The Respiratory System

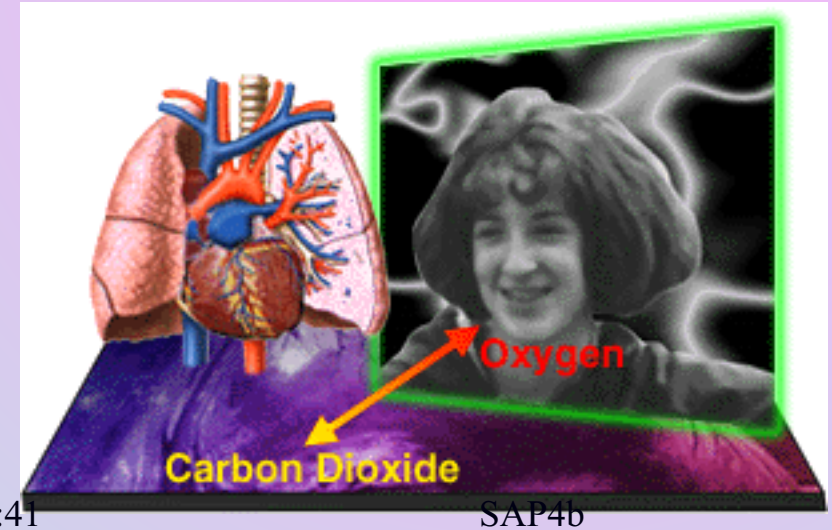
SAP4.b

Students will analyze the physical, chemical, and biological properties of process systems as these relate to transportation, absorption and excretion, including the cardiovascular, respiratory, digestive, excretory and immune systems.

b. Analyze, and explain the relationships between the respiratory and cardiovascular systems as they obtain oxygen needed for the oxidation of nutrients and removal of carbon dioxide.

