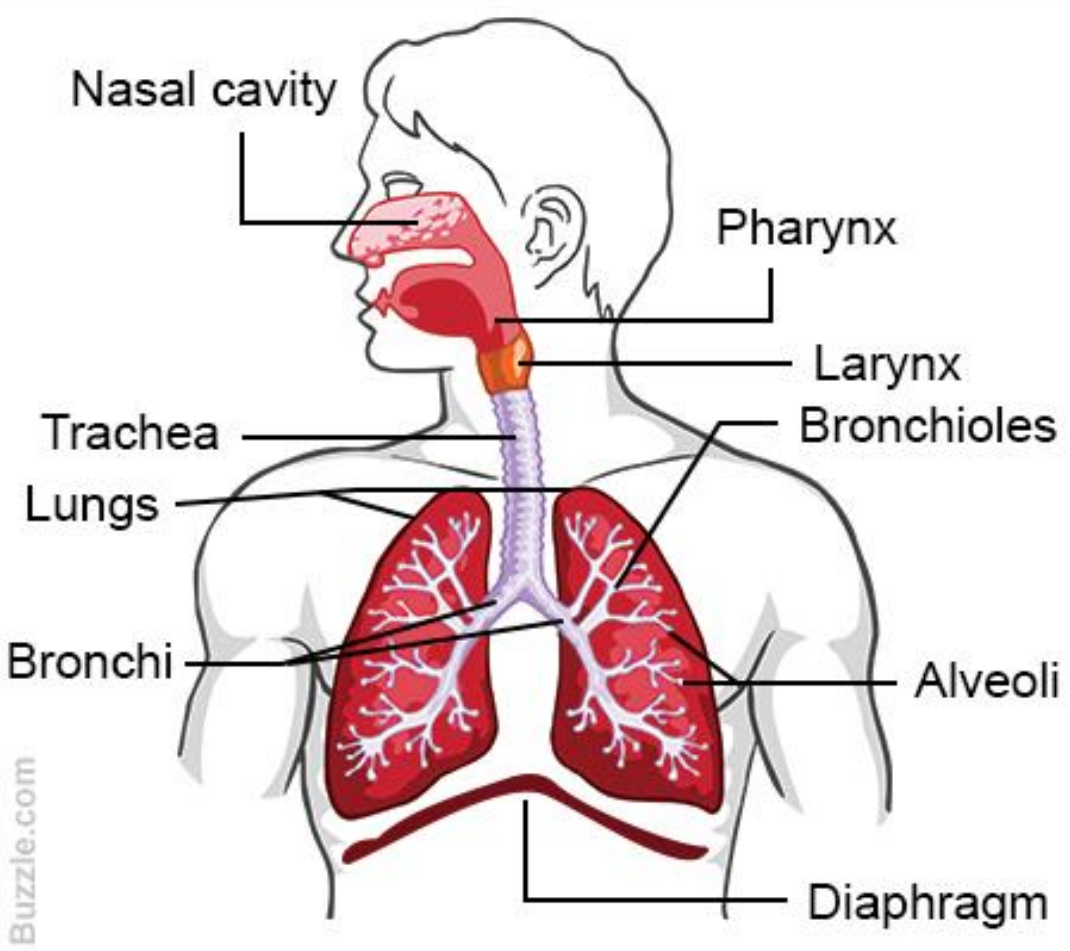
Lesson 1

Collect December break exam

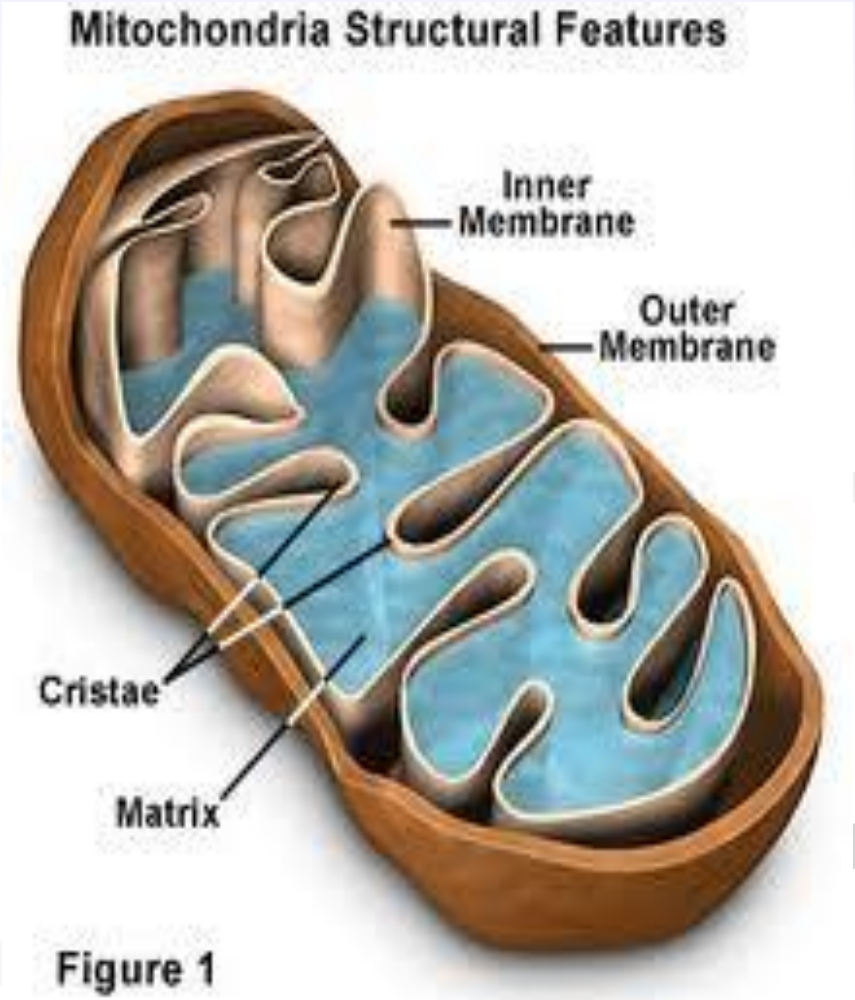
Respiratory Structures

The Respiratory System



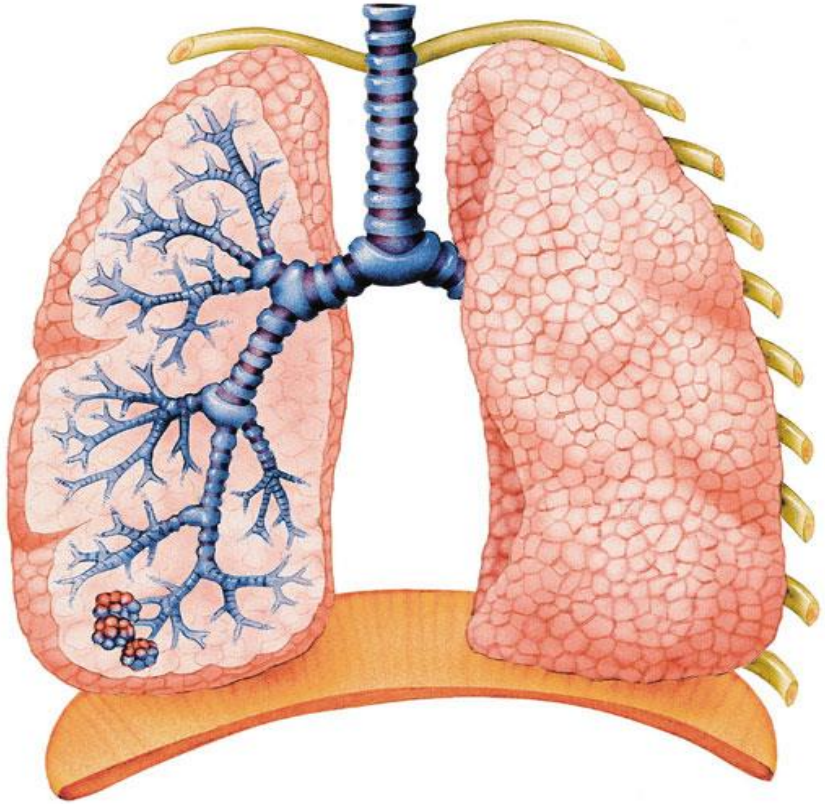
Review of Cellular Respiration

- reactions that convert chemical energy in food molecules into ATP
- Occurs in <u>ALL</u> cells
  - aerobic – <u>uses oxygen</u>
  - anaerobic – does NOT use oxygen

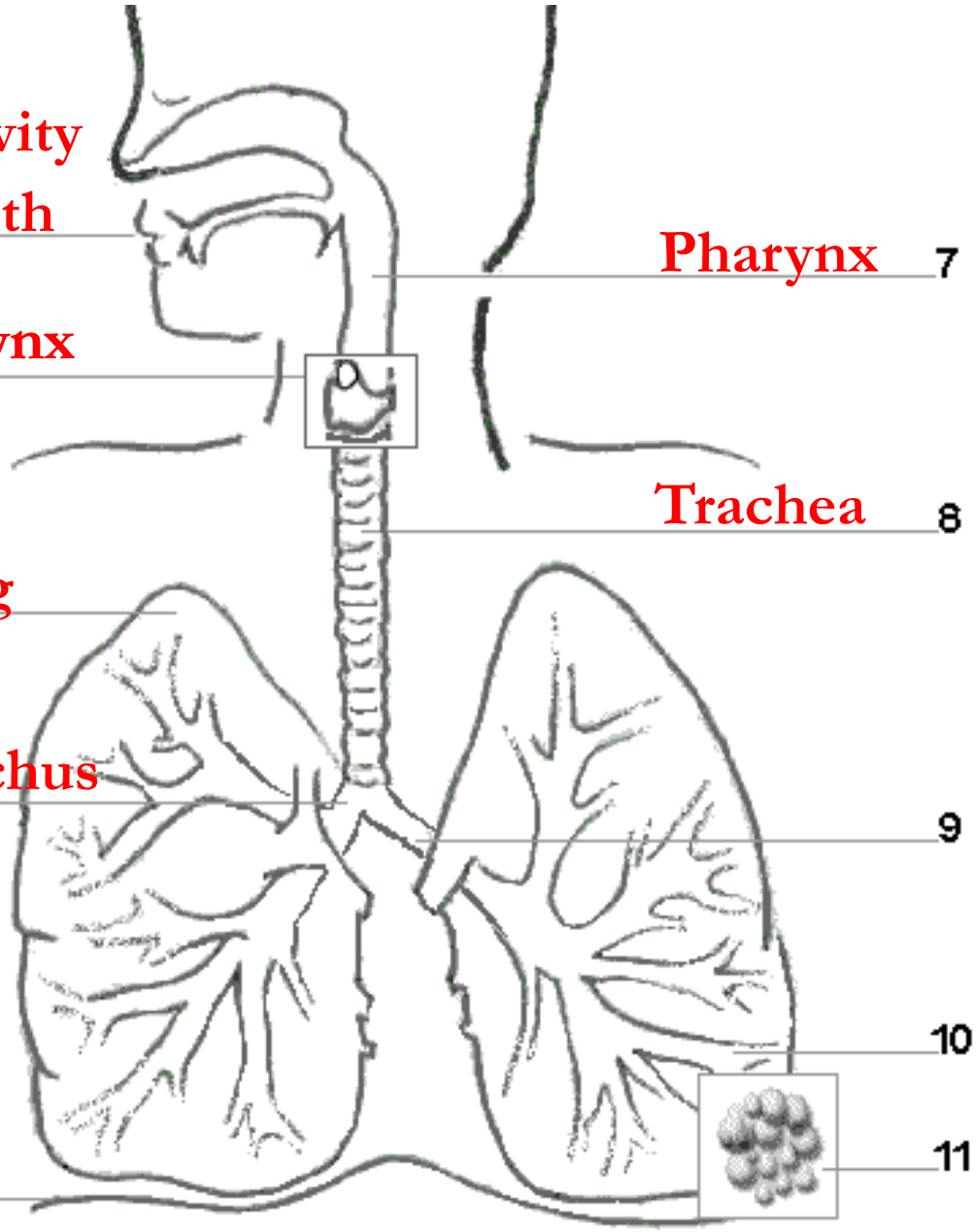


The Human Respiratory System…

- **<u>FUNCTION:</u>** **allows gasses to pass from the external environment to the internal surfaces of the lungs**

