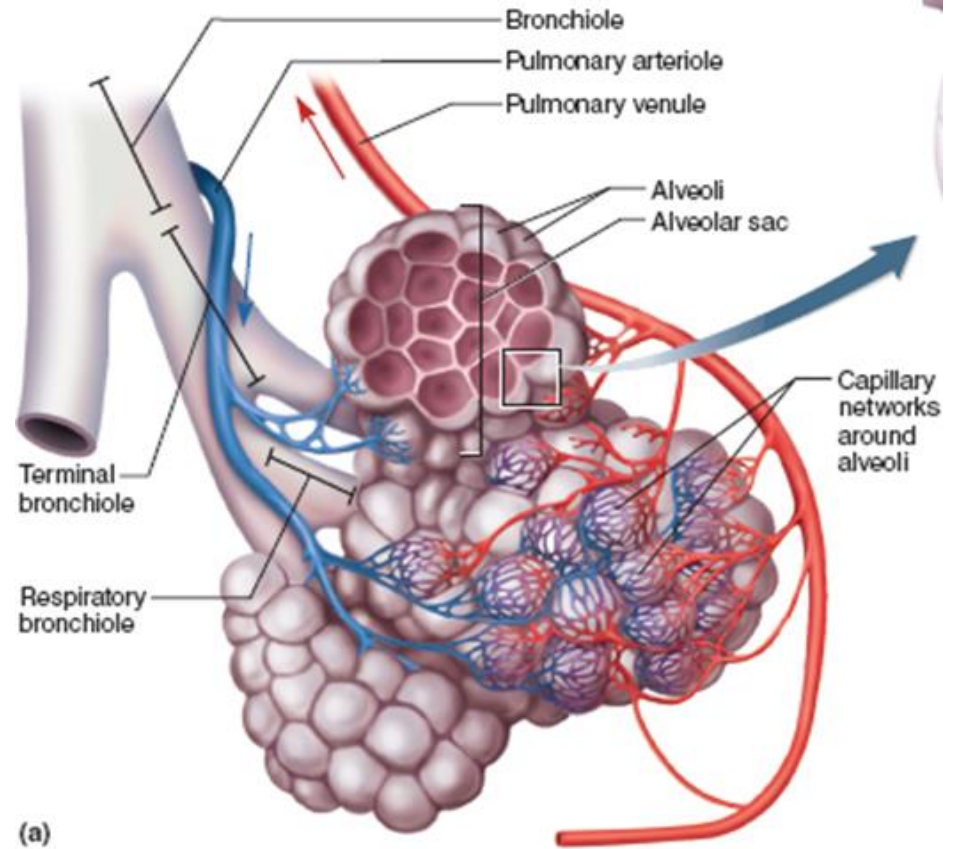
- Lobes
 - Right lung: 3
 - Left Lung: 2





Lungs Continued

- Alveoli
 - Type I Cells
 - Type II Cells (Great Cells)



