PHYSIOLOGY AND ANATOMY

Resuscitation and Hyper Inflation Systems

WHAT'S THE DIFFERENCE?

Anatomy is the study of the structure and identity of body parts or their FORM

Physiology is the study of how these parts function and relate to one another or their FUNTCION

ANATOMICAL REFERENCE TERMS

Anatomical/ Directional Terms

Distal - further from trunk
Proximal - closer to trunk

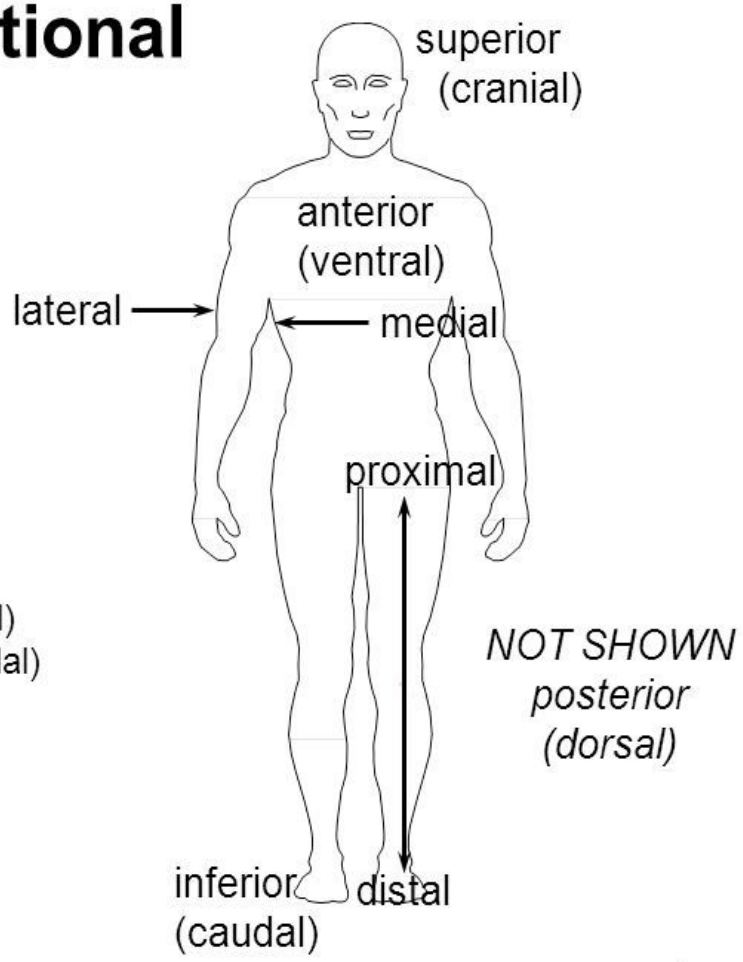
Lateral - away from midline
Medial - closer to midline

Anterior - front side (aka ventral)
Posterior - back side (aka dorsal)

Superior - closer to head (aka cranial)
Inferior - further from head (aka caudal)

Superficial - closer to surface
Deep - further from surface

Plantar - bottom of foot
Dorsal - top of foot



NOT SHOWN
posterior
(dorsal)

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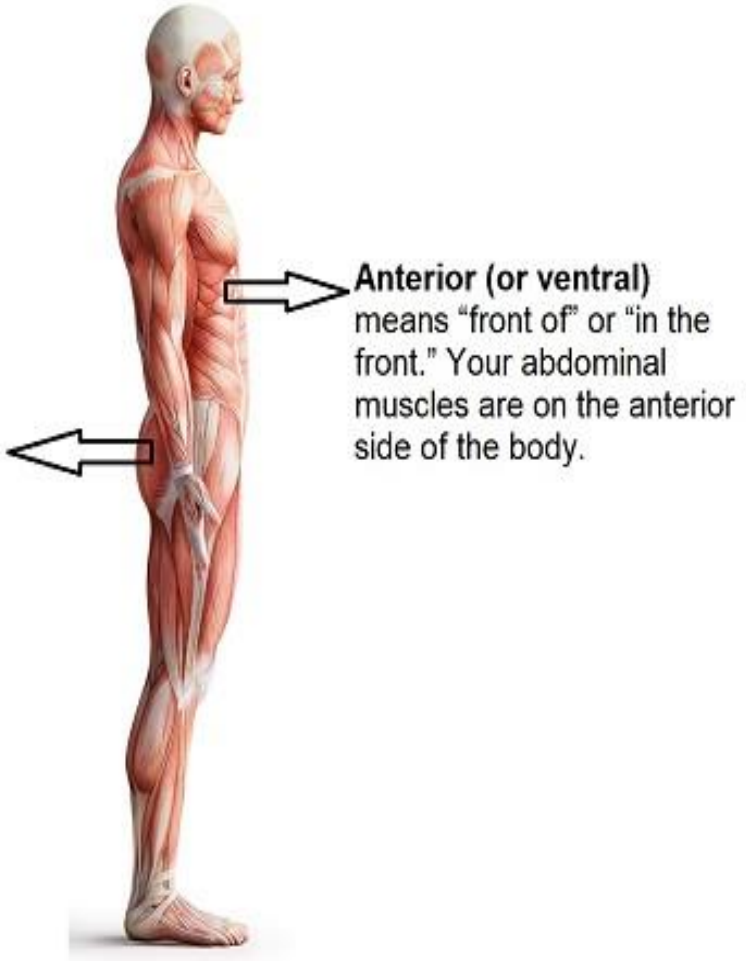

Posterior (or dorsal) means the opposite of anterior: "back of" or "behind/on the back."

Anterior (or ventral) means "front of" or "in the front." Your abdominal muscles are on the anterior side of the body.

CPR (RESUSCITATION) - DEFINED

Cardiopulmonary resuscitation (CPR) is a technique of basic life support for the purpose of maintaining oxygenation to the heart, lungs and brain.