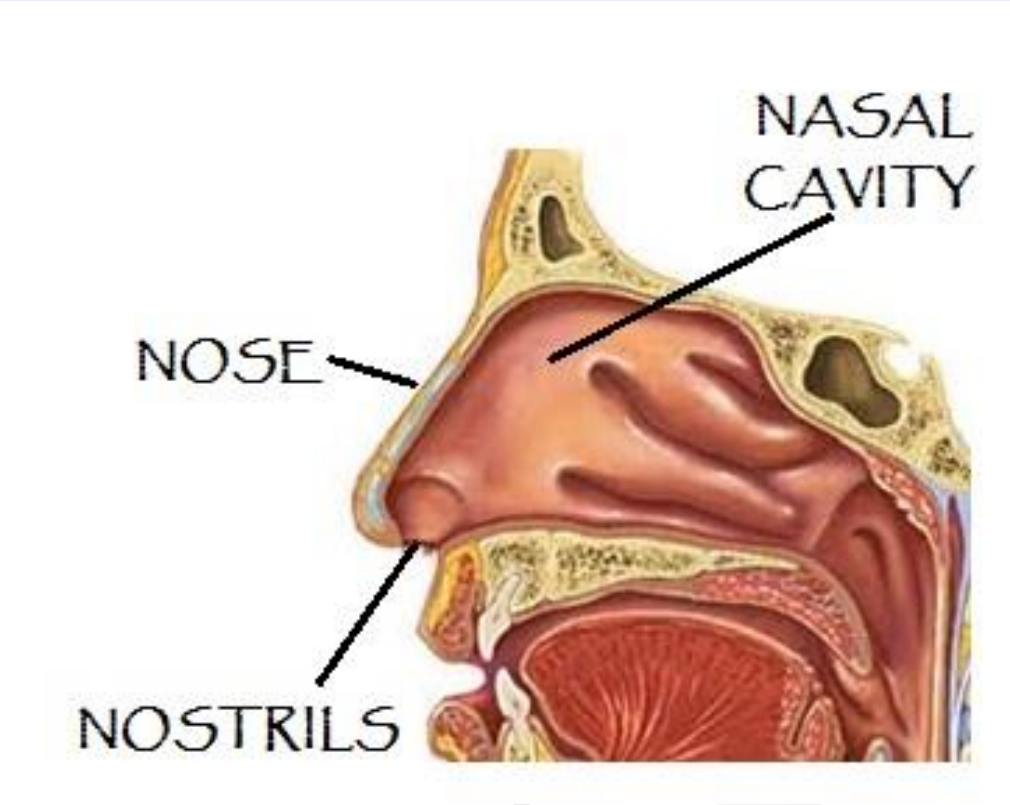


Structures of the Respiratory System



Nasal Cavity

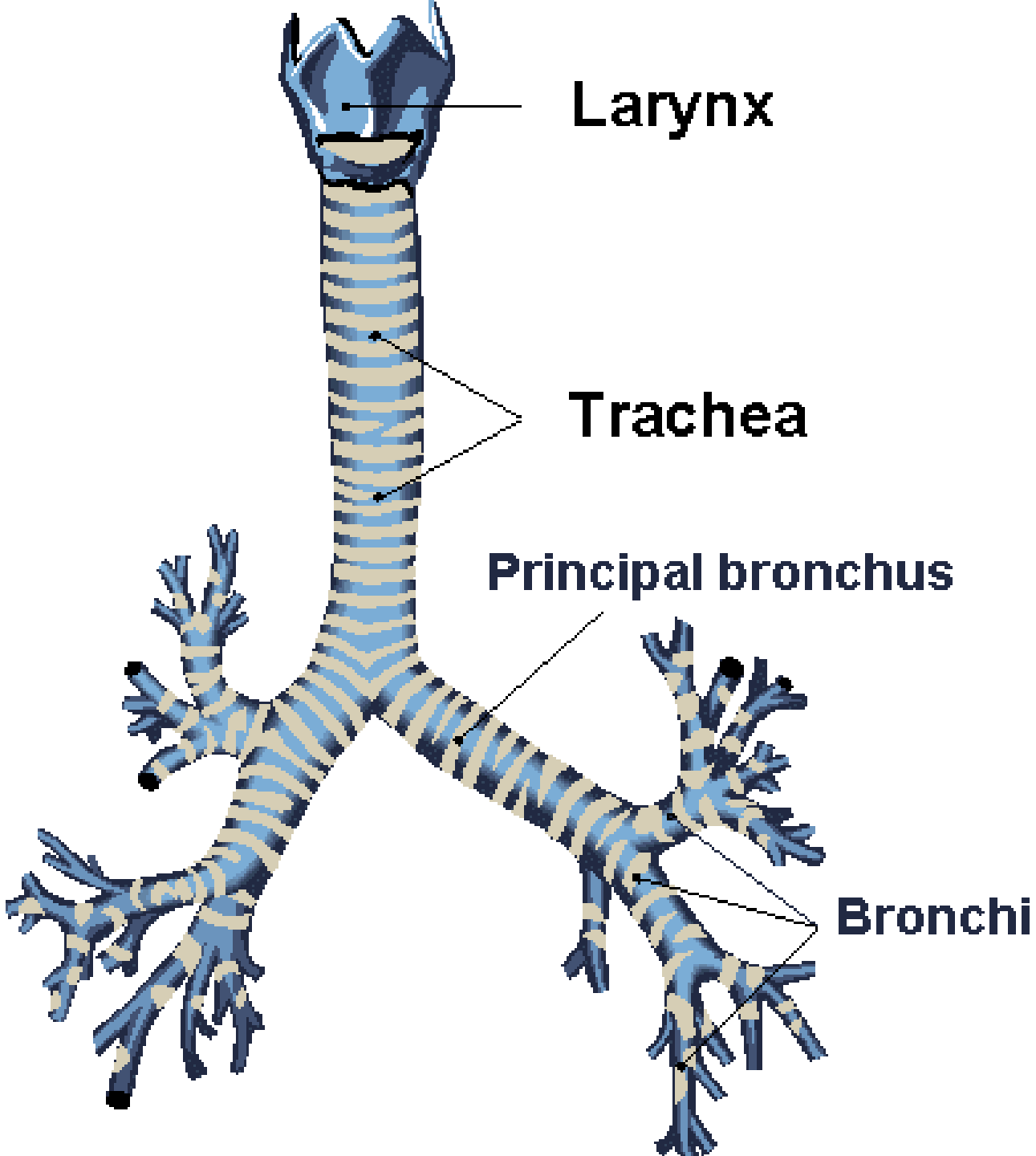
- lined with cilia (small hairs) & mucous membranes to trap debris
- filters, warms & moistens air
- sneezes remove debris

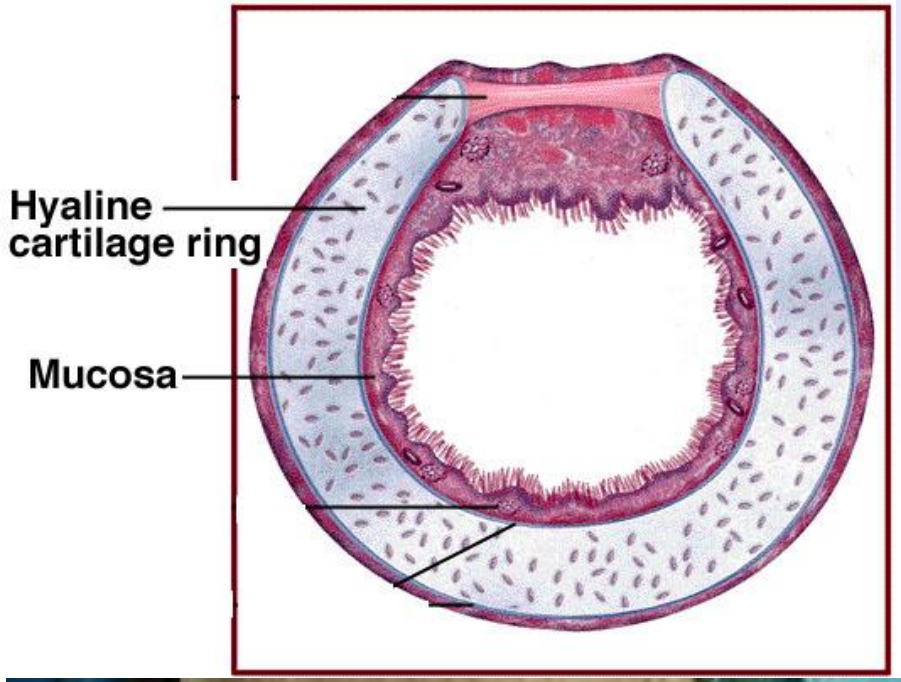


Pharynx

- Throat
- Contains the LARYNX – vocal cords (sometimes it protrudes as the Adams apple)

Larynx Video


Larynx
Trachea
Principal bronchus
Bronchi



A laryngectomy may result from laryngeal cancer, so…

DON'T SMOKE!

WARNING: graphic picture coming up

Tracheostomy v/s Laryngectomy

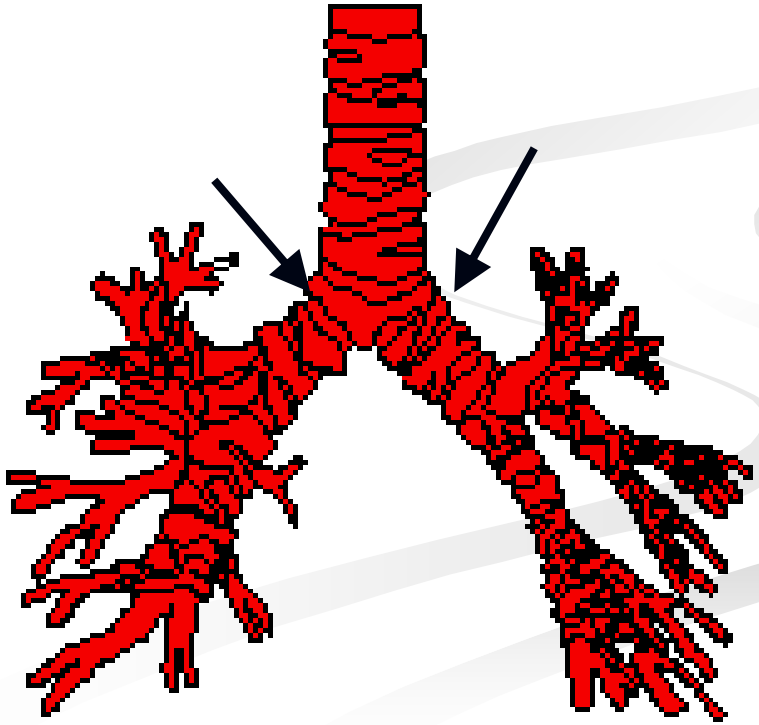
Tracheostomy	Laryngectomy
A hole is created into the trachea through an incision through the neck	Complete removal of the larynx with redirection of trachea
Mainly used to treat airway obstruction. Person can breathe via nose/mouth	Used to treat cancer of the larynx. Person now breathes through a 'stoma'
Speech through speaking valve. Normal sounding. No changes in voice.	Speech is never 'normal' again. Possible through TEP or electrolarynx.
Changes are usually temporary.	Changes are permanent & irreversible.

Trachea (windpipe)

- Epiglottis – flap that prevents food from entering airway
- Held open by cartilage rings
- Cilia & mucus trap debris, removed by coughing
  - Cigarette smoke & other pollutants interfere with cilia function

Bronchi

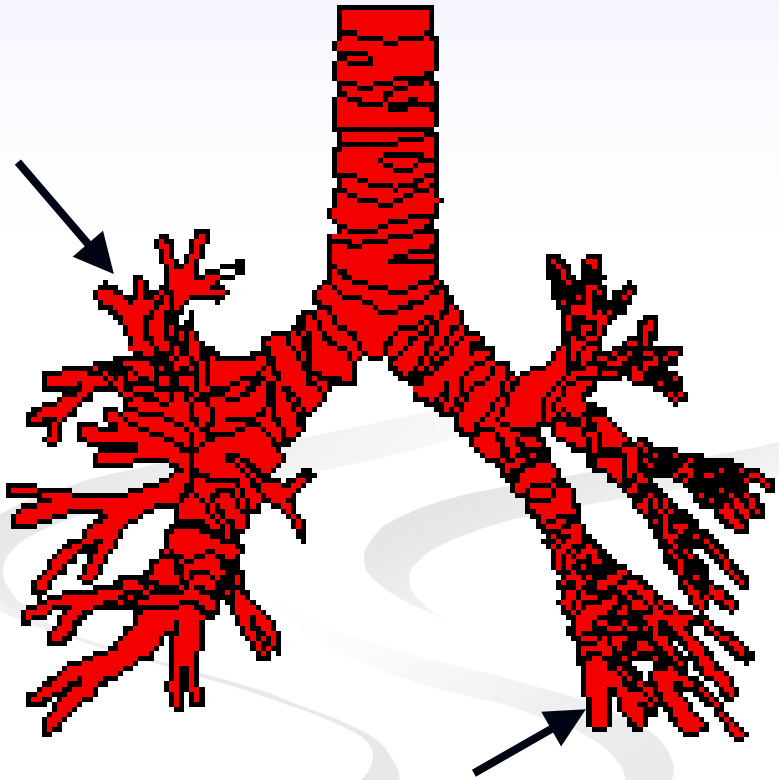
- 2 main branches of the trachea
- Lined with mucus and ringed with cartilage