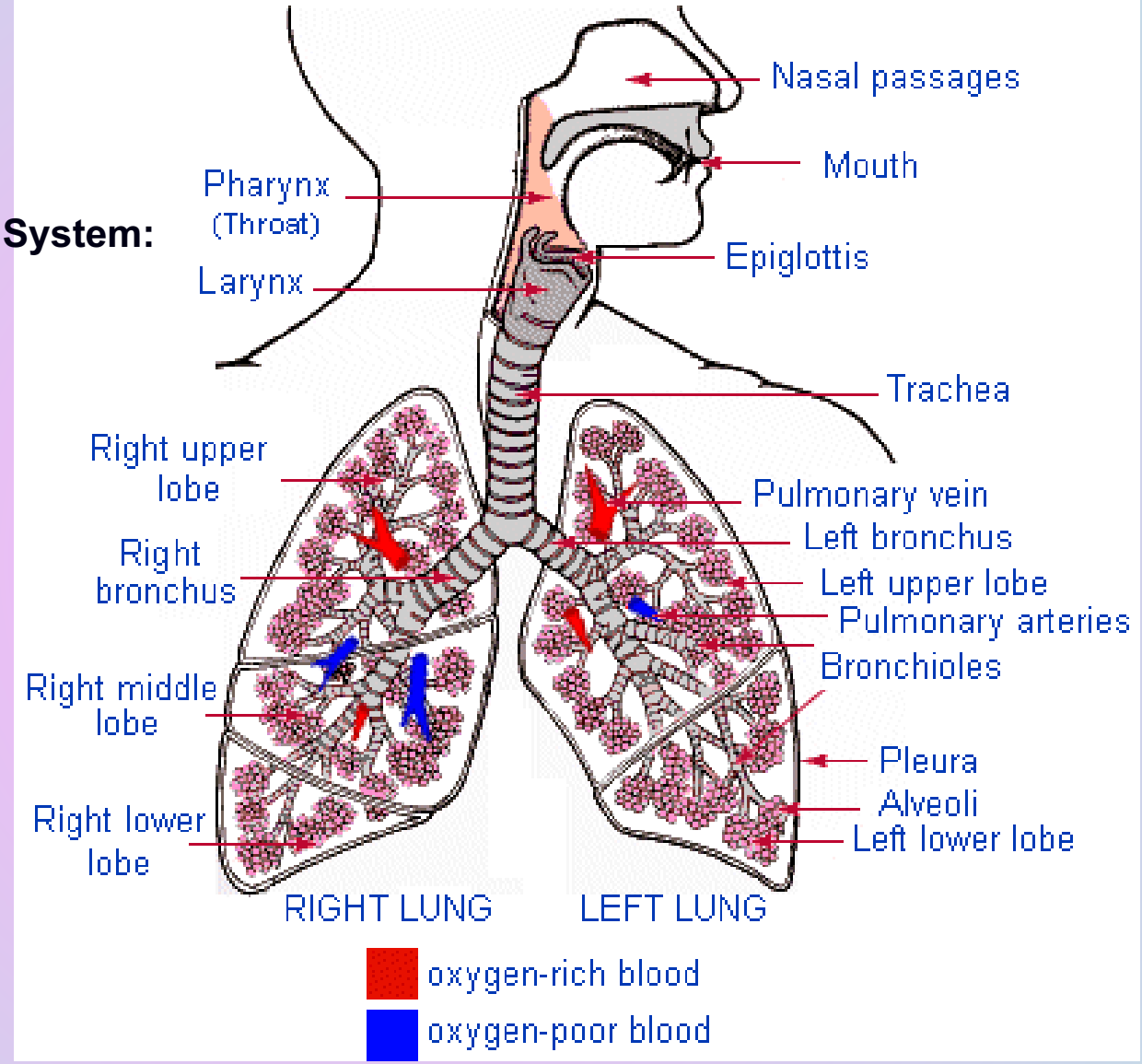
Objectives

- Functional Anatomy
  - Organs forming the respiratory passageway
  - Describe the structure and function of the lungs and pleural coverings



Organs of the Respiratory System:

Nose
Pharynx
Larynx
Trachea
Bronchi
Bronchial branches
Lungs
Alveoli



Functions of Respiratory System

- Delivers O_2
- Removes CO_2
- Filters the air
- Regulates blood pH

Respiratory System Anatomy

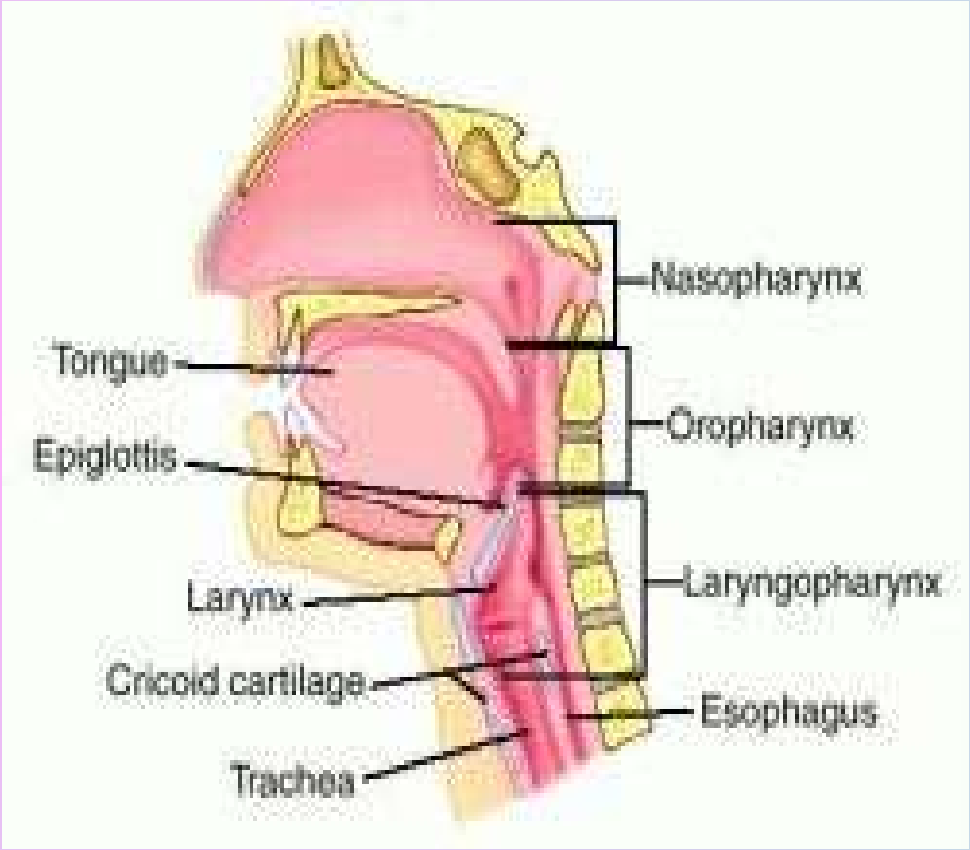
Nose

- Openings = nostrils/external nares
- Nasal Cavity = large open chamber
  - Lined with mucous membrane
    - Sticky
    - Wet
    - Warm (blood vessels)
- Separated by the septum
- Contains the sinuses- air pockets in the skull bones
  - Lightens skull
  - Affects voice
- Named for bones:
  - Frontal
  - Ethmoidal
  - Sphenoidal
  - Maxillary

Anatomy cont.