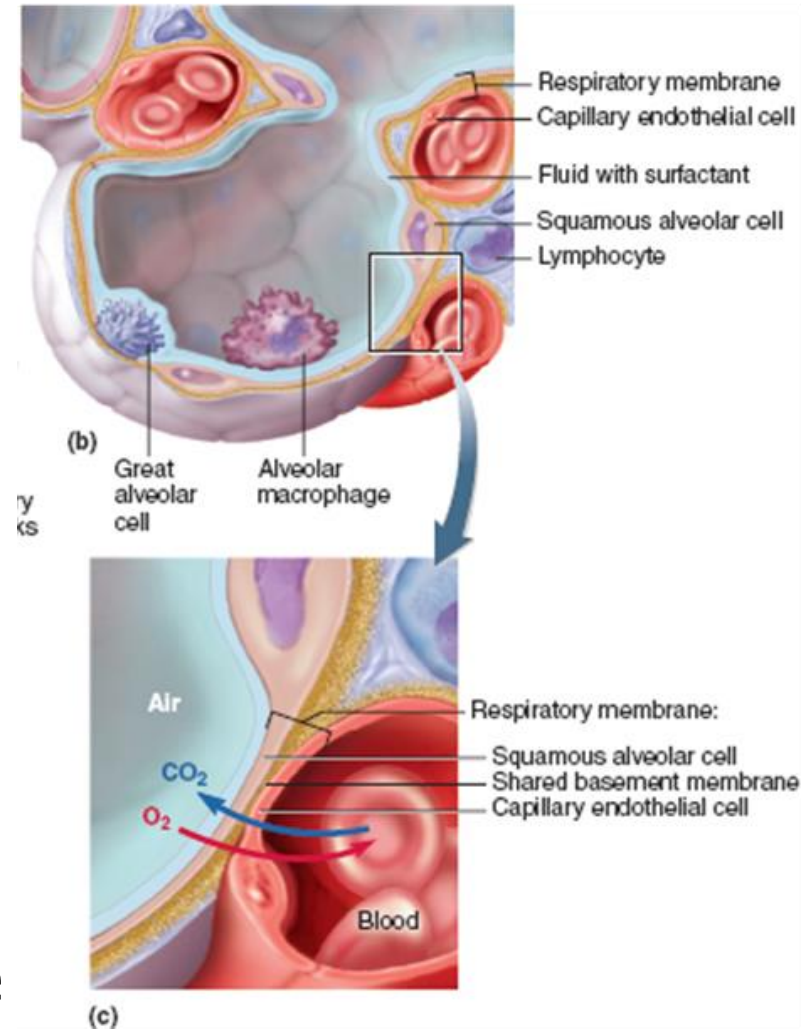
Pleurae

- Visceral Pleura
- Parietal Pleura
- Pleural Cavity



G. Site Gas Exchange

- Respiratory Membrane
 - Structural Barrier between Air and Blood
- Alveolar Wall
 - Type II Cells
 - Type I Cells
 - Macrophages
- Capillary Wall
- Shared Basement membrane



Respiration

Respiration has three meanings:

1. Pulmonary ventilation (breathing)
2. Gas exchange – the exchange of gases between the air in the alveoli and the blood
3. Gas transport in blood



Inhalation

- Inspiration (Inhaling)
 - Active Process
 - 2 major muscle groups: diaphragm and external intercostals
 - \uparrow Space \downarrow Pressure allows for more diffusion and air to come in



Exhalation

- Expiration
 - Passive Process
 - ↓ Space ↑ Pressure pushes air out
- Quiet vs. Forced Respiration