Bronchioles

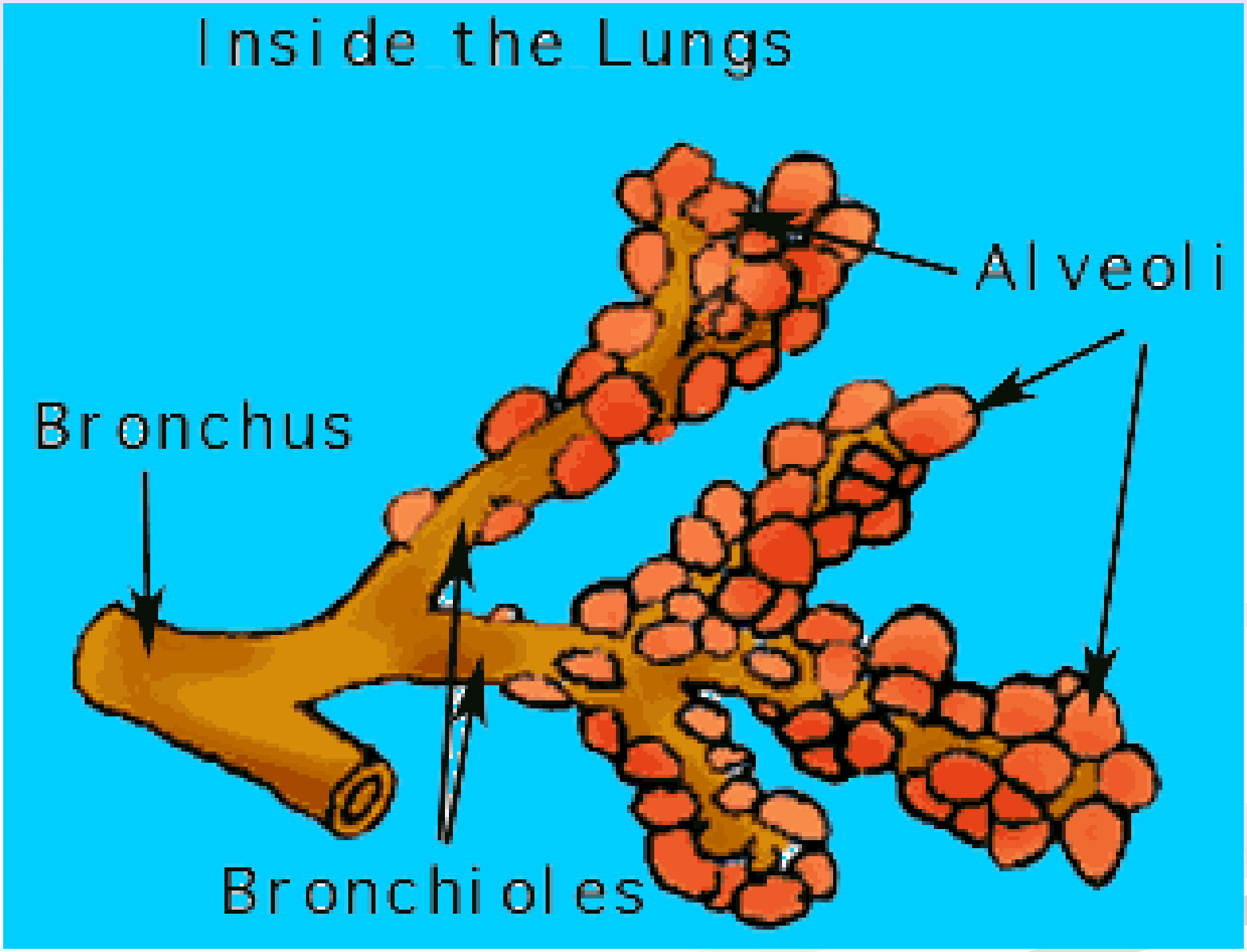
- Smaller branches of the bronchi
- Lined with mucus
- <u>NO cartilage rings</u>

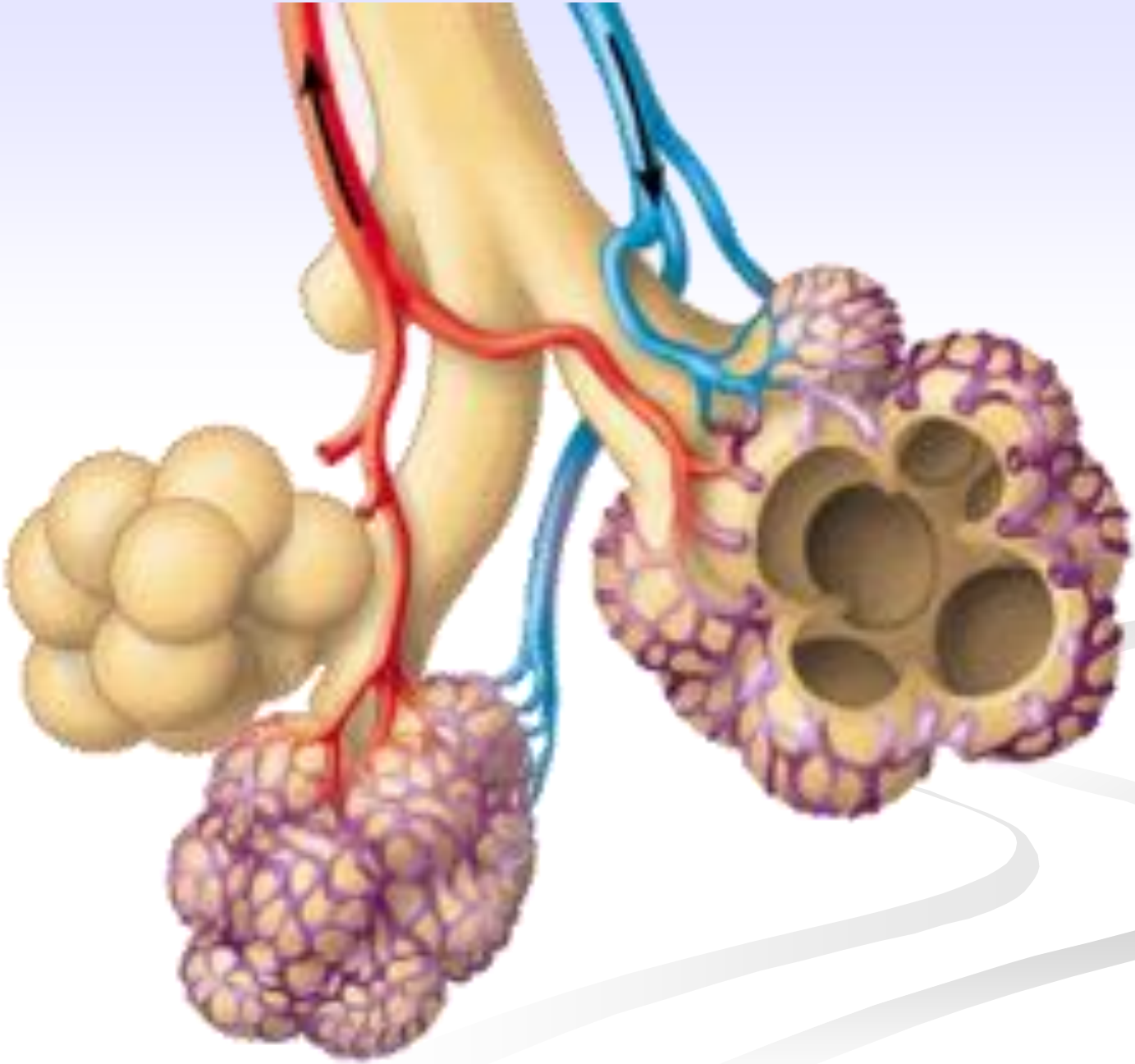
  (may close up during asthma or allergy attack)



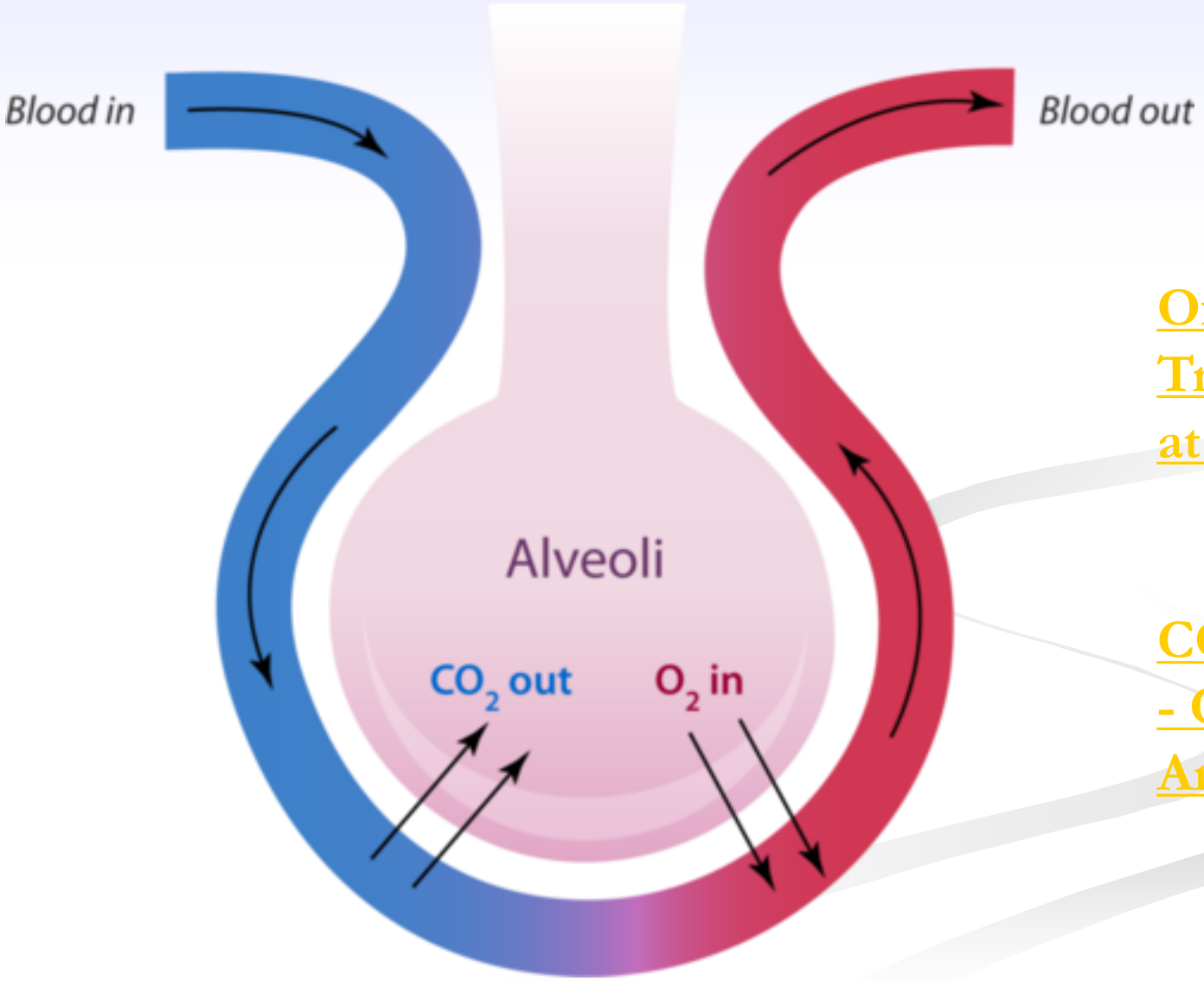
Alveoli

- Air sacs at ends of the bronchioles
- Functional unit of the lungs
- Thin, moist membranes surrounded by capillaries
- Gas exchange (diffusion)
- Inhaled O_2 enters the capillaries
- CO_2 enters the alveoli to be exhaled