Pharynx (throat)

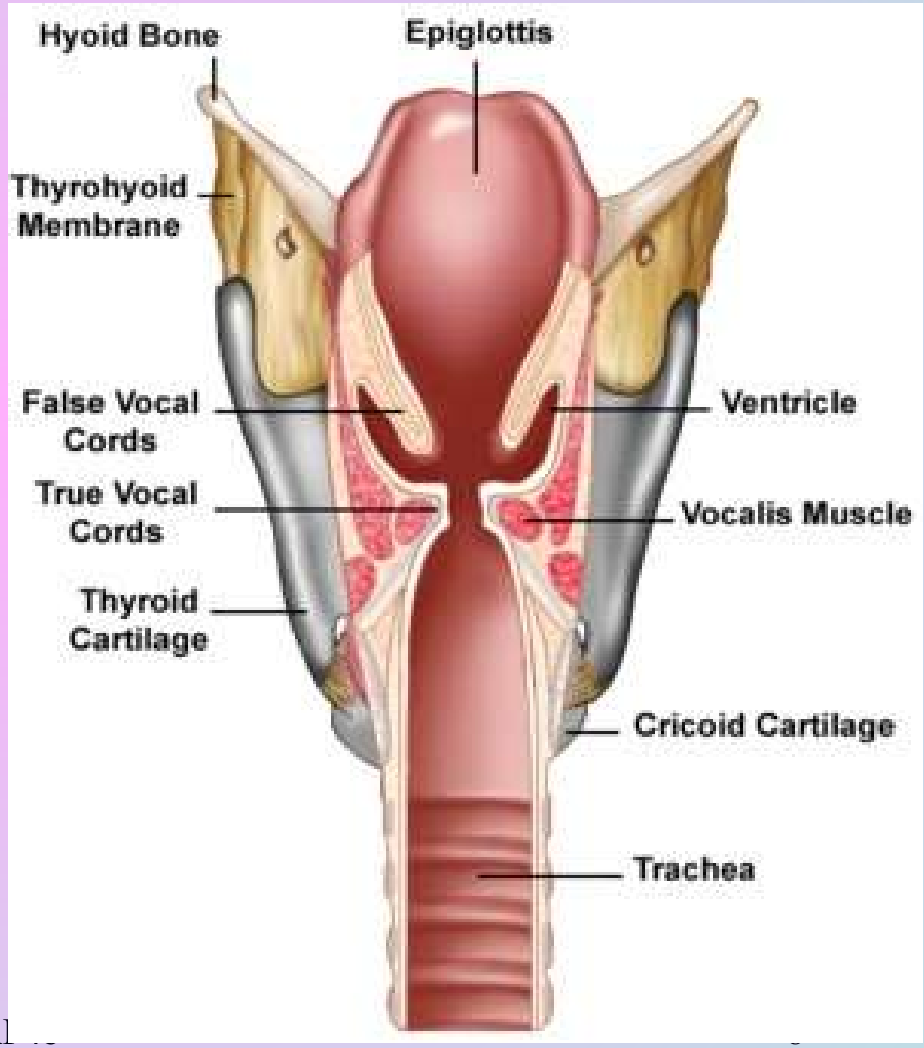
- Lined with mucous membrane
- Passageway for food and air
- Air sent to larynx, food is sent to the esophagus
- Tonsils located here
  - Trap bacteria



Anatomy cont.

Larynx (voice box)