BACK TO CPR…

Respiratory arrest is a condition that exists at any point a patient stops breathing or is ineffectively breathing.

It often occurs at the same time as cardiac arrest, but not always. In the context of advanced cardiovascular life support, however, respiratory arrest is a state in which a patient stops breathing but maintains a pulse.

Importantly, respiratory arrest can exist when breathing is ineffective, such as agonal gasping. (*The gasping associated with agonal breathing is not true breathing, but rather a brainstem reflex. Agonal breathing often occurs because the heart is no longer circulating oxygen-rich blood. In other cases, it may be due to the lungs not bringing in enough oxygen.)*

RESPIRATORY ARREST

For the purposes of respiratory arrest, the patient will have circulation and thus there is no need to defibrillate. Indeed, there is no need for chest compressions or formal CPR for that matter. Respiratory arrest management, at least initially, centers on successful ventilation.

The ACLS survey

- Airway
- Breathing
- Circulation
- Differential diagnosis

The first goal is to establish an open airway in the patient. The rescuer should use the tools available to them according to a given situation and as appropriate. For instance, if the patient is found in respiratory arrest in a non-hospital setting, the rescuer may only be able to use basic airway techniques such as head tilt/chin left or jaw thrust maneuver. Incidentally, the head tilt/chin left is used when cervical spine injury is not an issue and the jaw thrust maneuver is used when an injury to the cervical spine is suspected or feared. If an oropharyngeal or nasopharyngeal airway device is available, consider using these means to assist in airway maintenance (see A Review of Airways).

When you are administering artificial respiration, you are breathing for the patient. Avoid excessive ventilation and make sure that you see the chest rise and fall with breaths. Are you providing sufficient oxygenation? If you have access to supplemental oxygen, use it. You may use 100% oxygen initially, but it is best to titrate the level of supplemental oxygen necessary to achieve blood oxygen levels of 94% or higher (based on pulse oximetry). Likewise, if you have access to quantitative waveform capnography, you can use it to monitor end tidal carbon dioxide.

Remember that a person who is in respiratory arrest may enter cardiac arrest at any moment. Therefore, it is important to check for pulses to assess circulation. If the patient enters cardiac arrest at any moment, you should follow the cardiac arrest resuscitation algorithm immediately.

CAUSES OF RESPIRATORY ARREST

- Drowning
- Stroke
- Cardiac Arrest
- Drug overdose
- Suffocation
- Accident / injury
- Head Trauma
- Neuro muscular paralysis
- Spinal injuries

QUICK TERMINOLOGY CHECK…

What's the difference between a Heart Attack (MI) and a Cardiac Arrest?

BOTH BAD BUT DIFFERENT

A heart attack is when the flow of oxygen-rich blood in one or more of the coronary arteries becomes blocked, and a section of heart muscle can't get enough oxygen. If blood flow isn't restored quickly that section of heart muscle begins to die.

Cardiac arrest is the absence of a heartbeat.

CARDIAC ARREST VS. HEART ATTACK

WHAT'S THE DIFFERENCE?

CARDIAC ARREST

CARDIAC ARREST IS AN "ELECTRICAL" PROBLEM, OCCURING WHEN THE HEART MALFUNCTIONS & STOPS BEATING UNEXPECTEDLY.

An irregular heartbeat, caused by an electrical malfunction, triggers cardiac arrest. The heart is unable to pump blood to the brain, lungs, and other organs.

Within seconds a person will become unresponsive and stop breathing. If not treated within mintues, death occurs.

HEART ATTACK

A HEART ATTACK IS A "CIRCULATION" PROBLEM, OCCURING WTHEN BLOOD TO THE HEART IS BLOCKED.

Blocked artery prevents oxygen-rich blood from reaching the heart. If this blocked artery is not reopened, the unnourished part of the heart begins to die.

Discomfort in chest, shortness of breath, cold sweats, nausea, and/or vomiting may occur. Unlike cardiac arrest, the heart doesn't stop beating during a heart attack.

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AGAIN…

Cardiac arrest is the absence of a heartbeat

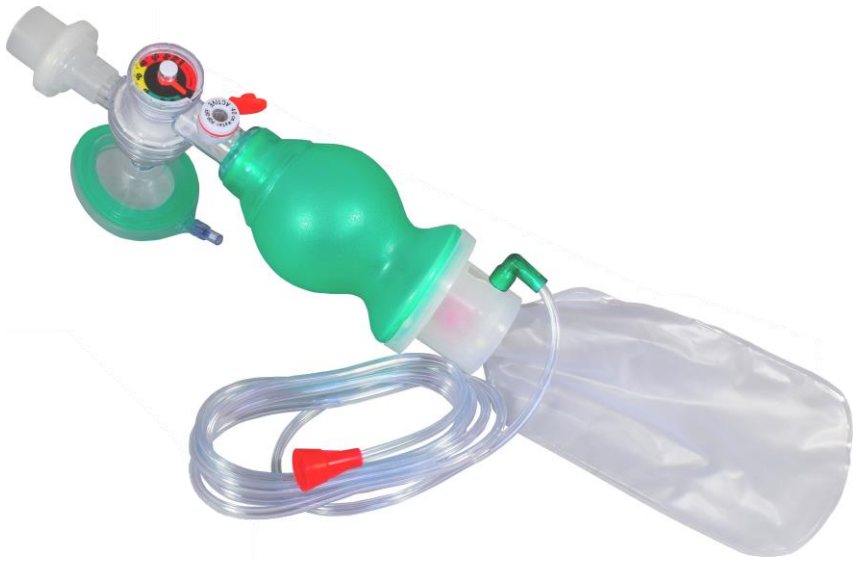
(Respiratory arrest again is the absence of adequate ventilation)

Patients may experience one or both but if they experience a CA, RA will imminently follow

Both require manual intervention or death will result

- How many cardiac arrests occur annually outside the hospital?
- How many CA occur inside the hospital?
- Likelihood of survival inside a hospital?
- Likelihood of survival outside a hospital?