Inside the Lungs
Alveoli
Bronchus
Bronchioles



Pulmonary Gas Exchange

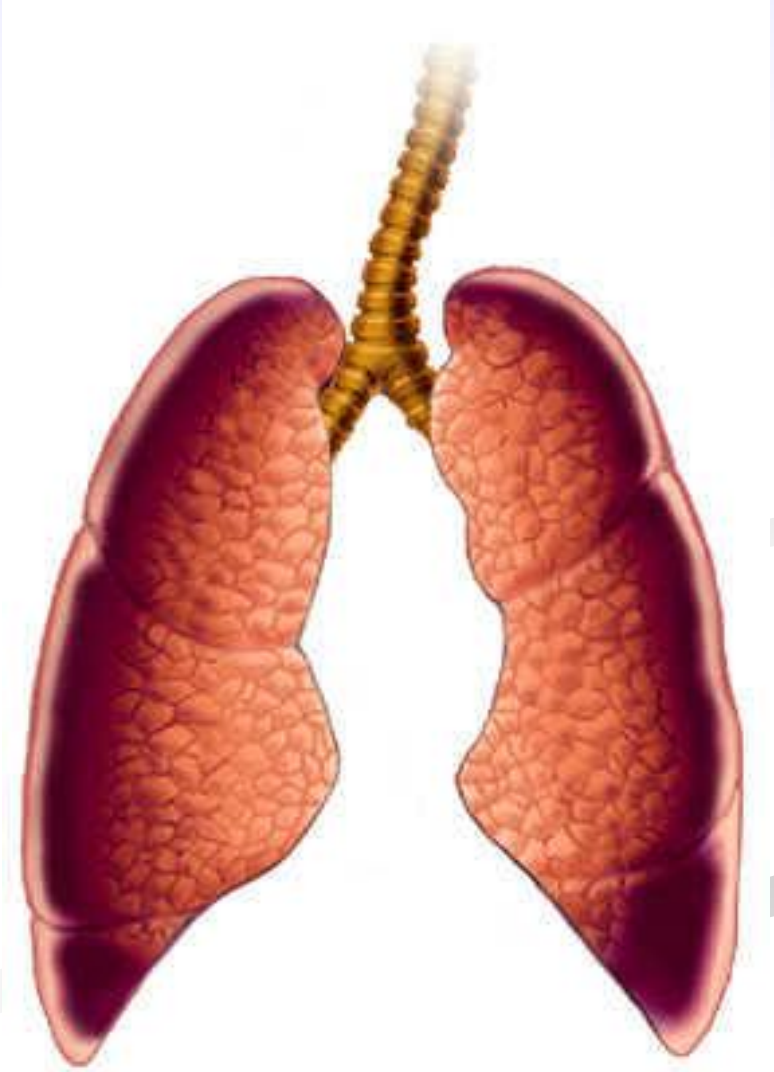


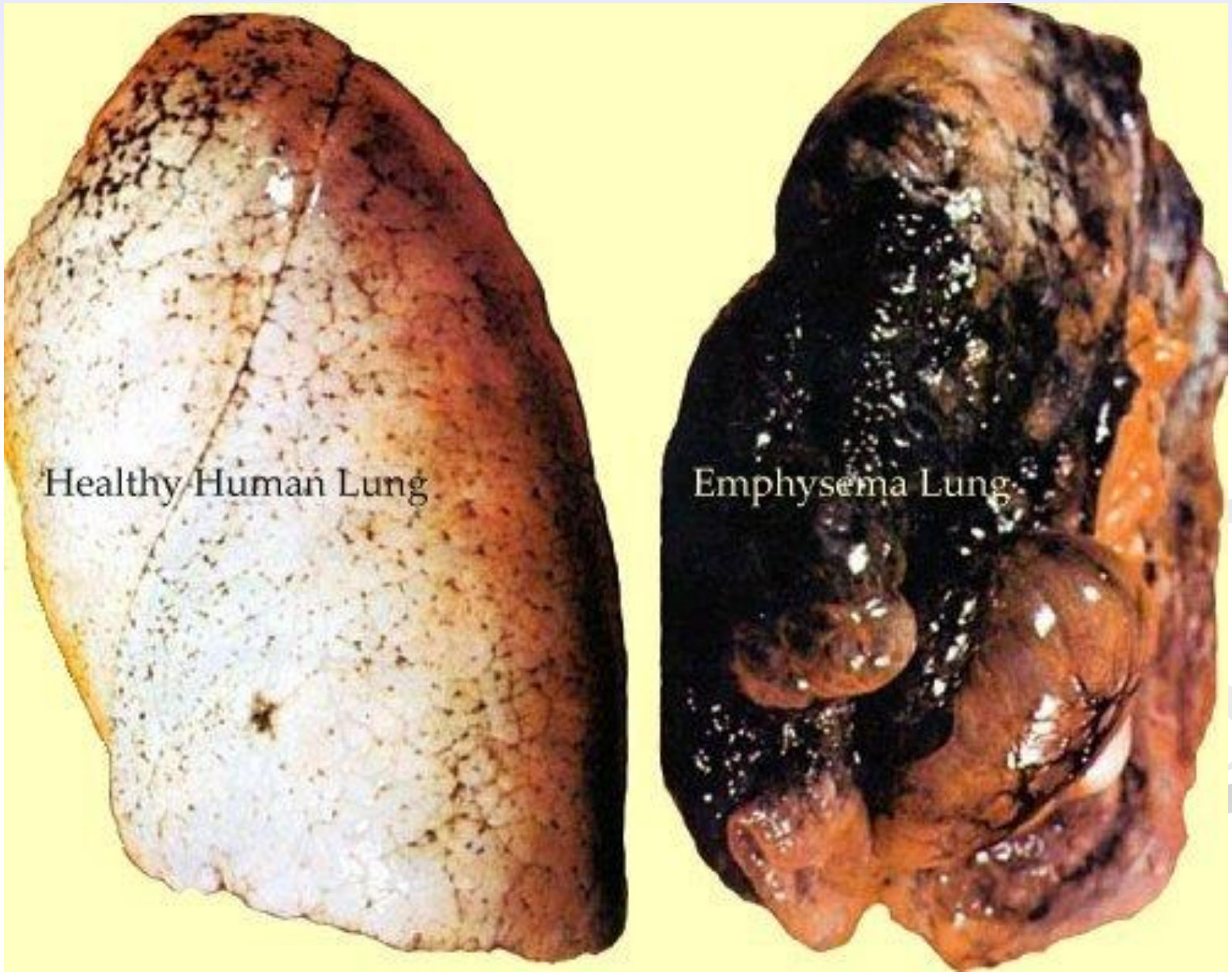
Oxygen Transport (stop at 2:10)

CO2 Transport - Carbonic Anhydrase

Lungs

- Spongy tissue including bronchioles and all alveoli




Healthy Human Lung
Emphysema Lung

1. One of the two openings in the nose. **nostril**	2. The fleshy folds of tissue in the larynx. They vibrate and produce sound when air passes through the opening between them. vocal cords
3. The system that includes your nose, trachea, lungs, and diaphragm. respiratory system	4. The smallest and thinnest air tubes in the lungs. They are connected to the alveoli. bronchioles
5. The air passage tube in your throat that leads to the lungs. This is also called your windpipe. trachea	6. The two tubes leading from the trachea to each lung. bronchi
7. A colorless gas that you breathe in. You need it to stay alive. oxygen	8. The dome-shaped sheet of muscle that forms the bottom of the chest cavity. diaphragm

9. The tiny air sacs in the lungs that take oxygen from the air and put it into the blood. **alveoli**	10. The muscle and cartilage where your vocal cords are located. This is also called your voice box. **larynx**
11. The tiny hairs inside your air tubes that keep dirt away from your lungs. **cilia**	12. The flap of cartilage behind your tongue. This closes the opening to your windpipe when you are swallowing food. **epiglottis**
13. The slimy liquid inside your nose and lungs that help to trap dirt from the air. This slimy liquid also helps to keep body passages moist and clean. **mucus**	14. The area at the back of your nose and mouth that allows air to pass into the trachea and food to pass into your esophagus. This is also known as your throat. **pharynx**

15. A sudden, explosive exhalation through the nose. **sneeze**	16. An explosive and sudden release of air through the mouth. **cough**
17. The bones that protect your lungs. **ribs**	18. The colorless gas that you breathe out as waste. **carbon dioxide**
19. To breathe in **inhale**	20. To breathe out **exhale**
21. This organ is the entrance to the respiratory tract in the body. It is also used for smelling. **nose / nasal cavity**	22. The two breathing organs where gas exchange occurs in the body. **lungs**