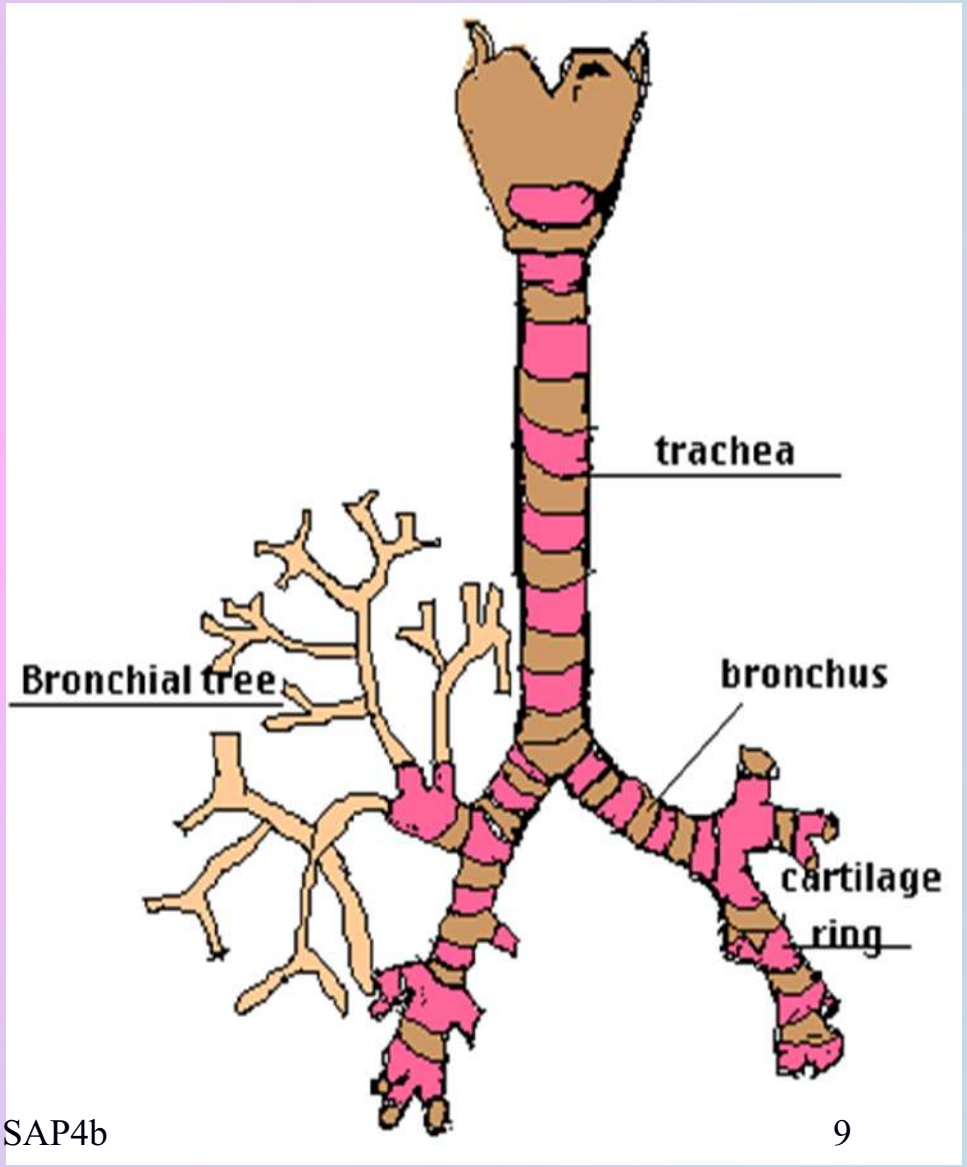
- Made of 9 cartilage rings; largest-Thyroid cartilage (Adam's apple)
- On top is a flap called the epiglottis- directs food into the esophagus
- Contains vocal cords
  - True= make sound
  - False= helps swallow and helps hold breath
  - Glottis= keeps food out of vocal cords



Anatomy cont.

Trachea (wind pipe)

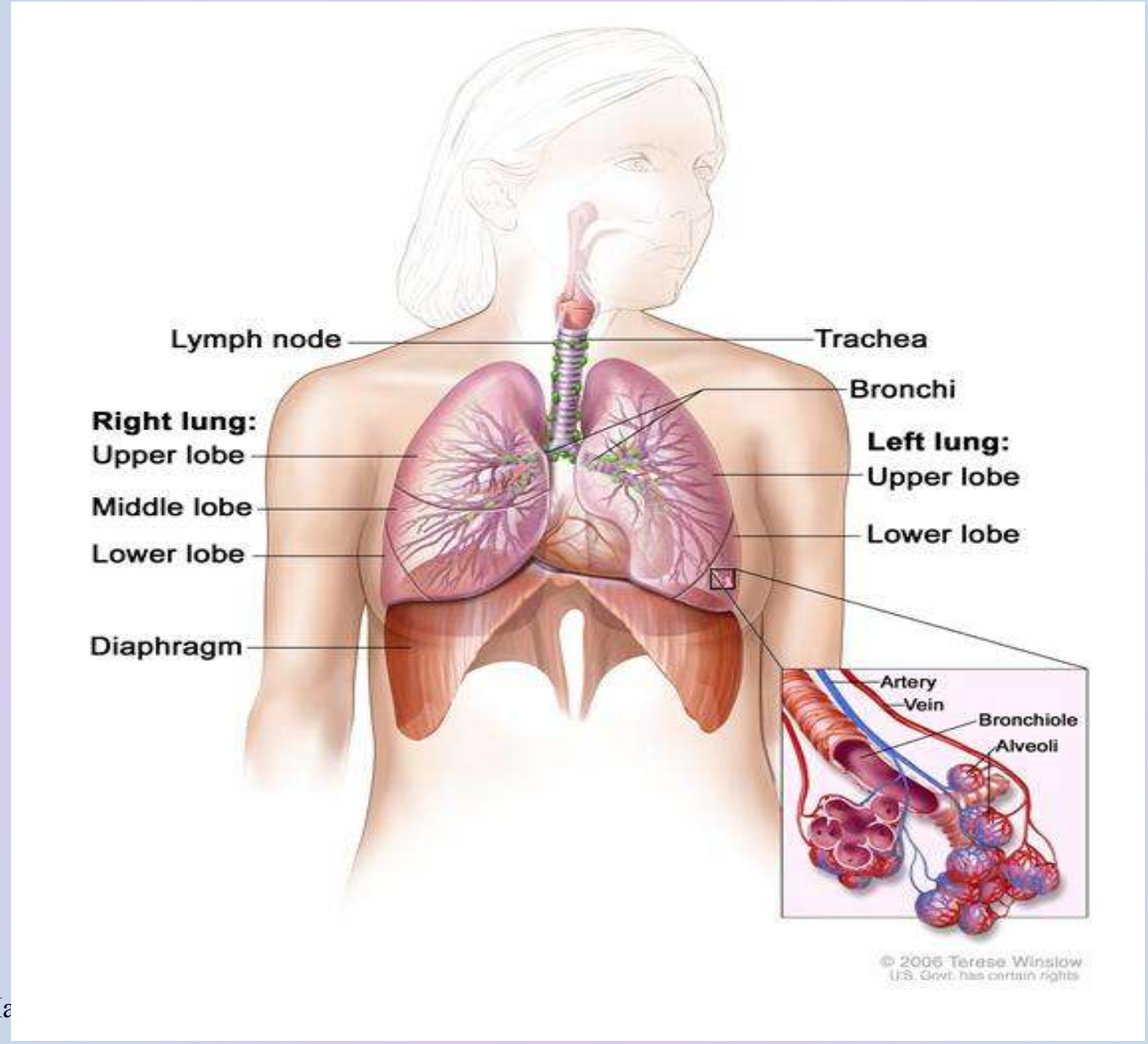
- Made of cartilage that is hard in front and soft in back to allow the esophagus to expand when you swallow
- Lined with mucous membrane
- Heimlich maneuver is used to “pop” food or objects from airway