SUNMED RESUS PORTFOLIO



RESUS BAGS

There are two types of ventilation bags, self-inflating bags and flow-inflation bags.

Self-Inflating Ventilation Bags

- A self-inflating bag refills itself when you stop squeezing it. Self-inflating resuscitation bags are commonly imprecisely called by one proprietary name, the Ambu bag. Squeezing the bag inflates the lungs. Releasing the pressure allows the bag to refill with air as well as with oxygen if an oxygen source is attached.
- The use of a self-inflating bag without supplemental oxygen will deliver an oxygen concentration of 21%. Most sick or injured patients need more oxygen than that. When the bag is attached to oxygen at a rate of 10-12 liters per minute you will deliver O2 levels of 40-60%. Adding a reservoir bag and running O2 at 12-15 liters per minute raises the concentration to 100%, but only if the reservoir is allowed to fill. In contrast, a flow inflation bag is filled with 100% oxygen all of the time.

HYPER INFLATION (FLOW INFLATING)

- Unlike a self-inflating bag, which looks like a soft filled football when not in use, an empty free flow inflation ventilation bag looks like a deflated balloon. A flow inflation bag requires constant fresh flow of oxygen into the bag: flow-inflation bags won't refill if the oxygen source is empty or detached. In addition you must maintain a good seal on the ventilation mask against the face, otherwise the bag deflates and you can't ventilate.
- Flow-inflation, or inflow dependent bags, while more challenging to use, are common on anesthesia machines and in other ICU type settings because they allow finer control of tidal volume, and greater ability to assess the ventilation, and provide a higher FiO2.
- Because the flow-inflating bag is soft, you can easily feel lung compliance and changes in resistance. When ventilating a neonate with a 500 ml bag, extremely fine control of tidal volume is possible, even while giving tidal volumes less than 50 ml. With spontaneous ventilation, you can actually see and feel the bag partially deflate with each inhalation before it reinflates with the gas flow. The amount of deflation gives a good indication of tidal volume. To the experienced hand, you will know immediately when you have lost the seal because the bag will go flat. This is unlike a self-filling bag that may lure you into a false sense of security because it's always full, even if the lungs are not filling well.

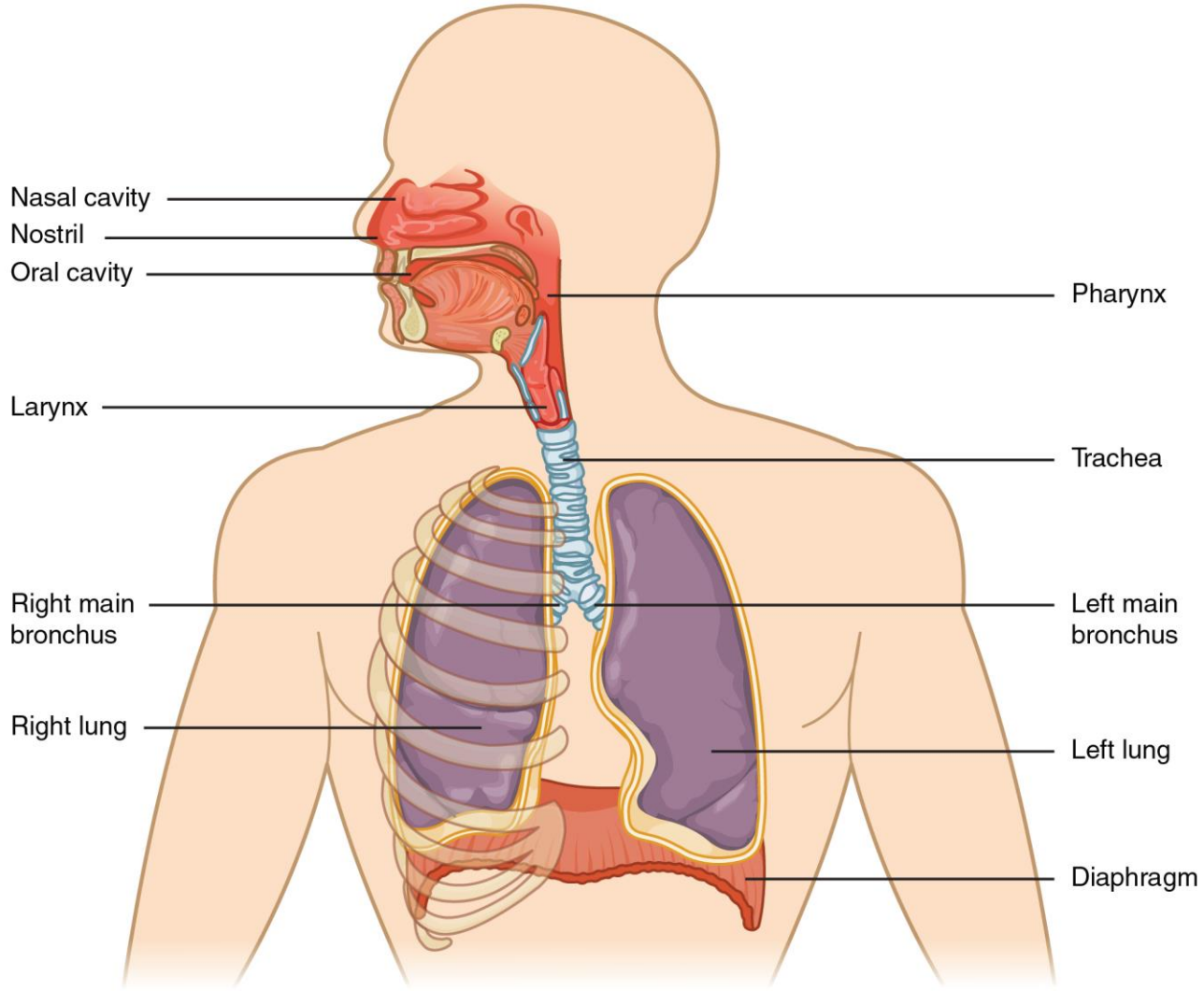
BVM – BAG VALVE MASK VENTILATION

There is considerable evidence that a variety of health care professionals do not consistently provide adequate bag valve mask (BVM) ventilation (BVMV).