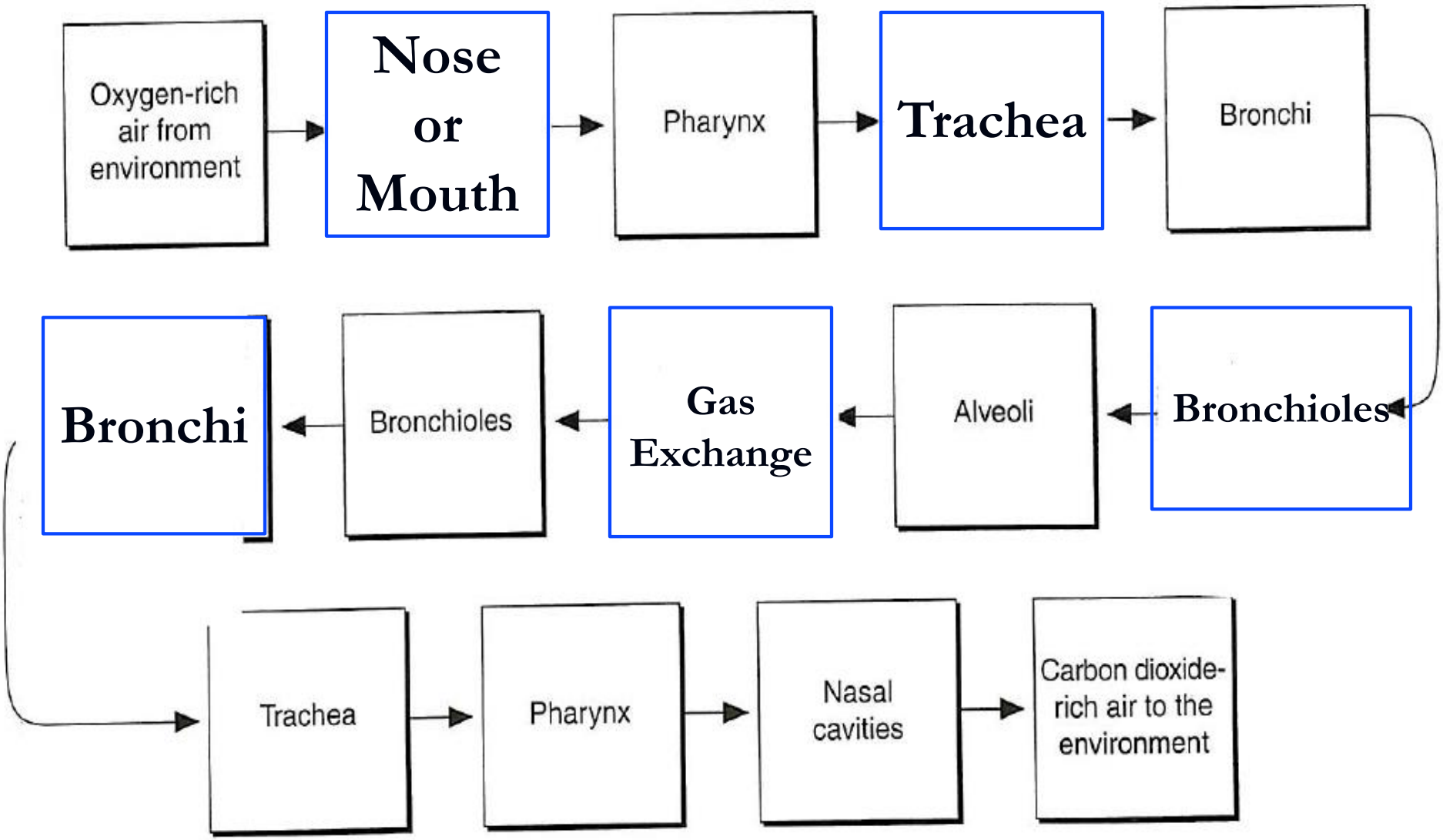
Lesson 2

Respiratory Functions

Air pathway

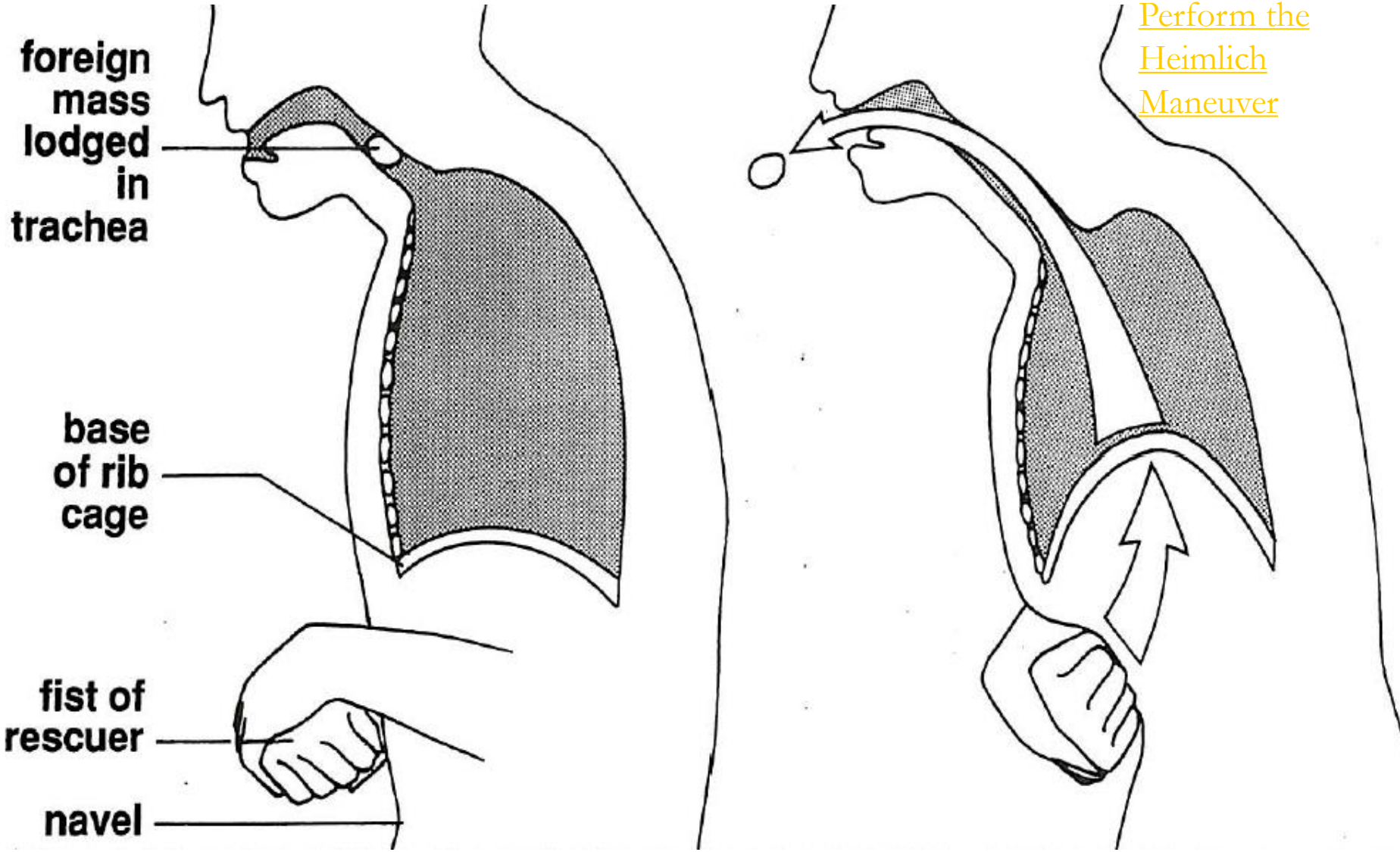
Breathing mechanisms

Pathway of Air



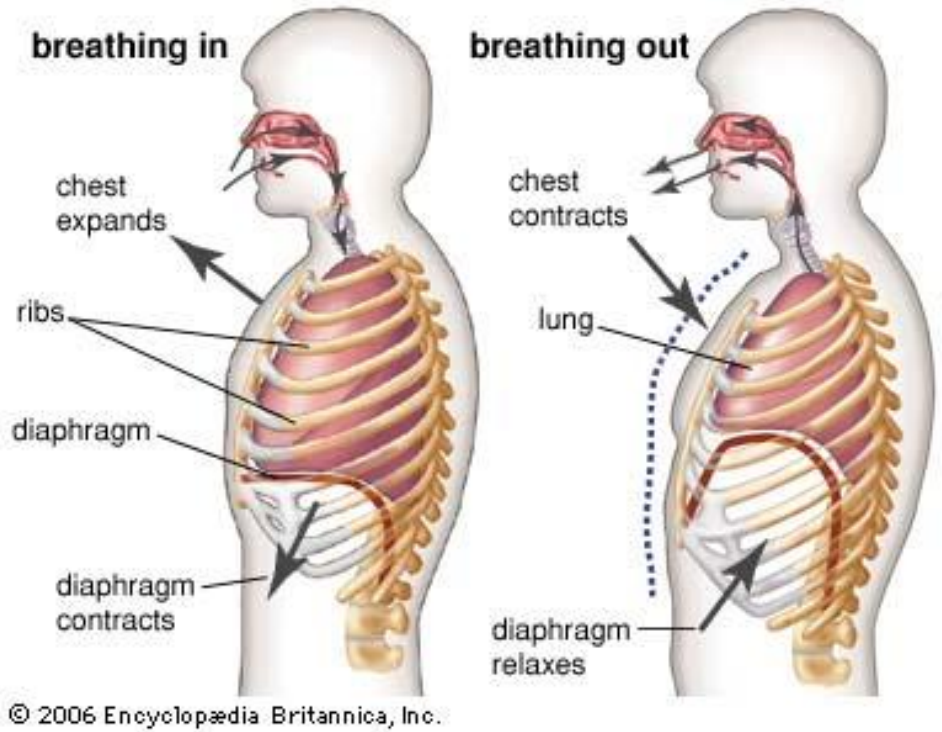
The Heimlich Maneuver can save a victim from choking. How can we apply this concept to understand the mechanics of breathing?

Video - How to Perform the Heimlich Maneuver



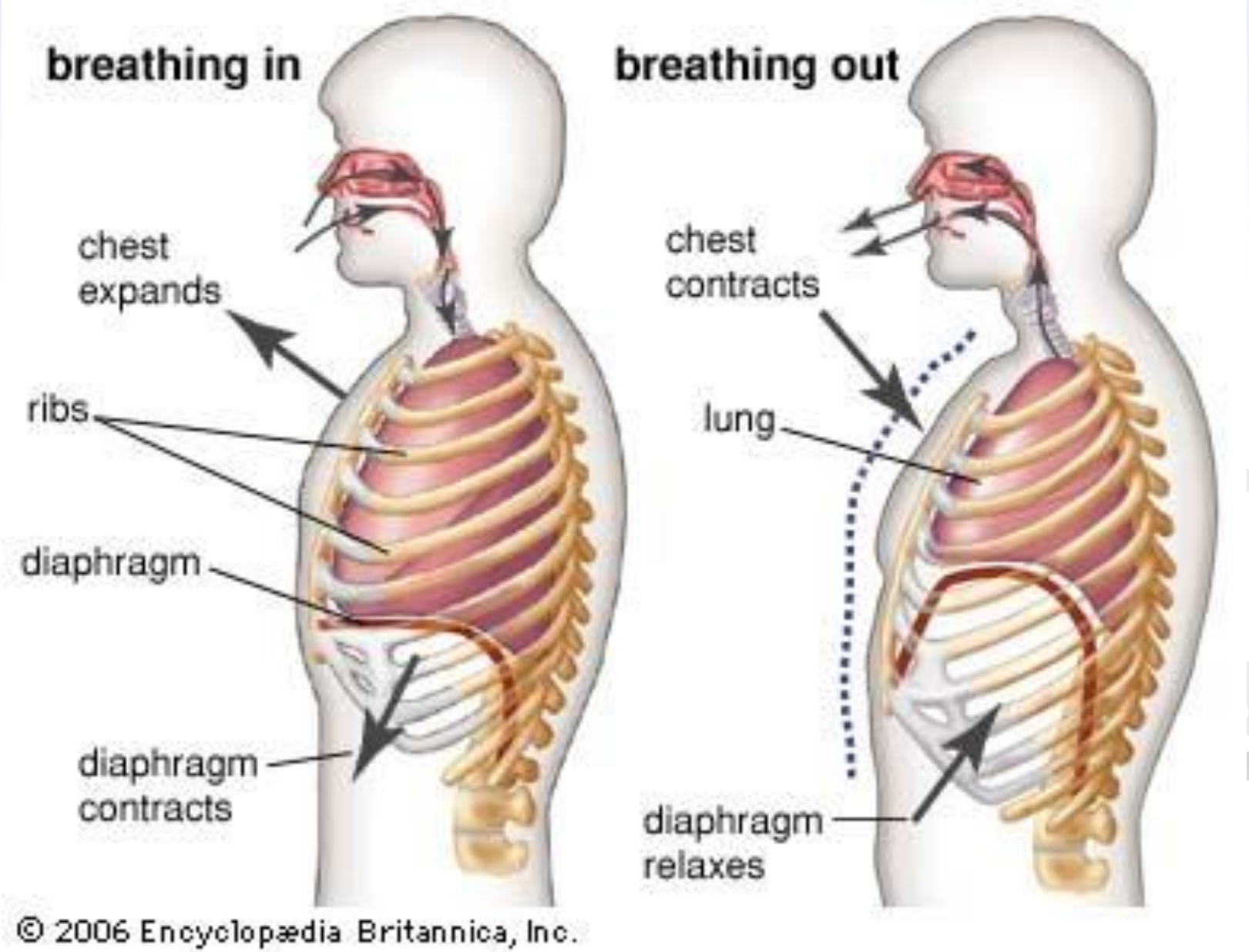
Diaphragm

- Dome shape muscle separating the thorax and the abdomen
- Contracts and flattens when you inhale
- Relaxes and curves up when you exhale



Breathing Video

Mechanics of Breathing



Rib Cage Muscles & Chest cavity

- Inhaling –
  - rib cage (intercostal) muscles contract
  - chest cavity expands
  - lower pressure in the lungs so air rushes in
- Exhaling –
  - rib cage muscles relax
  - chest cavity relaxes
  - Increased pressure in lungs forces air out

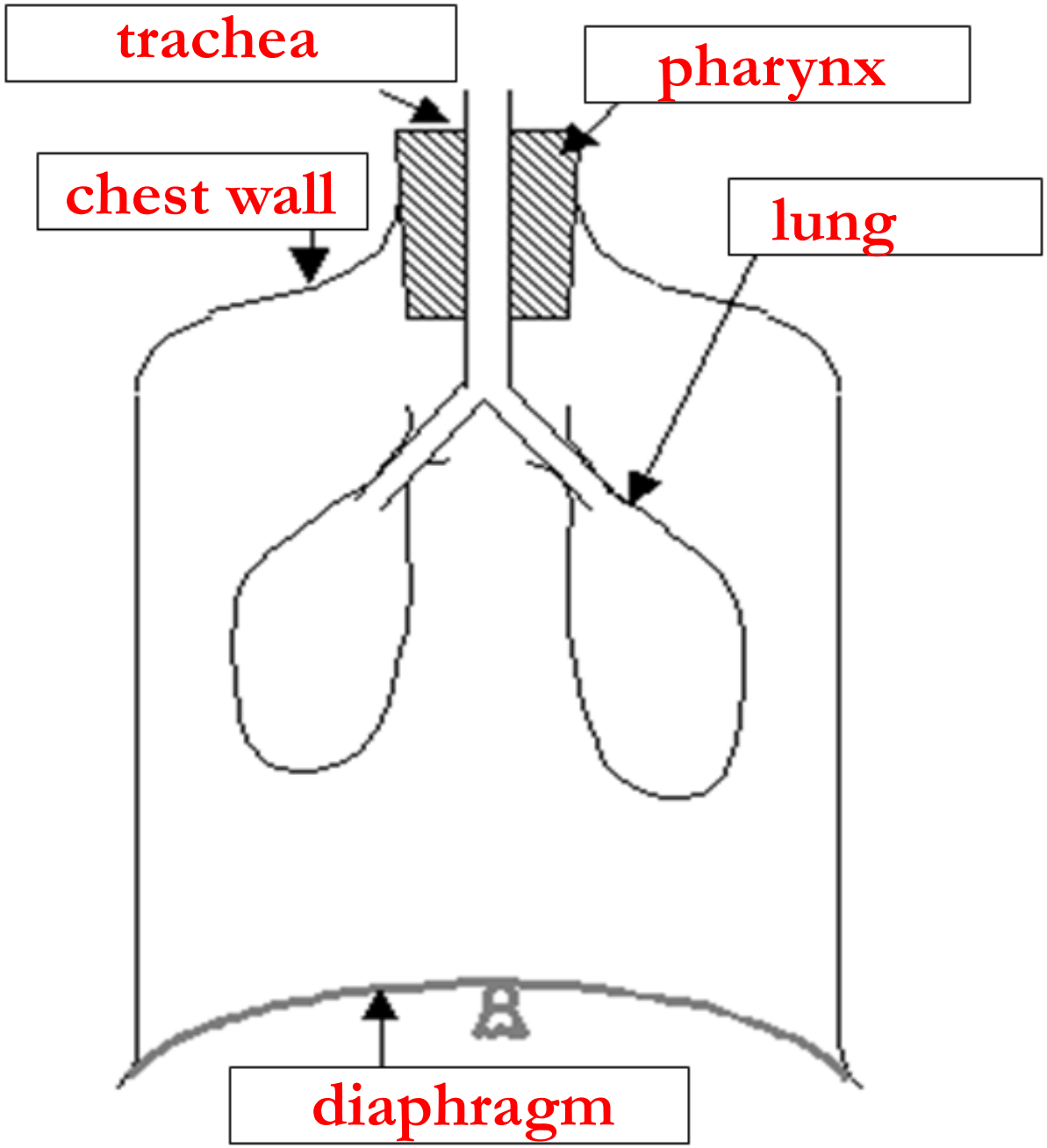
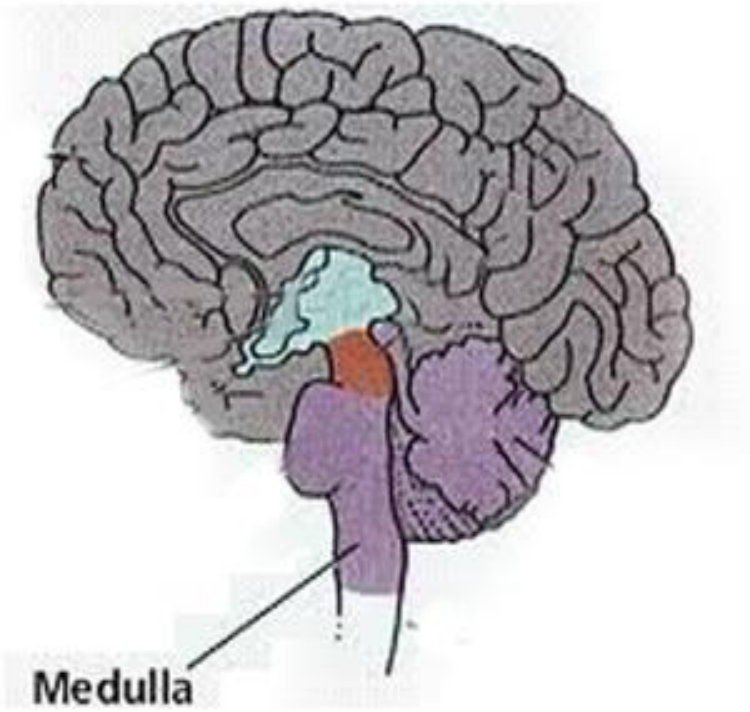

trachea
pharynx
chest wall
lung
diaphragm

Table 1 Comparison of Inhalation and Exhalation

Characteristic	Inhalation	Exhalation
1. Chest expands.	★	
2. Rib muscles relax.		★
3. Diaphragm moves upward.		★
4. Volume of the chest cavity increases.	★	
5. Rib muscles contract.	★	
6. Diaphragm relaxes.		★
7. Volume inside the chest cavity decreases.		★
8. Ribs move upward and outward.	★	
9. Diaphragm contracts.	★	
10. Air pressure in chest cavity decreases.	★	
11. Ribs move inward and downward.		★
12. Air rushes in.	★	
13. Air is forced out.		★
14. Diaphragm moves downward.	★	
15. Air pressure in chest cavity increases.		★