Anatomy cont.

Lungs- air sacs/ not muscle

- Right lung- 3 lobes; left lung- 2 lobes
- Surrounded by a pleural membrane
- Contains bronchiole tree
  - Primary bronchus (1º)
  - Secondary (2º) bronchi
  - Tertiary (3º) bronchioles
  - Terminal bronchioles
  - Alveolar sac
    - Contains alveoli
    - Gas exchange/covered with capillaries
    - Very thin, easy to damage


Lymph node
Trachea
Bronchi
Right lung:
Upper lobe
Middle lobe
Lower lobe
Diaphragm
Left lung:
Upper lobe
Lower lobe
Artery
Vein
Bronchiole
Alveoli
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Lung volumes/capacities

- Tidal volume- amount of air breathed in and out in 1 breath
- Inspiratory Reserve Volume- maximum amount of air you can pull in
- Expiratory Reserve Volume- maximum amount of air you can exhale

* NO BIG BREATH FIRST

- Residual Volume- amount of air left in lungs after exhaling everything possible

1. Keeps the lungs slightly inflated
2. Keeps gas exchange happening

- Vital Capacity- take in a big breath first and then exhale as much as possible
- Functional Residual Volume- amount of air left in lungs after normal breathing
- Total Lung Capacity- total of all volumes; total air in/out and residual *6 liters