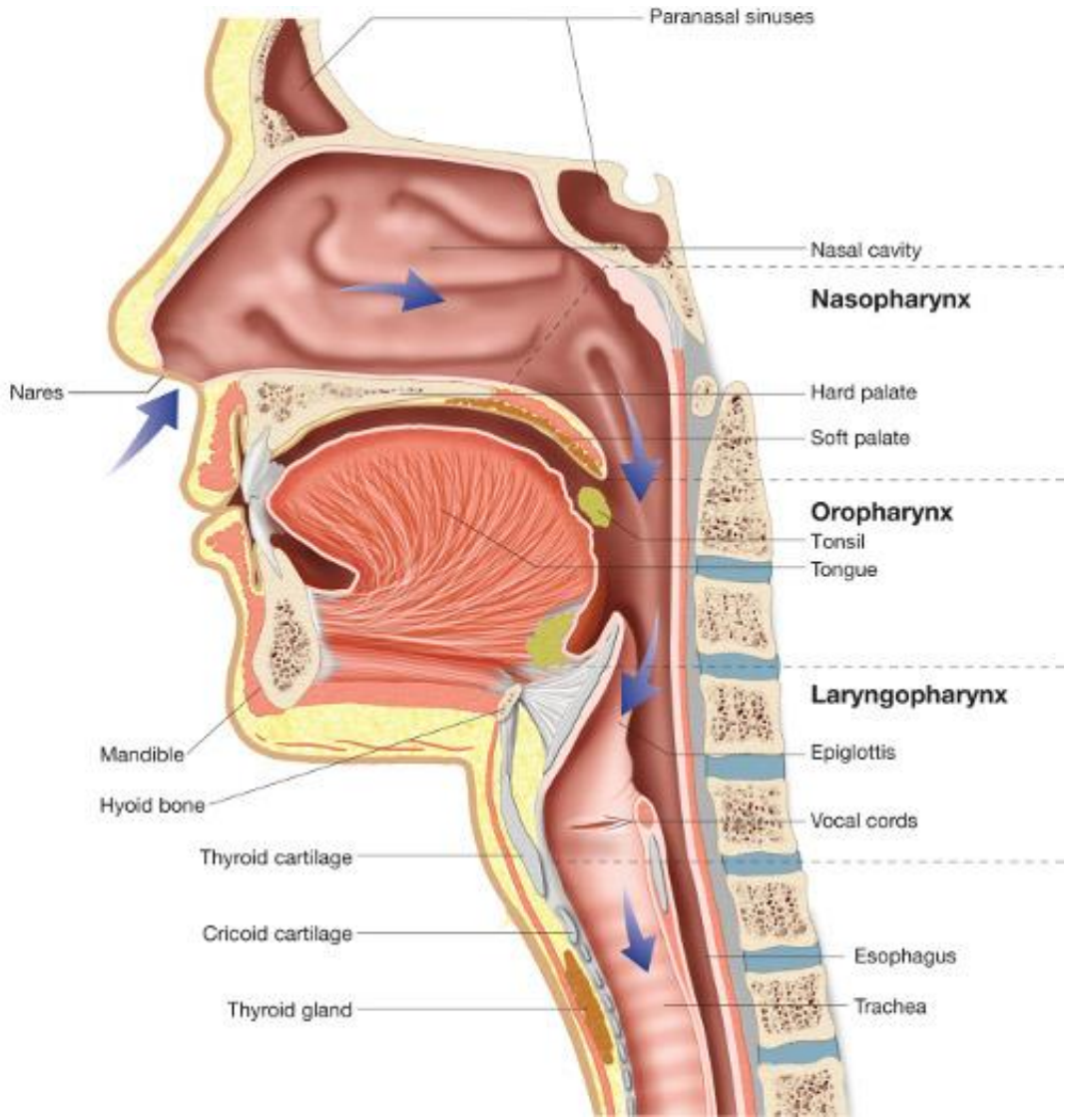
Ineffective BVMV may not only result in a failure to achieve cardiopulmonary stability, but also may complicate the patient's condition.

For example, hyperventilating a patient can cause gastric distension, which increases the risk of regurgitation, and increased intrathoracic pressure, which reduces cardiac output and consequently, perfusion of blood to the organs. Failure to achieve effective mask ventilation can be rescued by successful intubation, but difficult mask ventilation and difficult intubation often occur concurrently.