Breathing Rate

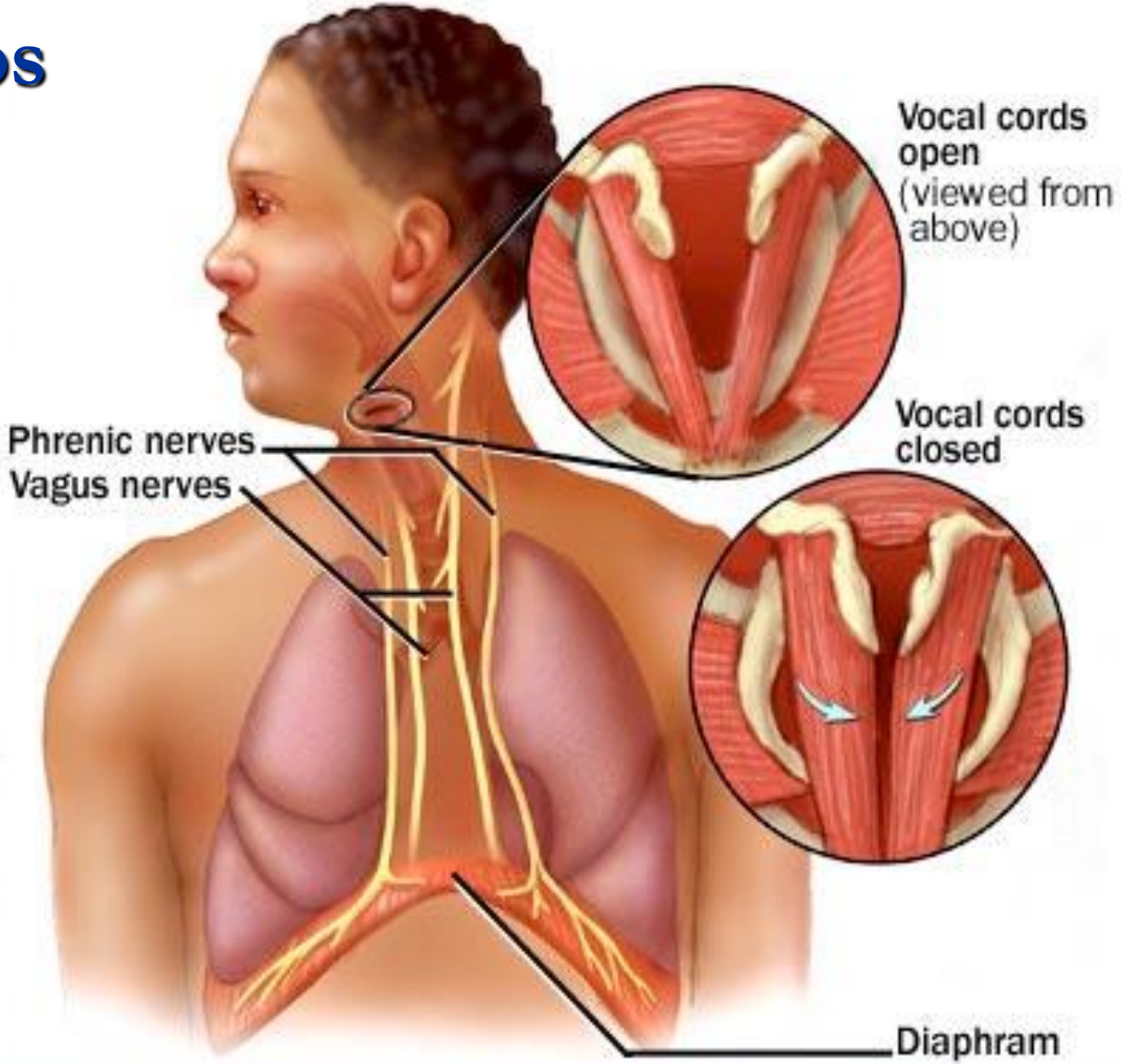
- controlled by the amount of $\underline{CO_2}$ in the blood
- detected by the medulla of the brain
- increased CO_2 levels lead to increased breathing rate