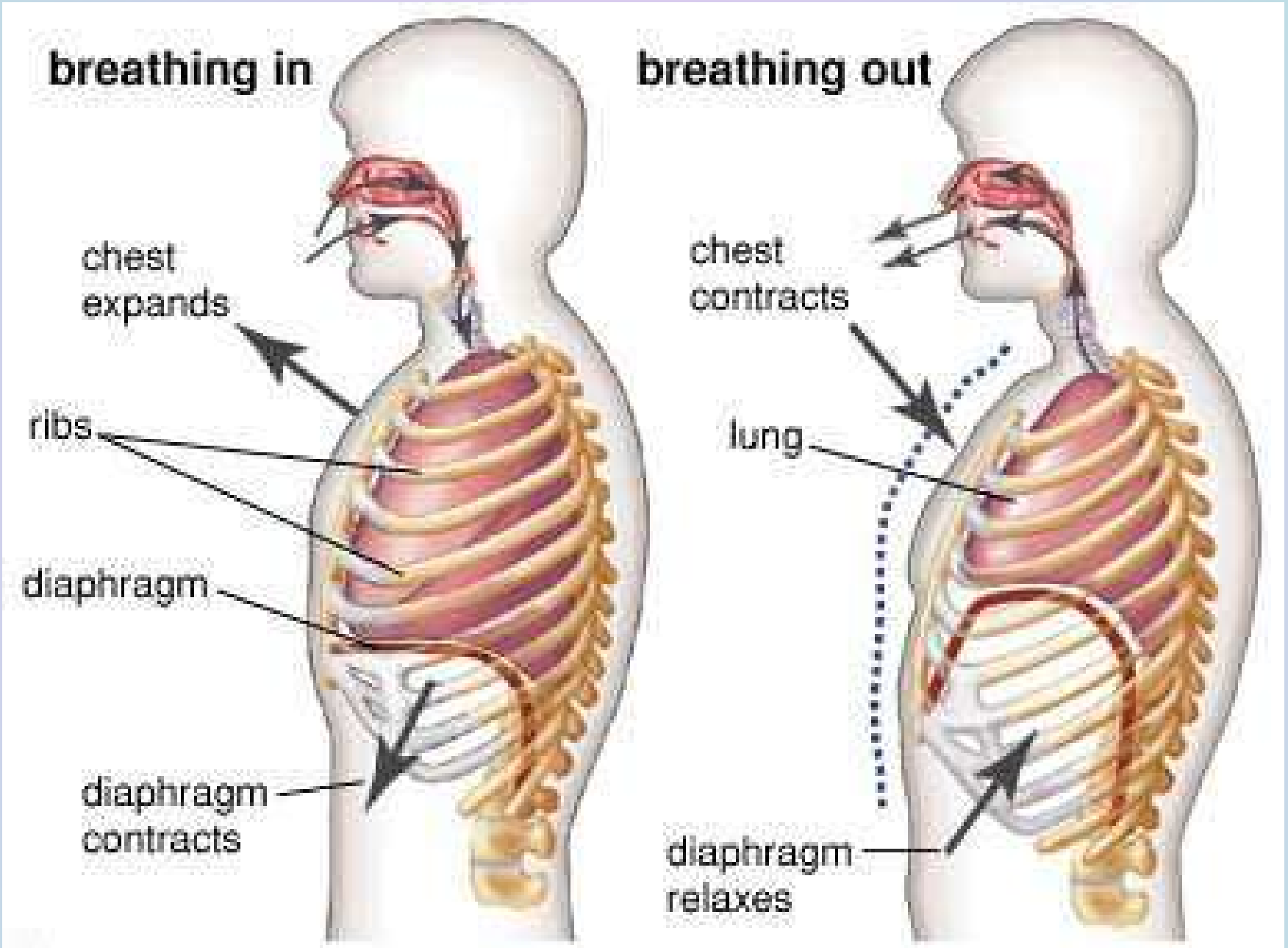
Overview

- The primary function of the respiratory system is to supply the blood with oxygen in order for the blood to deliver oxygen to all parts of the body. The respiratory system does this through breathing. When we breathe, we inhale oxygen and exhale carbon dioxide. This exchange of gases is the respiratory system's means of getting oxygen to the blood.

Breathing

In=Inhalation/Inspiration

- Active process- muscle contract/energy
- Diaphragm contracts and moves down
- External intercostals contract and pulls ribcage up and out
- Surface Tension between the lung and the chest wall makes the lung be pulled out with the ribs (in step 3)
- Volume in the lungs increases, pressure decreases
- To equalize the pressure we bring in more air


breathing in
chest expands
ribs
diaphragm
diaphragm contracts
breathing out
chest contracts
lung
diaphragm relaxes

Breathing cont.