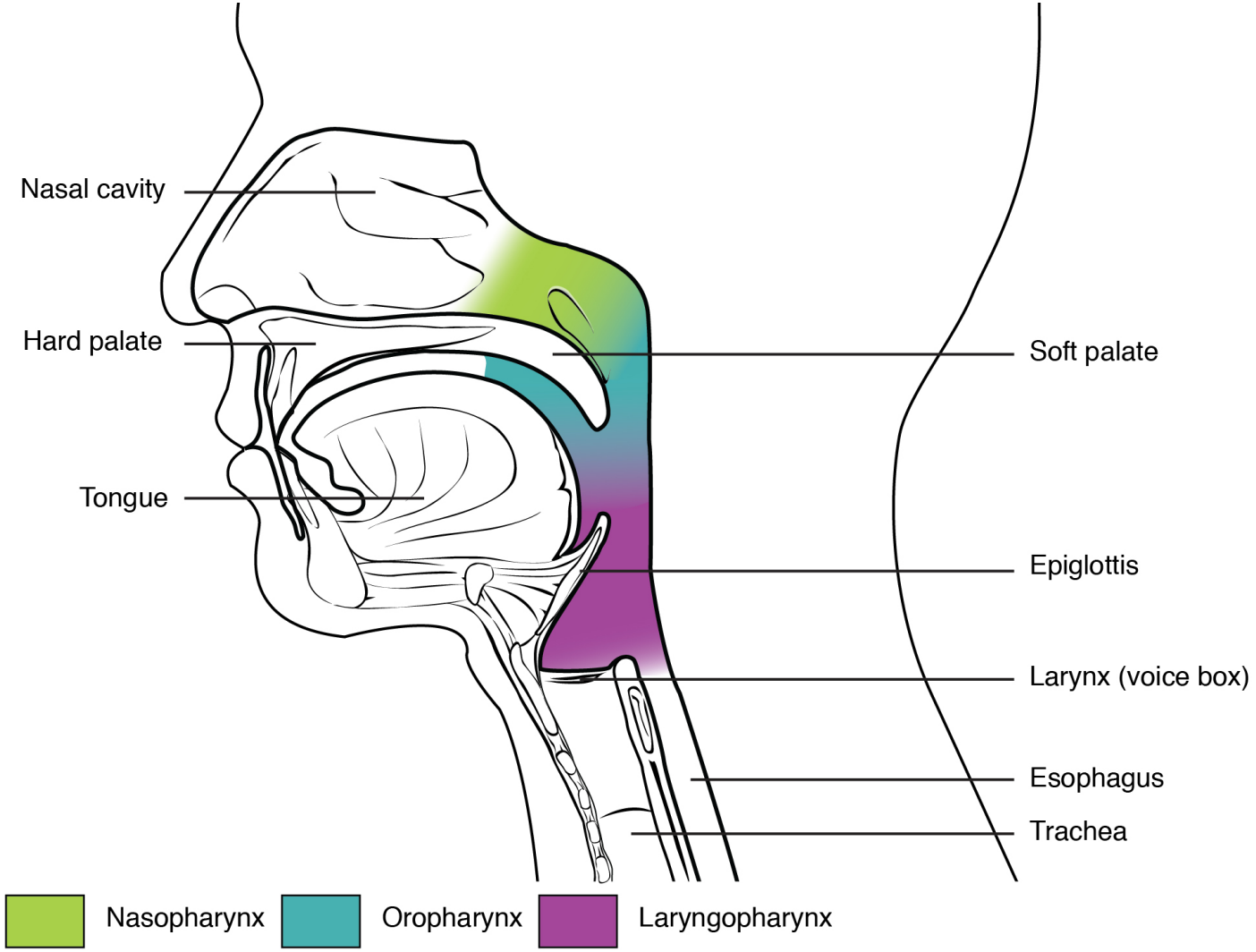
AIRWAY – UPPER AND LOWER



AIRWAY ANATOMY



PHARYNX

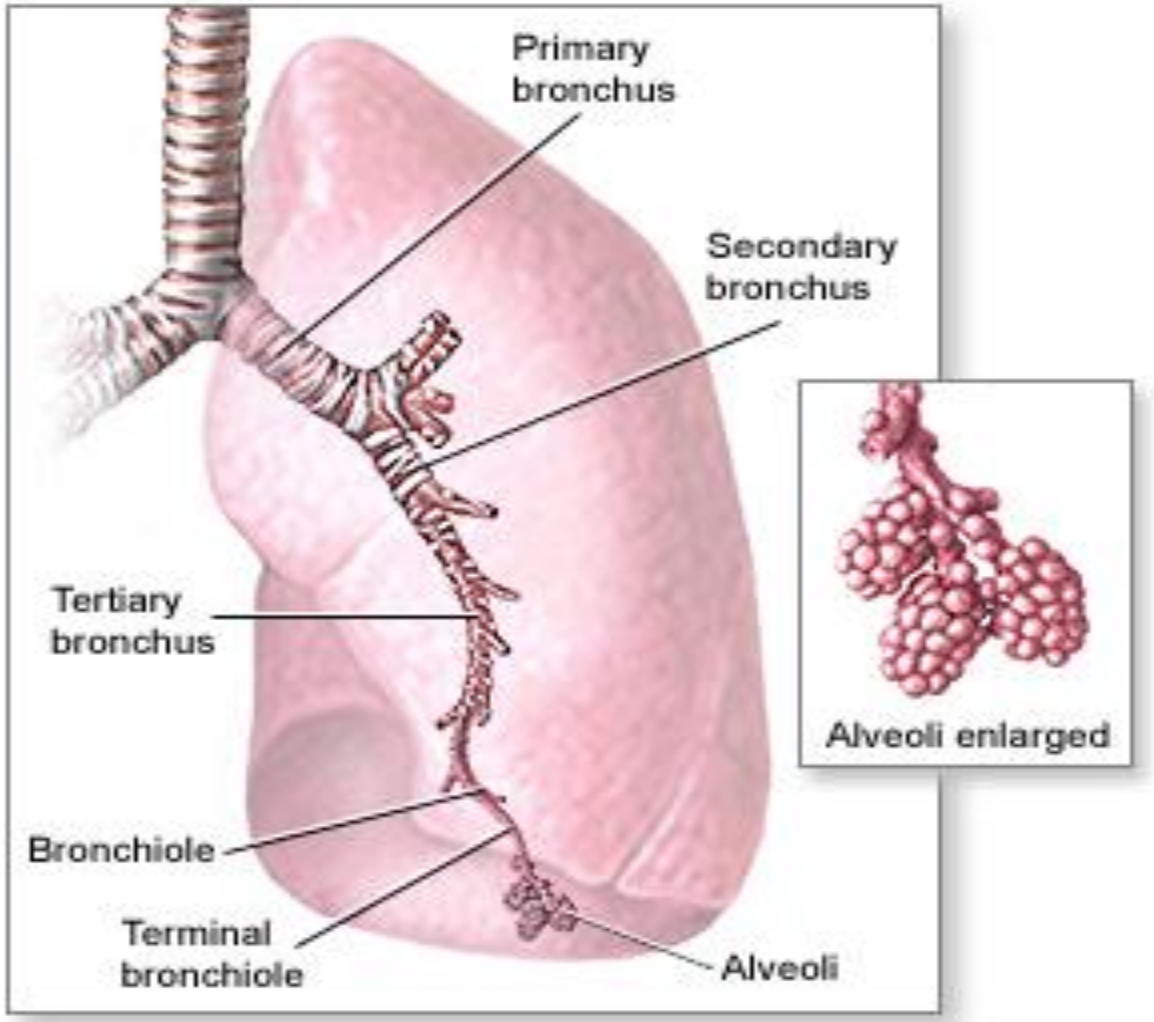

Nasal cavity
Hard palate
Tongue
Soft palate
Epiglottis
Larynx (voice box)
Esophagus
Trachea
Nasopharynx
Oropharynx
Laryngopharynx