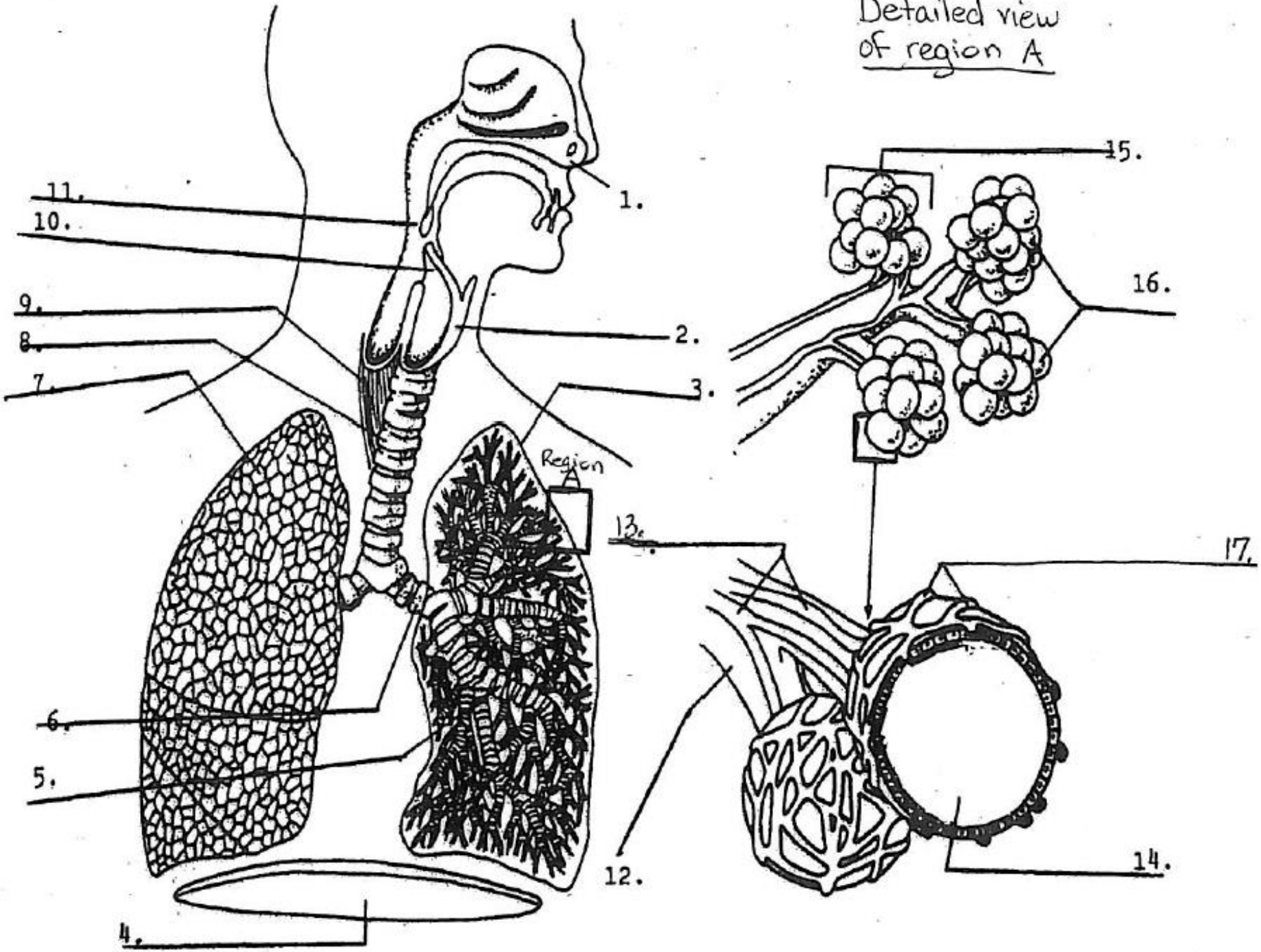


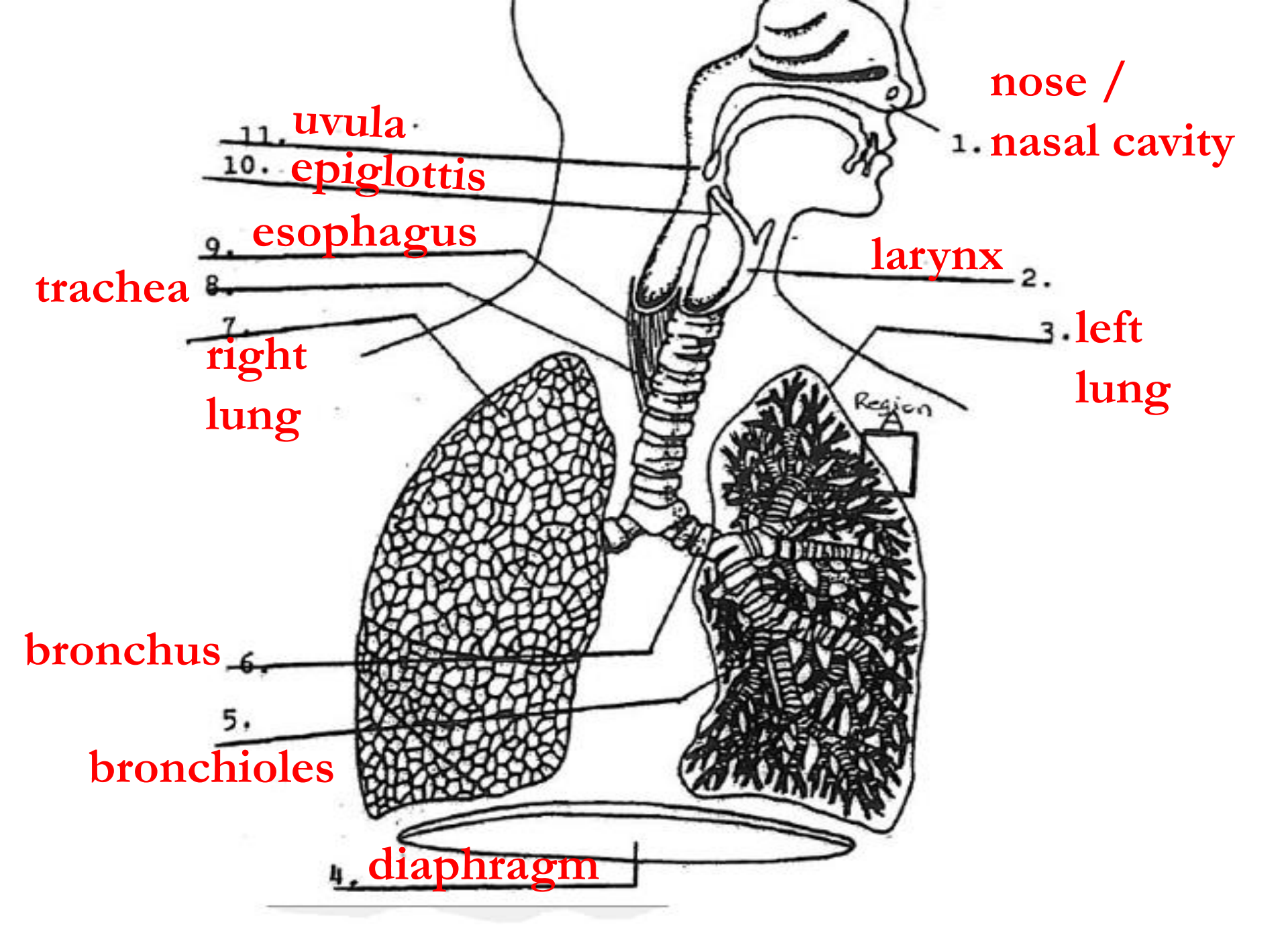
Hiccups

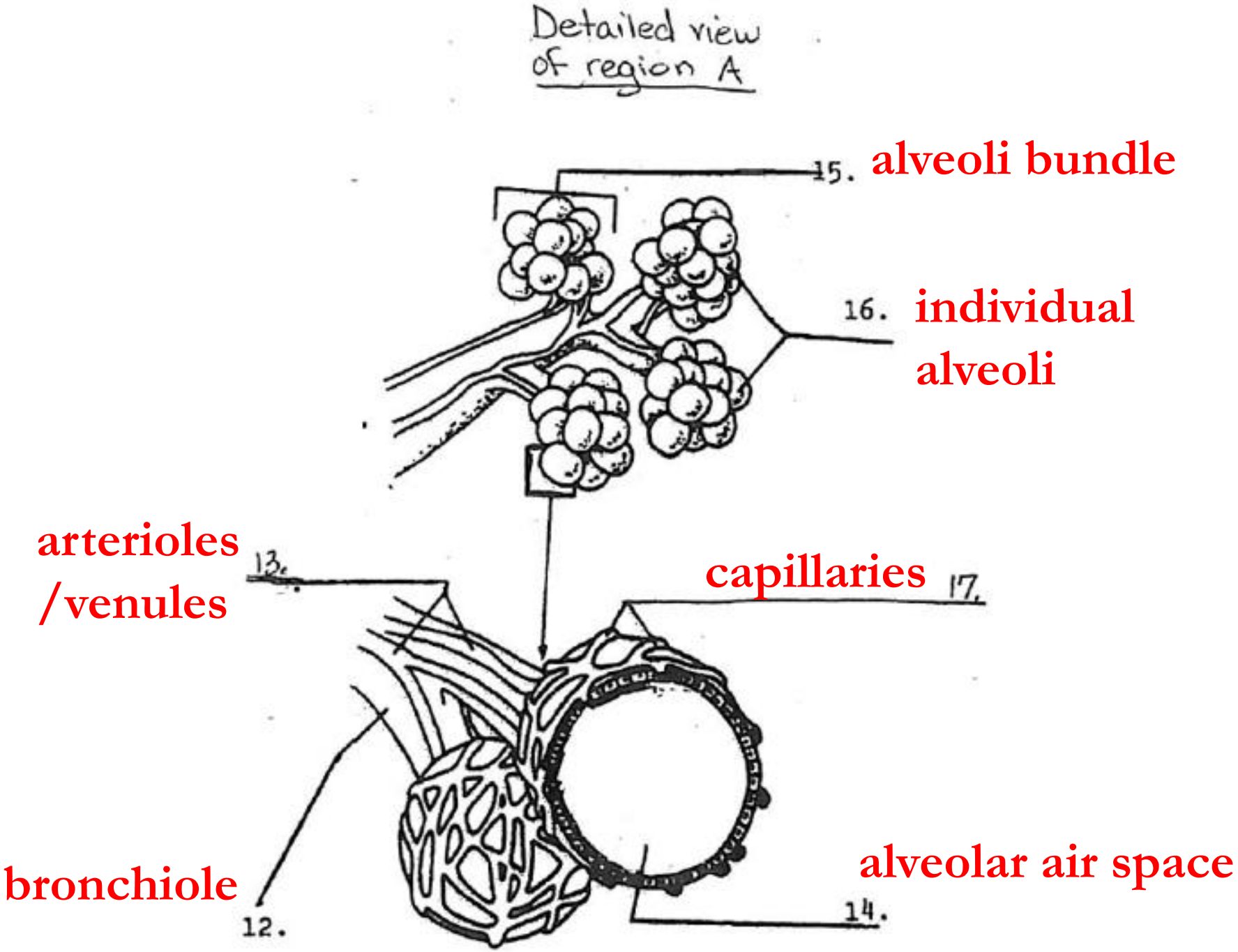
Video - What are hiccups?

Video - Hiccup girl




Detailed view of region A
11.
10.
9.
8.
7.
1.
2.
3.
Region A
6.
5.
4.
15.
16.
13.
17.
12.
14.


nose /
1. nasal cavity
11. uvula
10. epiglottis
9. esophagus
larynx
2.
trachea
8.
7.
3. left
right
lung
lung
Region
bronchus
6.
5.
bronchioles
4. diaphragm

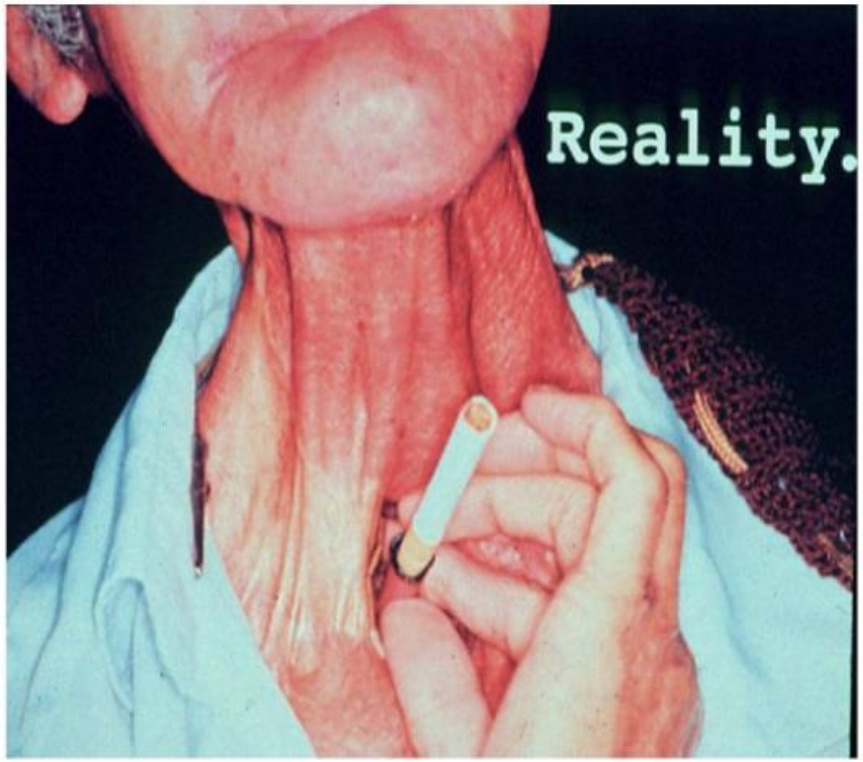

Detailed view
of region A
15.
alveoli bundle
16.
individual
alveoli
arterioles
/venules
13.
capillaries
17.
bronchiole
12.
alveolar air space
14.

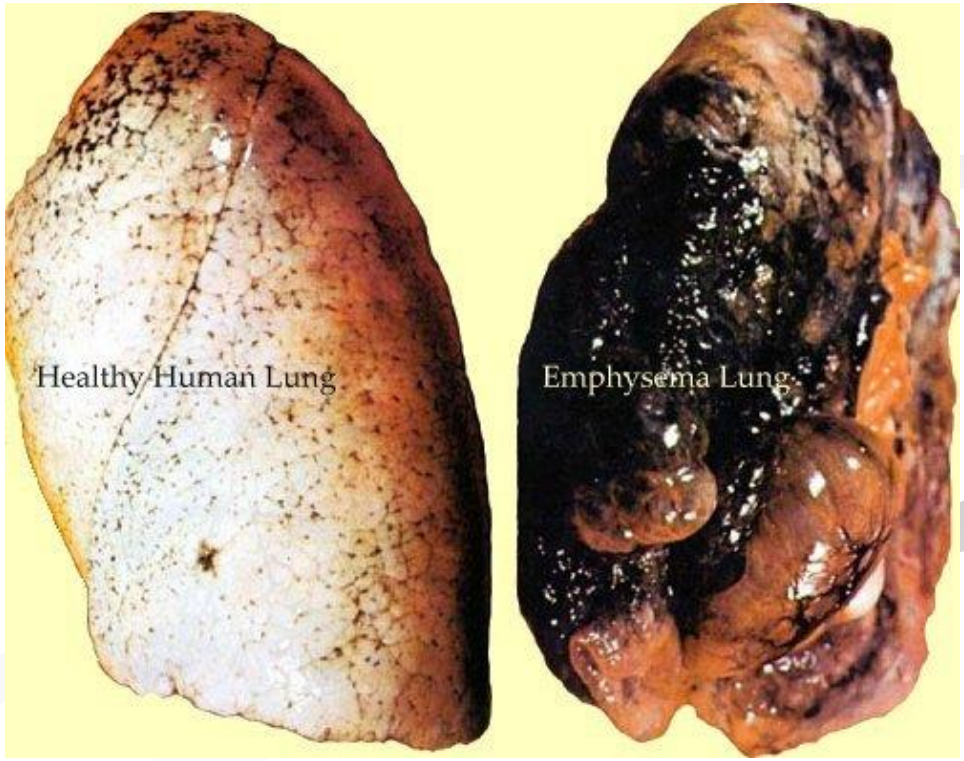
Lesson 3

Respiratory Malfunctions

- Pneumonia
- Bronchitis
- Asthma
- Emphysema

Respiratory System Malfunctions

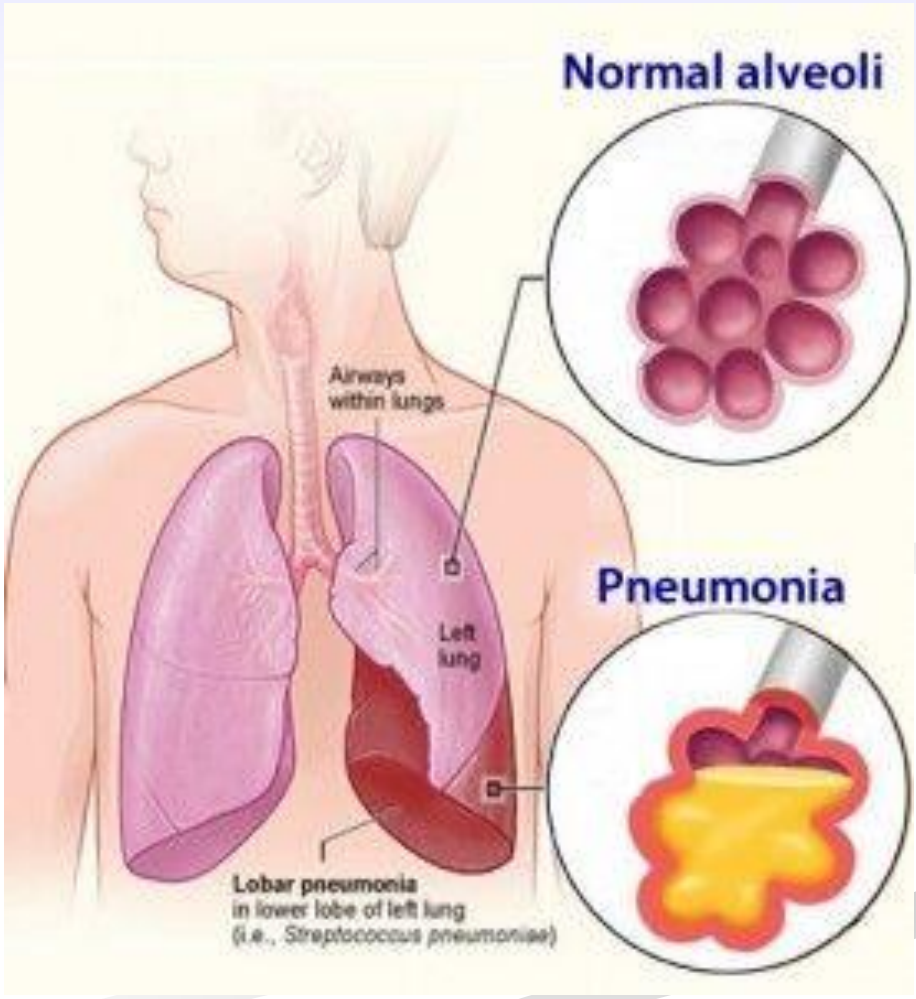




1. Pneumonia

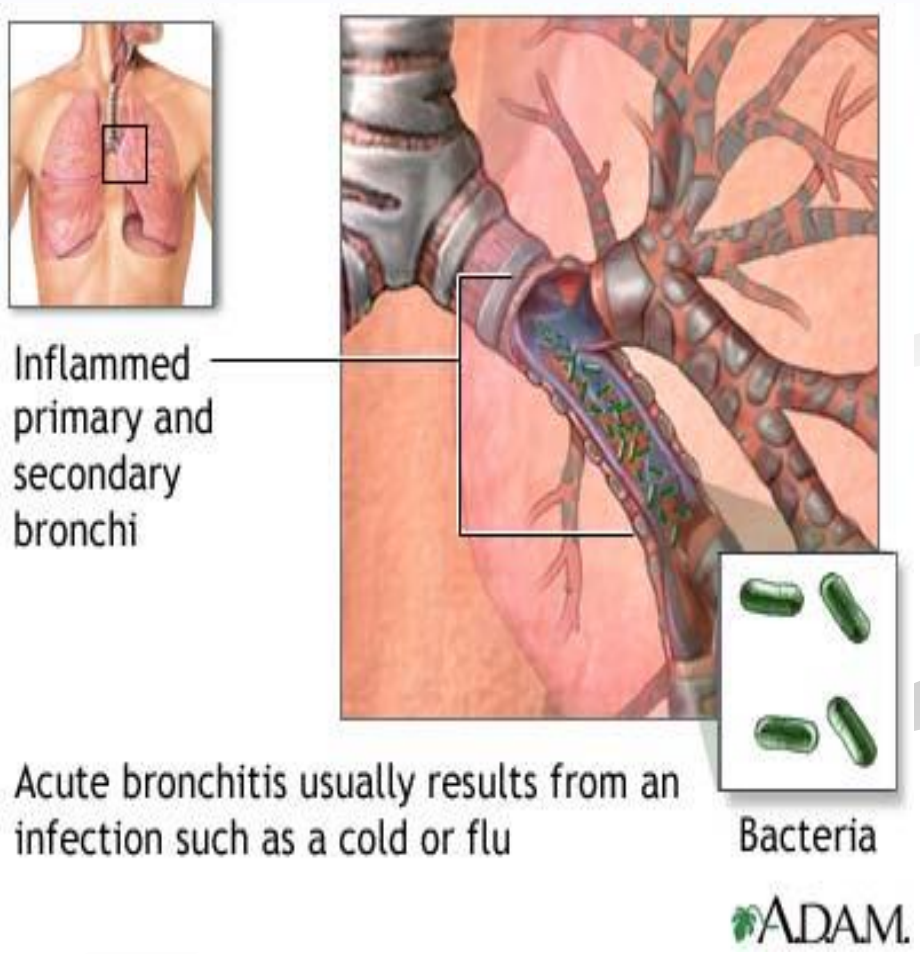
- Fluid develops in the alveoli of lungs
- ***cause***: bacteria or viral infection
- ***symptoms***: fever, chills, fatigue & excessive cough with mucus
- ***Treatments/prevention***: antibiotics & rest,