Sites of respiration

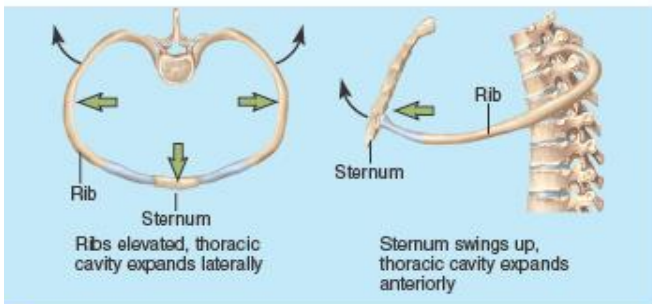
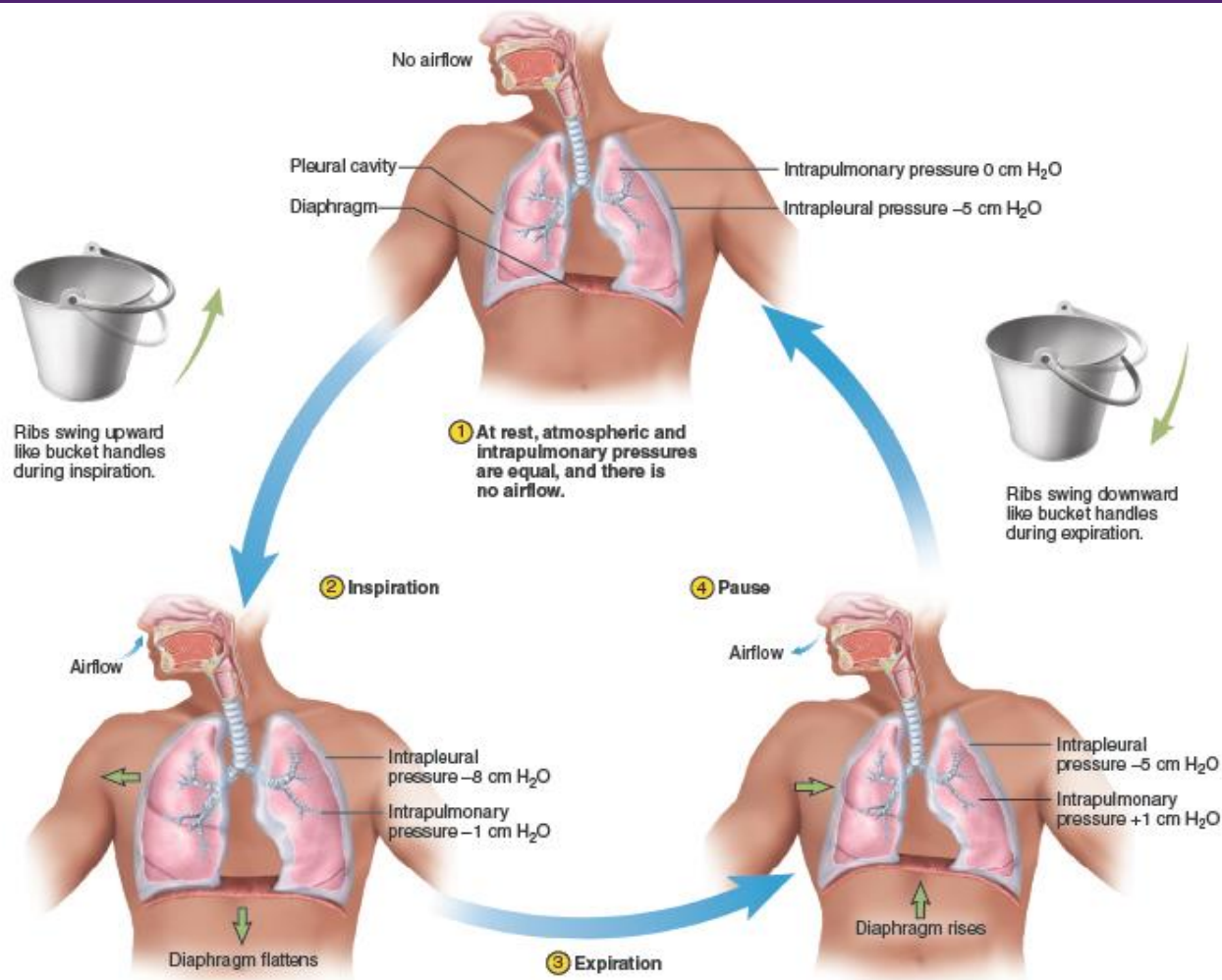
- Sites of pressure change
 - Alveolar (intrapulmonary) Pressure
 - Intrapleural



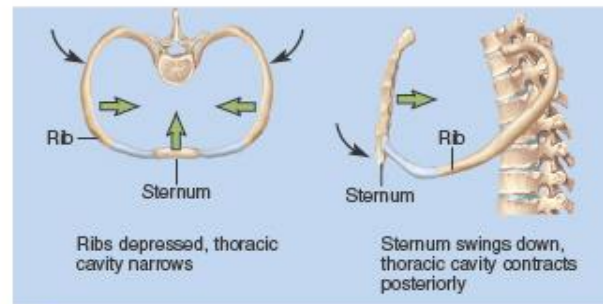
Types of Pressure

- Composition of air
- Atmospheric Pressure
- Partial Pressure





2 In inspiration, the thoracic cavity expands laterally, vertically, and anteriorly; intrapulmonary pressure drops 1 cm H₂O below atmospheric pressure, and air flows into the lungs.



3 In expiration, the thoracic cavity contracts in all three directions; intrapulmonary pressure rises 1 cm H₂O above atmospheric pressure, and air flows out of the lungs.