AIRWAY VIEW IN SUPINE POSITION

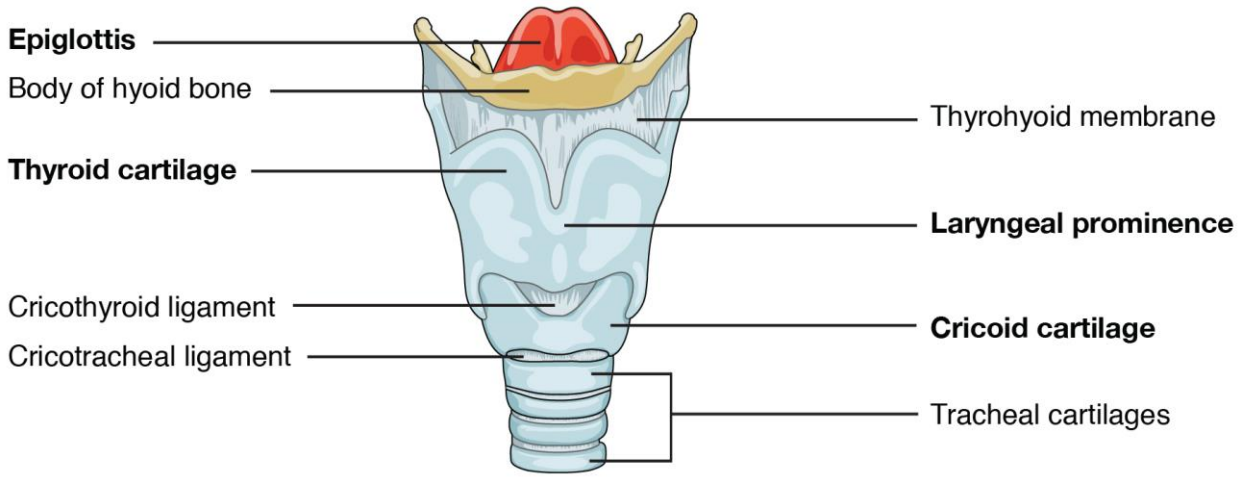
AUDIENCE ENGAGEMENT . . .

What is another name for a temporary absence of breathing?