  wash hands often



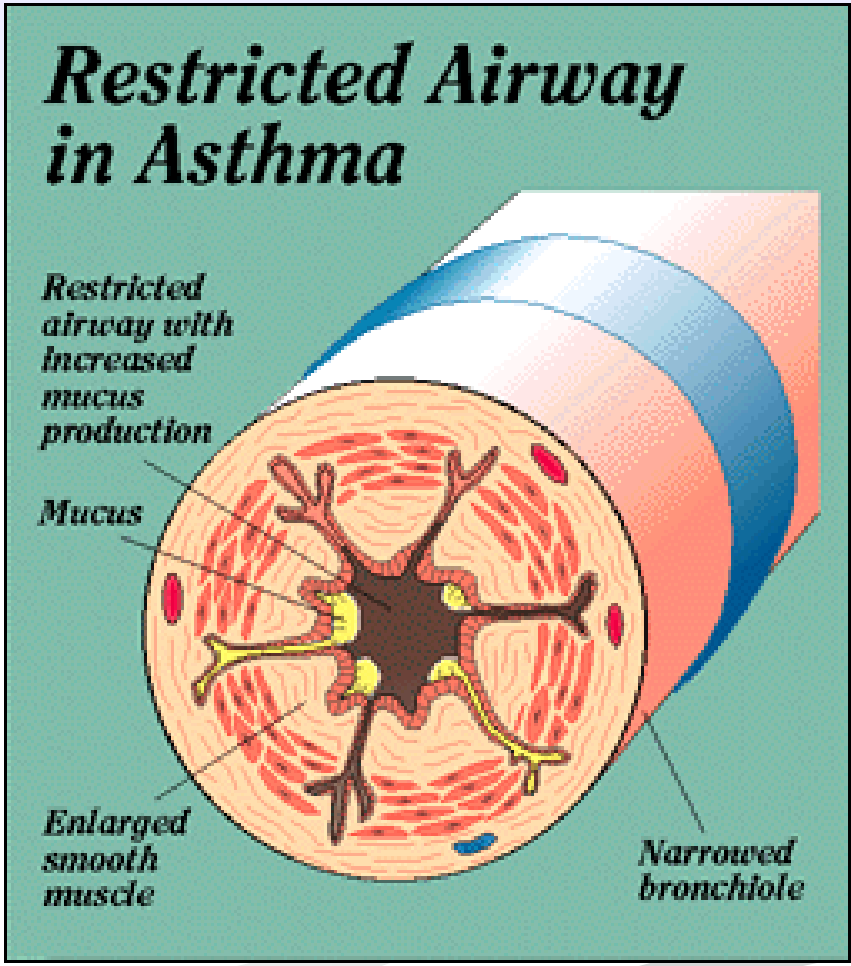
2. Bronchitis

- Inflammation of the bronchial tubes
- *cause*: bacterial / viral infection, lung irritant
- *symptoms*: cough, mild fever, tiredness, wheezing
- *treatments*: avoid irritants, drink liquids, rest



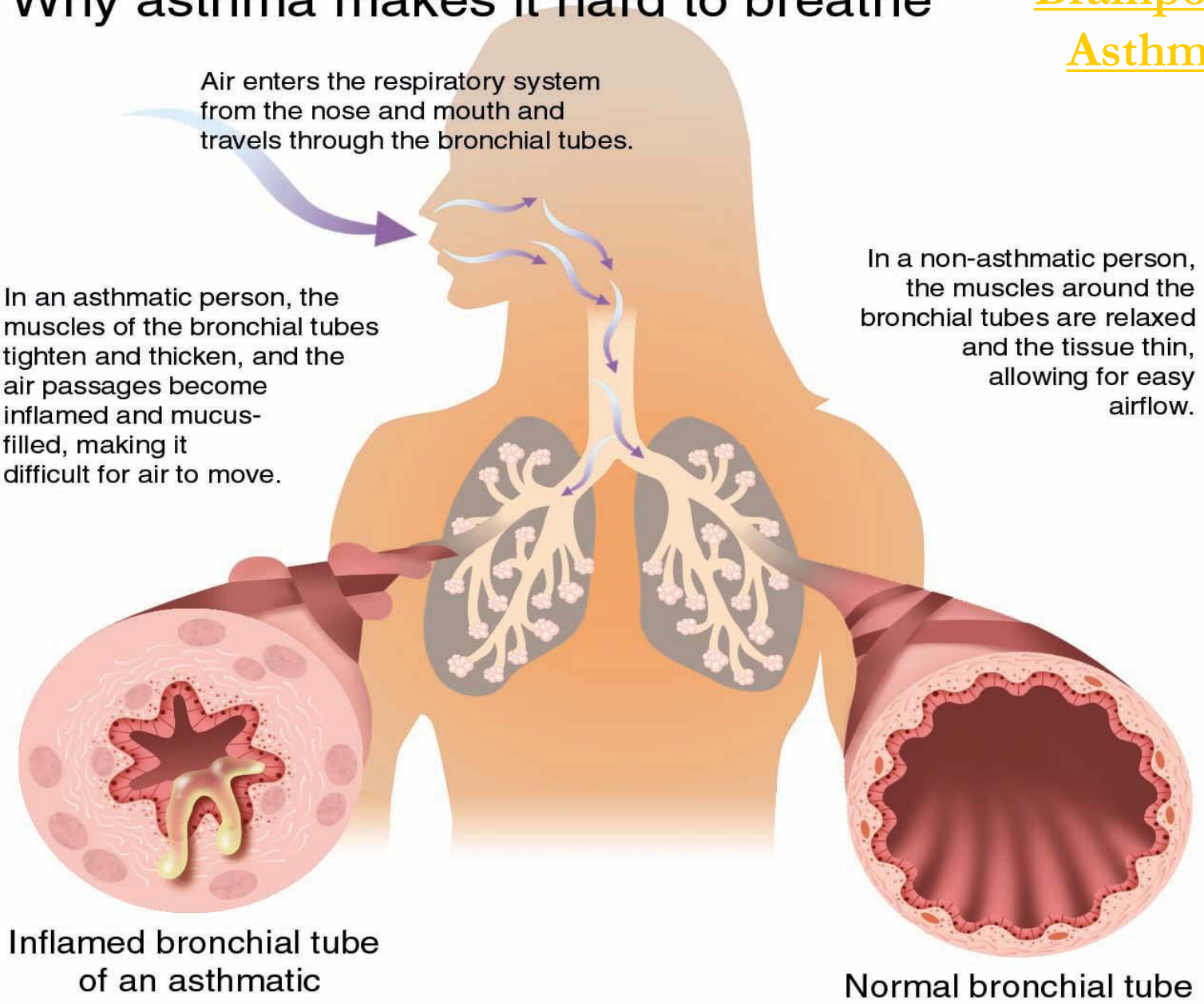
3. Asthma

- bronchioles constrict, airflow is reduced
- *cause:* triggered by an allergic response, smoke, dust, or stress
- *symptoms*: Difficulty breathing, chronic cough
- *treatments:* Inhaler or nebulizer, anti-inflammatory drugs



Why asthma makes it hard to breathe

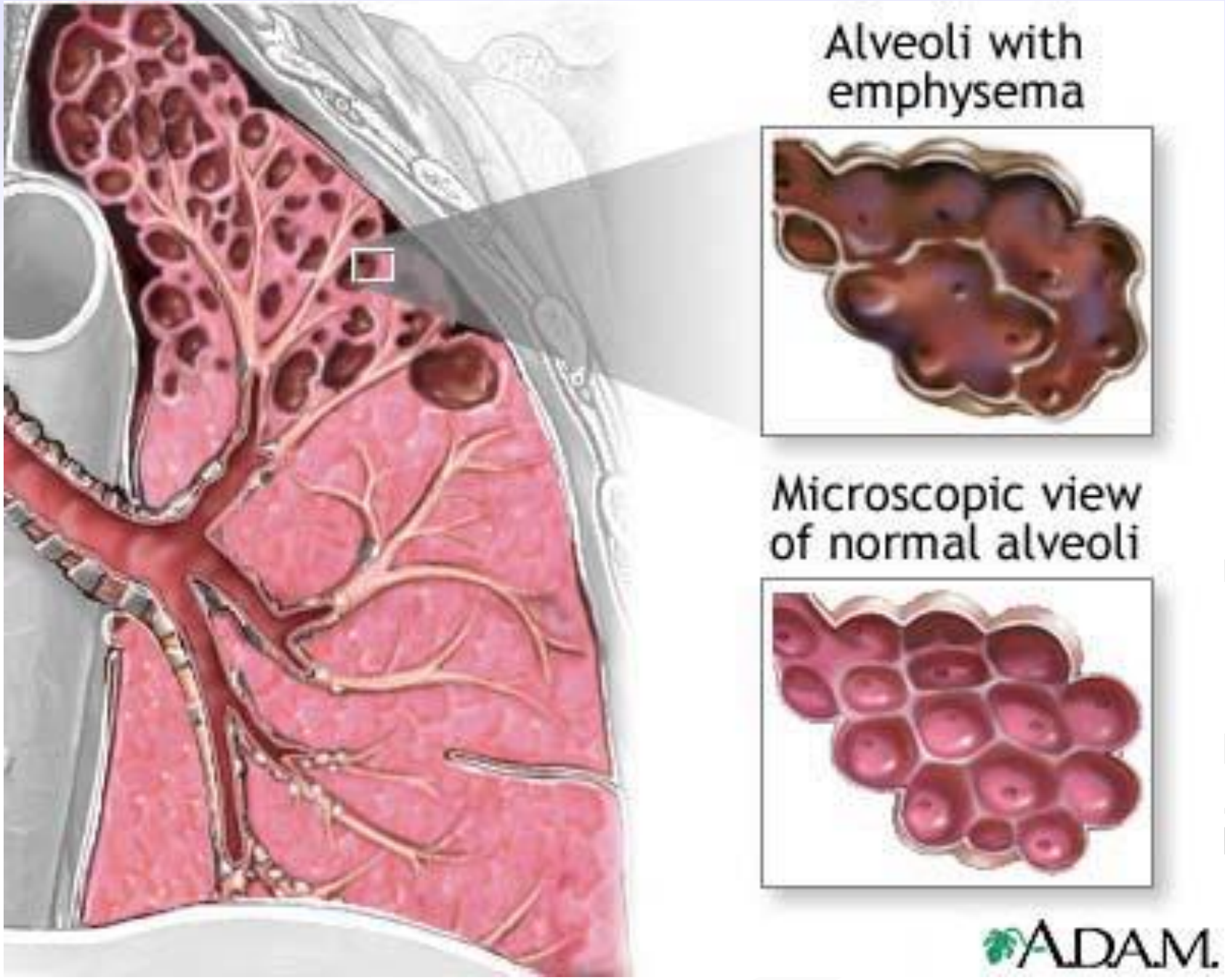
Brainpop - Asthma



Source: American Academy of Allergy, Asthma and Immunology

4. Emphysema

- breakdown of alveoli walls and loss of elasticity of lungs
- ***cause***: 80% of cases due to smoking, air pollution
- ***symptoms***: chronic cough, shortness of breath
- ***treatments***: no cure! oxygen therapy, stop smoking to slow progression


Alveoli with emphysema
Microscopic view of normal alveoli
A.D.A.M.