PEER Life Science Organ Systems Gas Exchange Notes Outline

**Why It Matters**

* Every cell in your body requires oxygen to obtain energy.
* Carbon dioxide is a waste product of cells that can become toxic if too much accumulates.
* Blood carries oxygen and carbon dioxide in the body.
* Gas exchange between blood and air takes place in the lungs.

**What We Know**

* Gas exchange involves two body systems: the respiratory system and the circulatory system.
* Carbon dioxide is a waste product of the Krebs Cycle.
* The respiratory system brings oxygen to the blood and exchanges it with carbon dioxide that needs to be removed from the blood.
* Structures of the respiratory system:
	+ Mouth & nose - these are the openings where respiratory gases enter and leave the body.
	+ Pharynx & larynx - these are the structures that connect the nose and mouth to the trachea. The pharynx connects to both the respiratory and digestive systems. The larynx contains the vocal cords which produce sound when air causes them to vibrate.
	+ Trachea - this passageway connects the larynx to the lungs.
	+ Bronchial tube - the trachea breaks up into these smaller tubes to enter the right and left lungs.
	+ Lungs - these are the balloon-like structures that temporarily hold air in the body.
	+ Bronchioles - within the lungs the bronchi split into these even smaller tubes which attach to the alveoli.
	+ Alveoli - these are the small sac-like structures where gas exchange occurs with the blood. Singular is “alveolus.”
* Epiglottis is the structure that covers the opening of the trachea when you swallow and directs food and fluids down the esophagus.
* The trachea breaks into two tubes called bronchial tubes or bronchi that enter into each lung and branch into smaller tubes called bronchioles.
* Gas exchange occurs in tiny, balloon-like sacs in the lungs called alveoli.
* Alveoli are surrounded by small blood vessels called capillaries that allow for gases to diffuse between the blood and air.
* In diagrams (oxygenated/deoxygenated) blood is labeled blue and (oxygenated/deoxygenated) blood is labeled red.
* A muscle called the diaphragm found at the bottom of the chest cavity helps move air into the lungs by contracting (moving up/down) and moving air out of the lungs by relaxing (moving up/down).
* The circulatory system is made up of the:
	+ Heart
	+ Blood
	+ Blood vessels
* The primary functions of the circulatory system are
	+ Transport nutrients and oxygen to cells
	+ Remove waste and carbon dioxide from cells
	+ To provide for efficient gas exchange.
* The heart is divided into four chambers. The top two chambers are called atria and the bottom two chambers are called ventricles.

Draw and label a diagram of the heart



* There are three types of blood vessels:
	+ Arteries - these carry "oxygen rich" blood away from the heart, except in the case of the artery to the lungs.
	+ Capillaries - these are the sites of gas exchange between the tissues.
	+ Veins - these return "oxygen poor" blood to the heart, except for the vein that carries blood from the lungs.
* Arterioles are branches of arteries entering tissues that can constrict (become more narrow) or dilate (become less narrow) to change how much blood flows into an area.
	+ A narrower arteriole allows (more/less) blood into tissues.
	+ A wider arteriole allows (more/less) blood into tissues.
* High blood pressure is also called hypertension and can be caused by atherosclerosis or cholesterol buildup

**How We Know**

* Scientists measure lung capacity using an instrument called a spirometer.
* Our body breathes as much as 10,000 liters of air a day.
* Asthma is an allergy disease that causes chronic inflammation and swelling of the bronchial tubes.
* Scientists have learned about gas exchange by sampling the air directly. One observation is that air is greatly humidified before it enters the lungs.
* When blood is bright red, oxygen is bound to hemoglobin. When less oxygen is bound, the blood becomes darker.
	+ Most arteries carry oxygenated blood from the heart to the rest of the body.
	+ Arteries are thick and muscular. Veins are thin and loose.
* The heart has an artery that carries blood to the lungs to pick up oxygen and release carbon dioxide.
* The higher the concentration of carbon dioxide, the more acidic the blood is and the more toxic it becomes for cells.

**Common Hazards**

* Smoking is linked to 80-90% of lung cancer deaths.
* Nicotine (constricts/dilates) blood vessels.
* Harmful chemicals found in tobacco include:
	+ Acetone
	+ Carbon monoxide
	+ Formaldehyde
	+ Hydrogen cyanide
	+ Lead
* A common disease resulting from the breakdown of the lung linings is emphysema.
* Lung cancer is one of the most preventable kinds of cancer.
* Smokers are 15-30 times more likely to develop lung cancer than those who have never smoked.
* Symptoms of lung cancer may include:
	+ Cough that doesn’t go away
	+ Hoarseness
	+ Chest pain
	+ Shortness of breath
	+ Coughing up blood
* Secondhand smoke is (more/less) potent than what smokers breathe in.
* Secondhand smoke can lead to:
	+ Lung cancer
	+ Cardiovascular disease
	+ Childhood diseases (pneumonia, bronchitis, ear infections, tonsillitis, wheezing, and asthma).
* Pollution like carbon monoxide interferes with the blood’s ability to take up oxygen.
* Pollution is highest in large cities.
* As of October 2019, the CDC reported more than 800 lung injury cases associated with e-cigarette use.