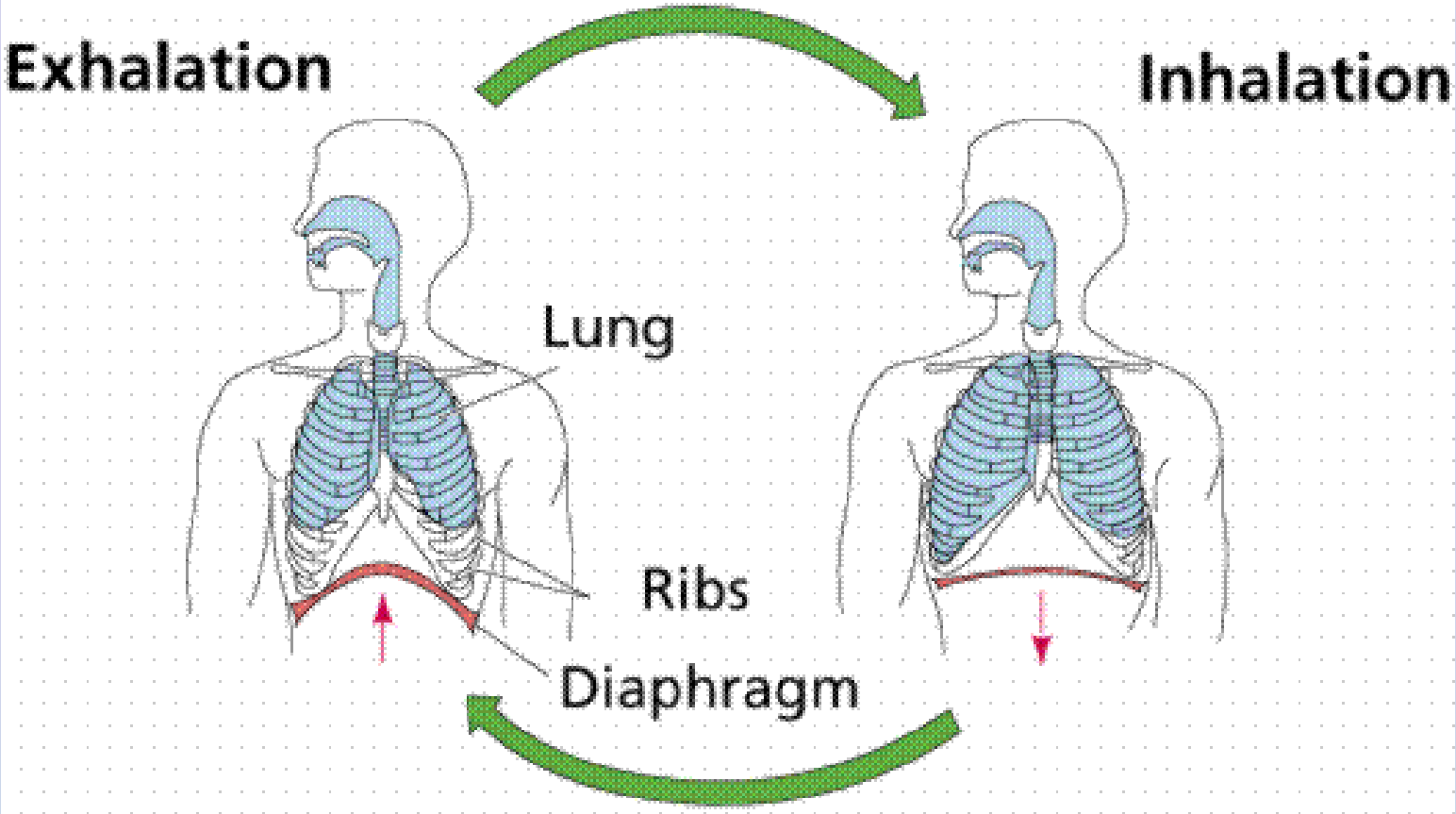
Out=Exhalation/Expiration

*passive- caused by muscles relaxing

- Muscles relax pushing on lungs
- Volume decreased, pressure increased
- To equalize the pressure we push air out

In a forced exhale, your ab muscles and your oblique muscles will contract to push on stomach and then diaphragm

Respiratory Physiology



Factors that Influence Respiration

- Physical
  - Talking
  - Coughing
  - Exercising
- Volition
  - Conscious control
- Emotional
  - Fear
  - Sadness
  - Excitement
- Chemical
  - Carbon dioxide levels
  - Decreased ph of blood

Non Respiratory Air Movements

- Voluntary or reflex activities that move air in or out of the lungs
- Include:
  - Sneezing
  - Laughing
  - Coughing
  - Crying
  - Hiccupping
  - Yawning

Respiratory Disorders

COPD (Chronic Obstructive Pulmonary Disorders)