Gas Exchange

- Recall the respiratory membrane
- Partial pressure of oxygen and carbon dioxide facilitates exchange.



Exchange Continued

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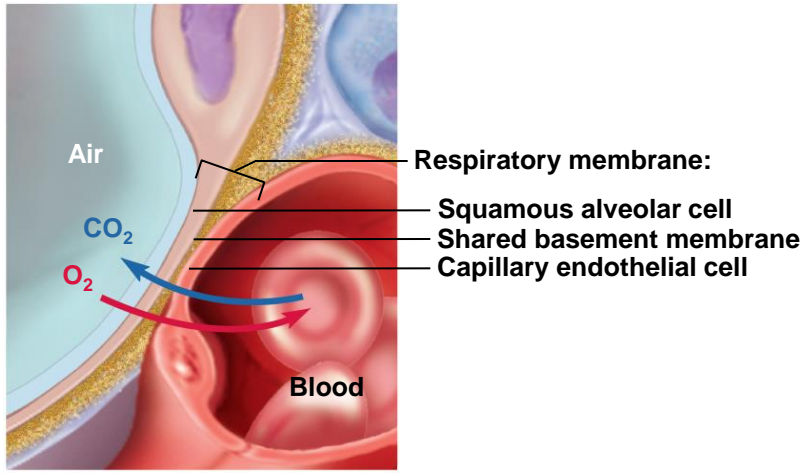
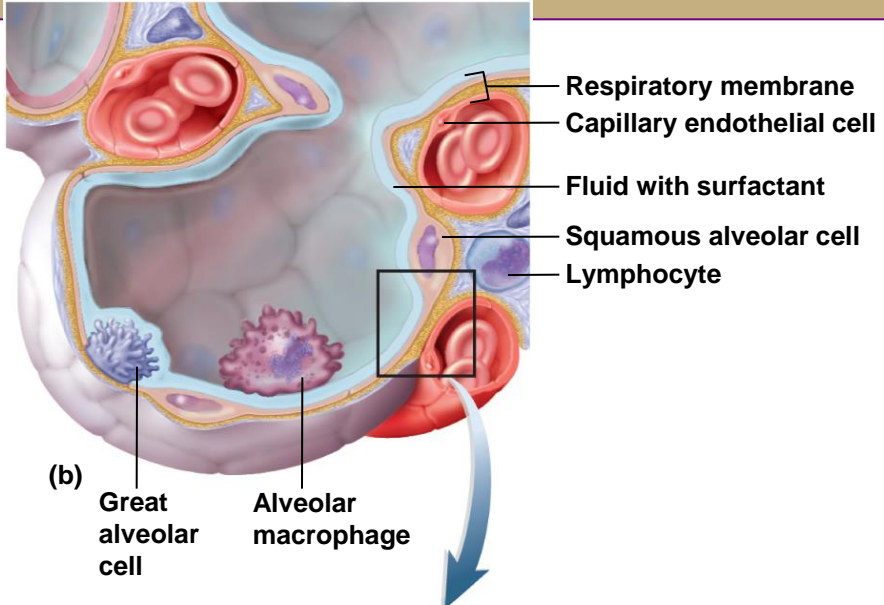