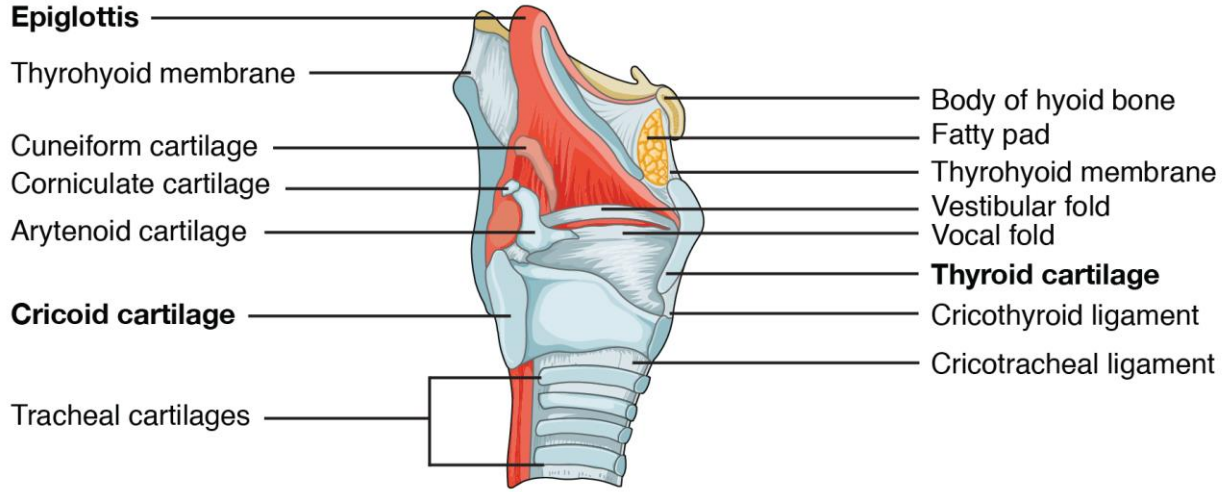
LOWER AIRWAY



LARYNX – START OF LOWER AIRWAY

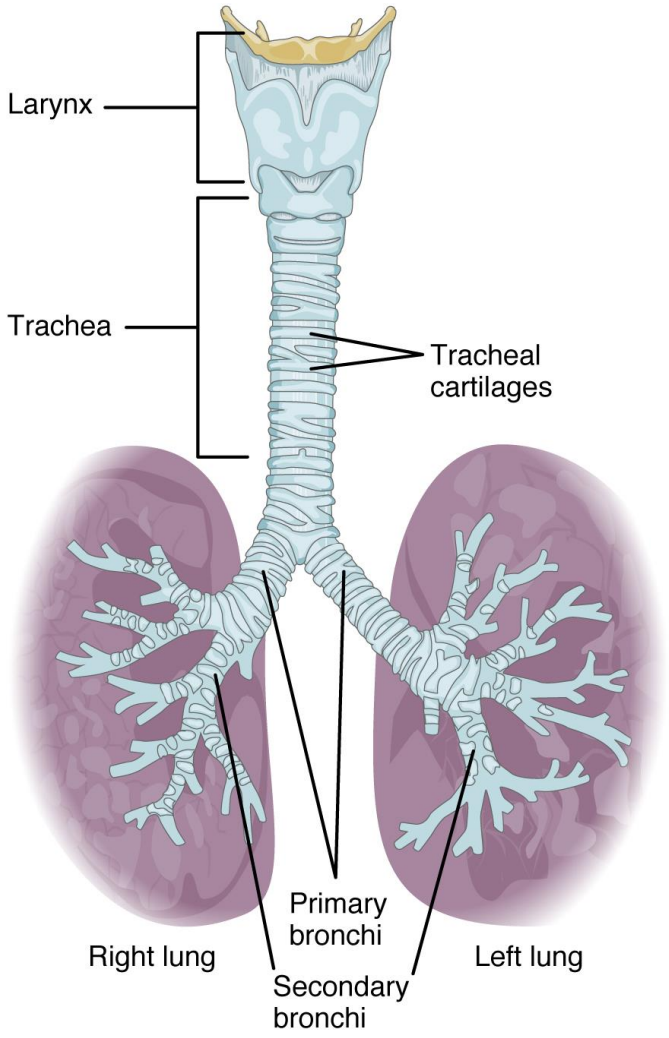


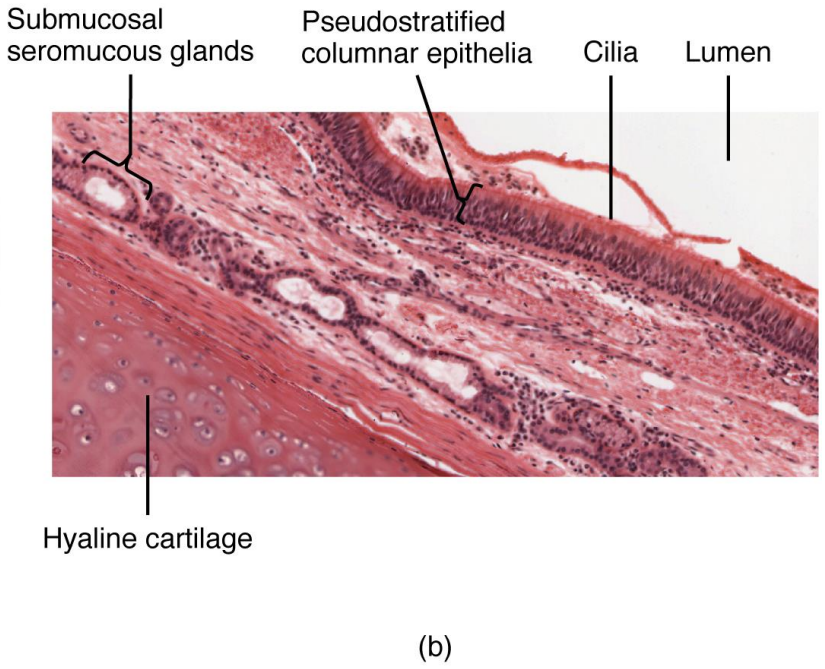
Anterior view



Right lateral view

TRACHEA

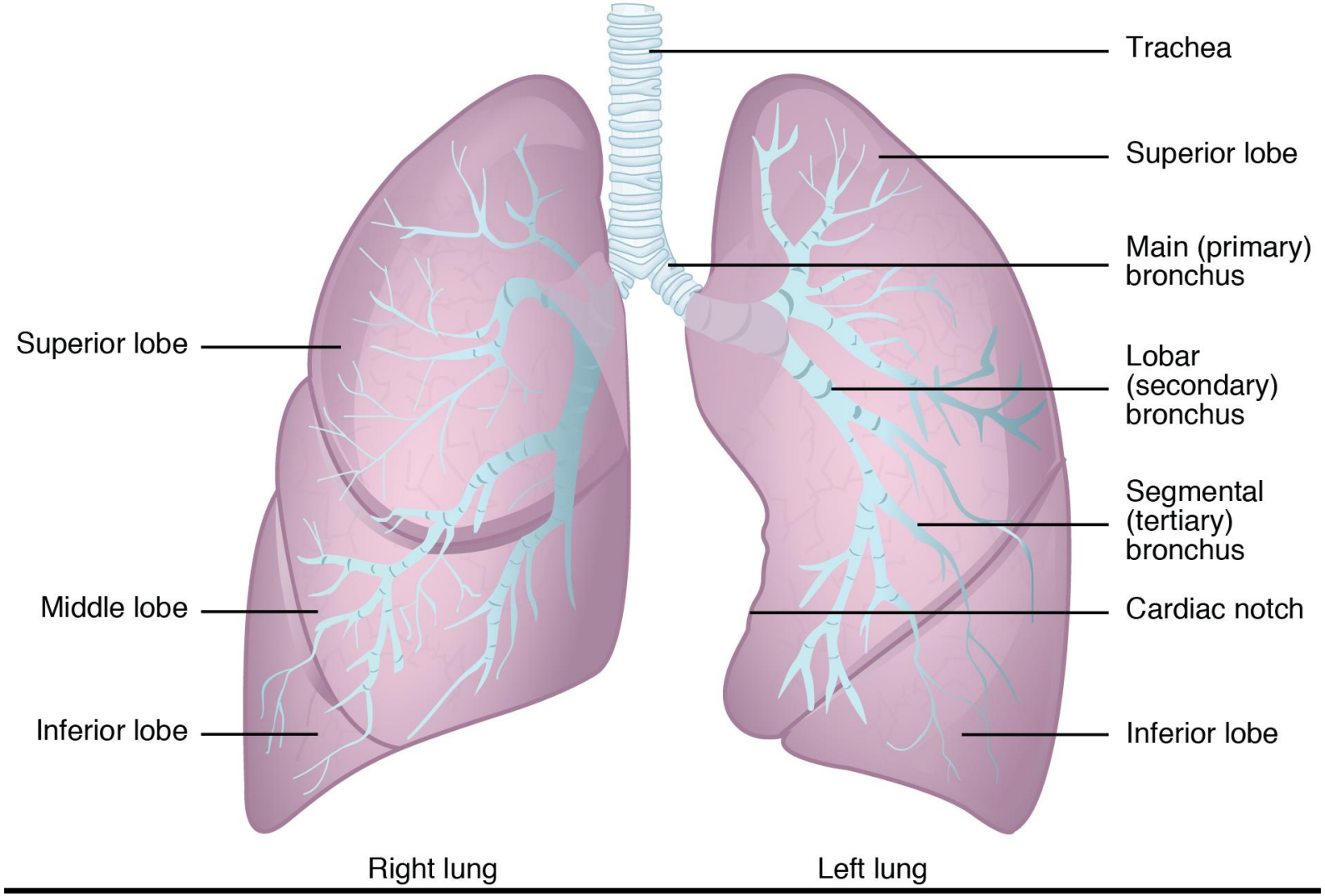

Larynx
Trachea
Tracheal cartilages
Primary bronchi
Right lung
Left lung
Secondary bronchi
(a)


Submucosal seromucous glands
Pseudostratified columnar epithelia
Cilia
Lumen
Hyaline cartilage
(b)

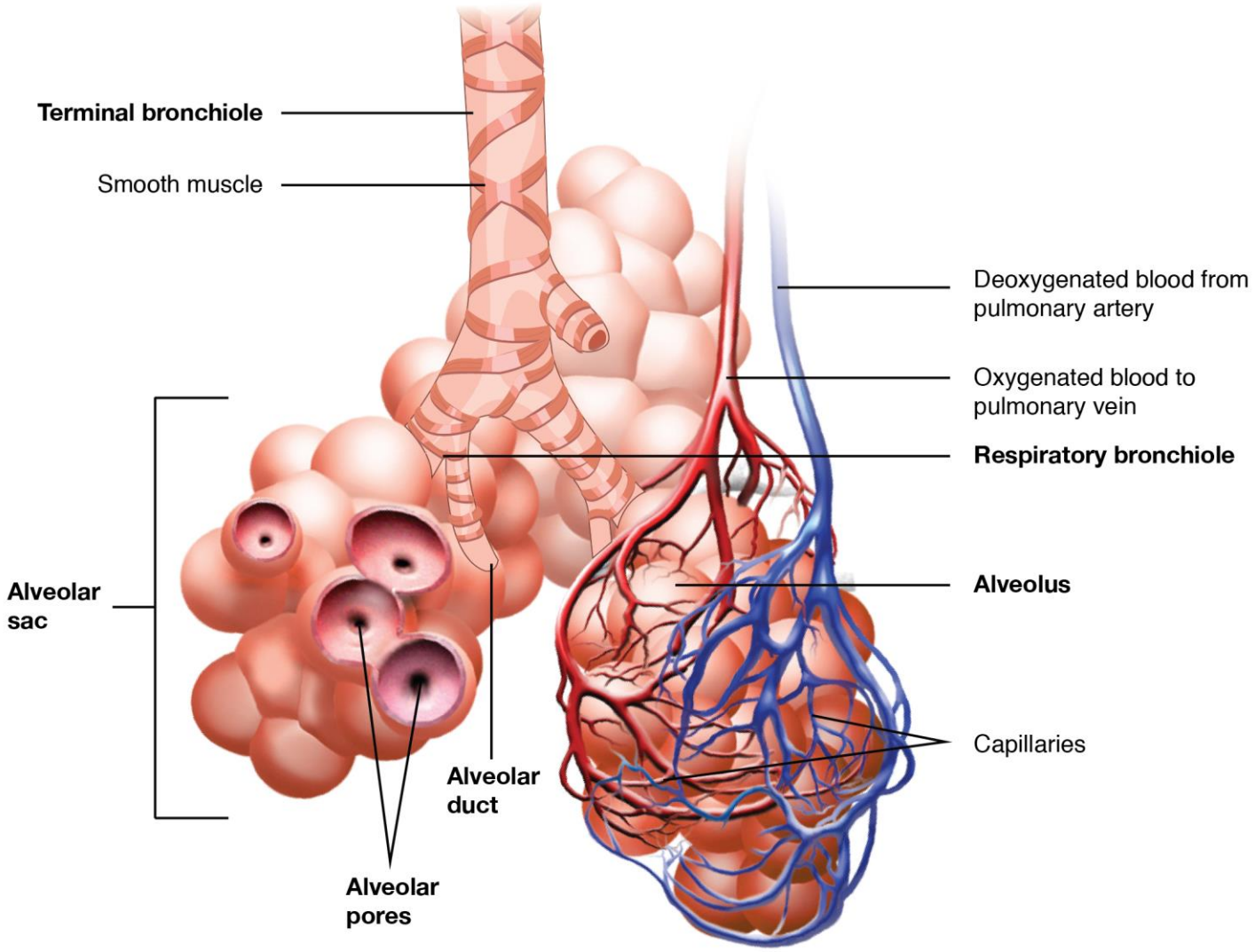
LUNGS

The major function of the lungs is to perform gas exchange, which requires blood from the pulmonary circulation.

This blood supply contains deoxygenated blood and travels to the lungs where erythrocytes, also known as red blood cells, pick up oxygen to be transported to tissues throughout the body.



ALVEOLAR


Terminal bronchiole
Smooth muscle
Deoxygenated blood from pulmonary artery
Oxygenated blood to pulmonary vein
Respiratory bronchiole
Alveolus
Capillaries
Alveolar sac
Alveolar duct
Alveolar pores

QUIZ TIME

- What is the approximate surface area of an adult lung?
- How many bronchi does an average adult have?
- How long is the average trachea?
- How many liters of air do you breathe in one minute during rest? During exercise?
- How many liters of blood flow through your lungs in one minute during rest? During exercise?
- Total length of the airways in your lungs?

QUESTIONS?