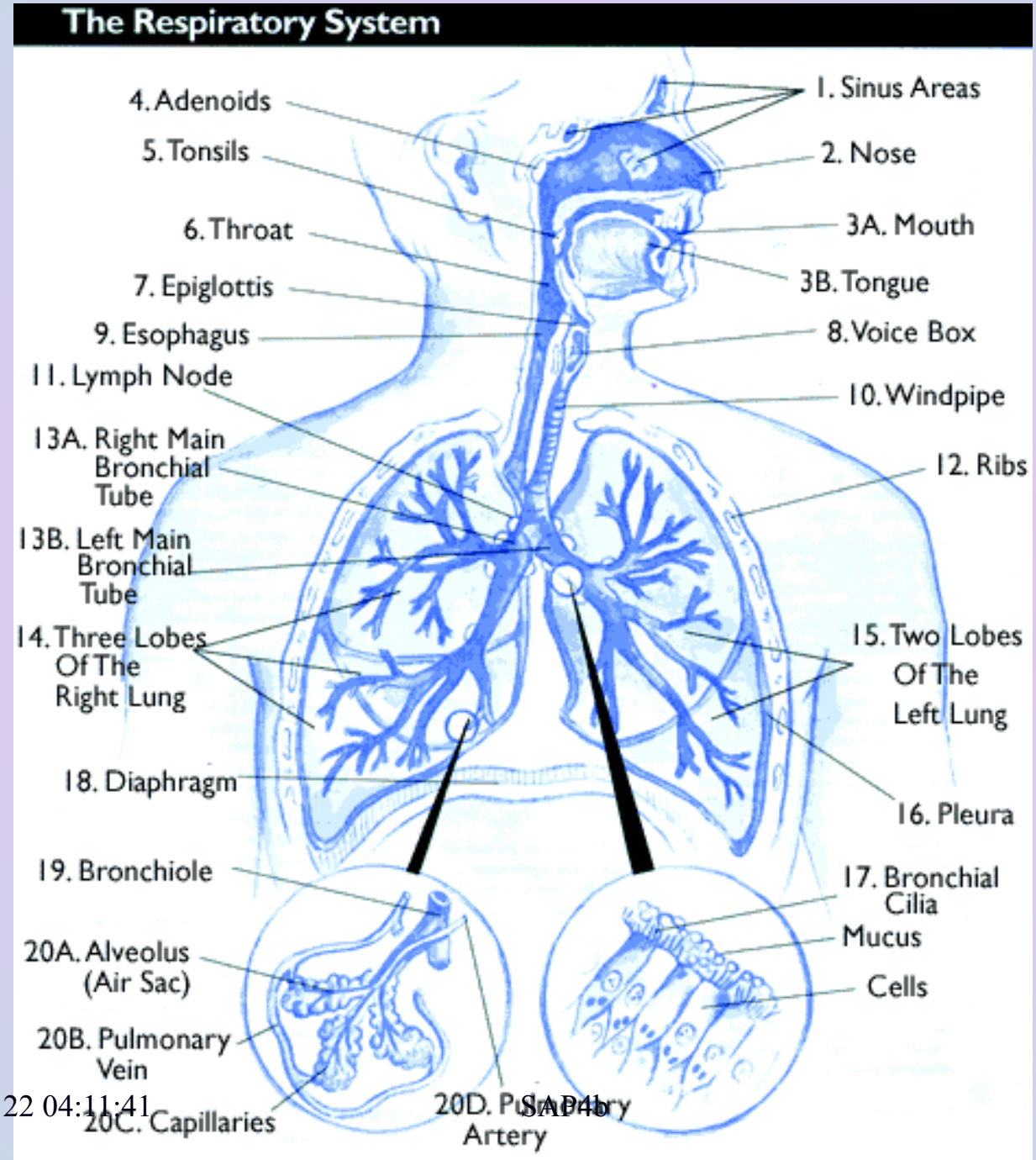
- Emphysema- associated with smoking and second hand smoke
  - Alveoli become enlarged and eventually rupture
  - Poor gas exchange, difficulty breathing, possibly rasping noise
- Lung Cancer- associated with smoking; tumor in lung tissue.
  - Depending on what part of the lung is affected symptoms vary
- Chronic Bronchitis- inflammation of the bronchioles; with increased mucus production; person has a productive cough (coughs up sputum) & labored breathing

Disorders cont.

- Pneumonia- fluid accumulates in the lungs, viral or bacterial
- Asthma- bronchiol walls spasm causing “spits” of air to enter lungs instead of a stream of air; inhalers relax the bronchioles to allow air to enter
- Cystic Fibrosis- genetic; increased mucus production. Too much mucus clogs air ways & tubes of the respiratory and digestive system
- Sinusitis- inflamed mucus membranes in the sinuses, causes increased pressure in sinus cavities (headaches)

Disorders of RS

- URI—
  - Upper respiratory infection
  - “Head Cold”
- LRI—
  - Lower respiratory infection
  - “Chest Cold”
- TB
  - Tuberculosis
  - Destroys lungs
- Pleurisy
  - Inflammation of the pleura
- Influenza
  - Acute infectious viral disease
  - Fever, chills, myalgia, headache, anorexia
- Cystic fibrosis
  - Hereditary disorder, affects exocrine glands
  - lungs, pancreas, digestive tract affected
  - Viscous mucus blocks bronchioles
  - Gas exchange impaired


The Respiratory System
4. Adenoids
5. Tonsils
6. Throat
7. Epiglottis
9. Esophagus
11. Lymph Node
13A. Right Main Bronchial Tube
13B. Left Main Bronchial Tube
14. Three Lobes Of The Right Lung
18. Diaphragm
19. Bronchiole
20A. Alveolus (Air Sac)
20B. Pulmonary Vein
20C. Capillaries
20D. Pulmonary Artery
1. Sinus Areas
2. Nose
3A. Mouth
3B. Tongue
8. Voice Box
10. Windpipe
12. Ribs
15. Two Lobes Of The Left Lung
16. Pleura
17. Bronchial Cilia
Mucus
Cells