Figure 22.12 b-c



Exchange

- <http://www.dnatube.com/video/2905/What-Happens-Inside-Lungs>

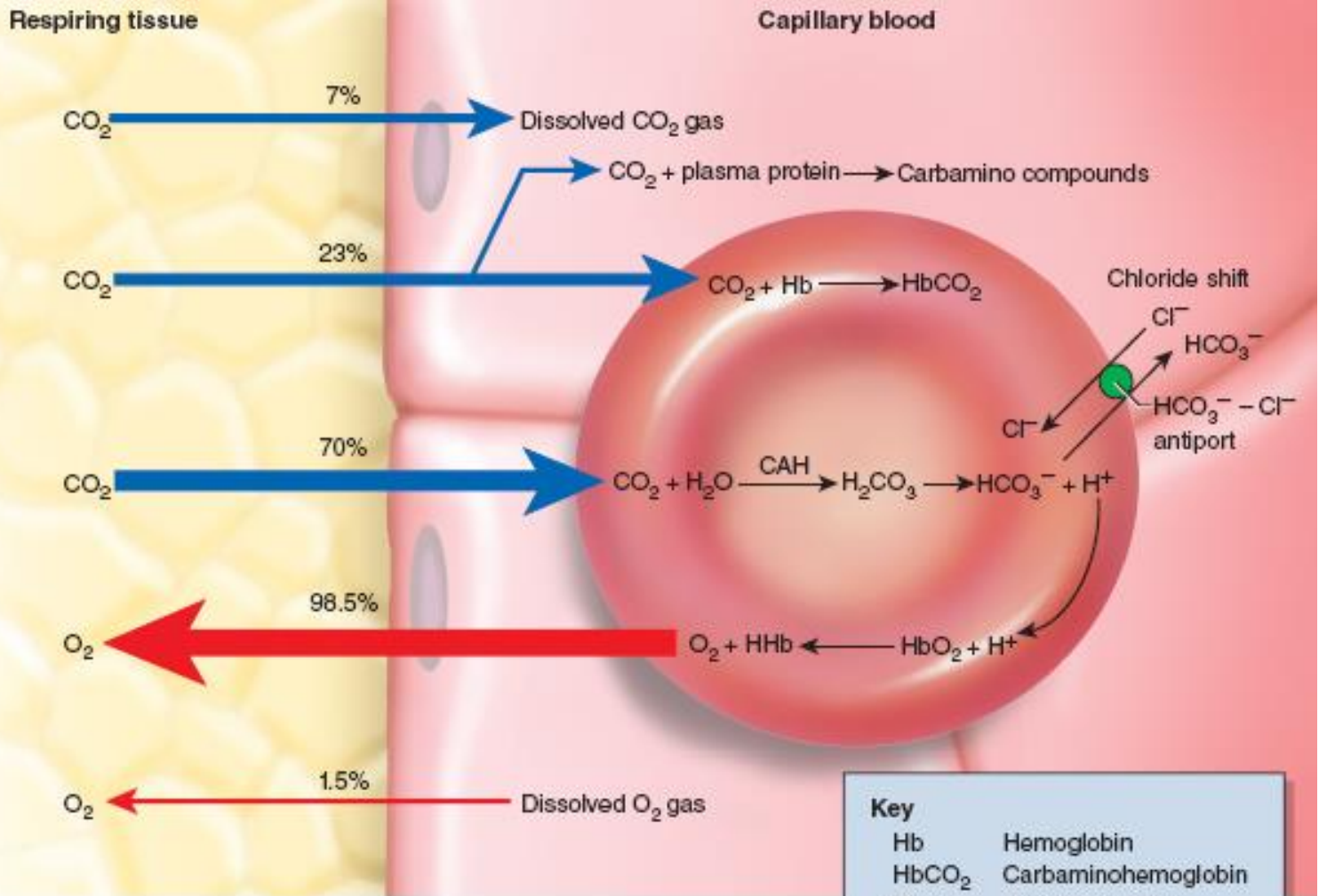


IV. Transportation of Gases

- Oxygen
 - Oxyhemoglobin
 - Dissolved in plasma
- Carbon Dioxide
 - Bicarbonate ion (HCO_3^-)
 - $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3 \rightleftharpoons \text{HCO}_3^- + \text{H}^+$
 - Hemoglobin - Carbaminohemoglobin
 - Dissolved in plasma



Gas Exchange and Transport



V. Neural Control of Breathing

- exact mechanism for setting the rhythm of respiration remains unknown
- breathing depends on repetitive stimulation of skeletal muscles from brain
- neurons in medulla oblongata and pons control unconscious breathing
- voluntary control provided by motor cortex



Brainstem Respiratory Centers

- Automatic, unconscious cycle of breathing is controlled by three pairs of respiratory centers in the reticular formation of the medulla oblongata and the pons
- Respiratory center in medulla
 - ventral respiratory group (VRG)
 - dorsal respiratory group (DRG)
- Respiratory center in pons
 - Pneumotaxic Center



Testing Your Recall

p887#1, 3, 4, 9, 11–14