Functions of the Circulatory System

- small organisms rely on diffusion to transport oxygen, nutrients, and waste products
- large organisms can't do this
- the transportation system of a living organism is the circulatory system
- humans and other vertebrates ahve closed circulatory systems: blood is contained within a system of vessels
- human circulatory system: heart, blood vessels, and blood

The Heart

- hollow organ, size of clenched fist
- composed almost entirely of muscle
- enclosed in a protective sac of tissue called the pericardium
- two thin layers of connective and epithelial tissue that form around a thick layer of muscle called the myocardium
- contractions of myocardium pump blood through circulatory system
- heart contracts 72 times on average, pumping 70 mm of blood w/ each contraction
- the septum divides the heart and prevents the mixing of oxygen-poor and oxygen-rich blood
- upper chamber is atrium: recives blood
- lower chamber is ventricle: pumps blood out
- heart: 4 chambers, 2 atria & 2 ventricles
- right side of heart pumps blood from heart to lungs thru a proccess called pulmonary circulation, where oxygen is absorbed
- oxygen-rich blood then flows to left side and pumped thru rest of body thru process called systemic circulation
- blood that resturns to right side is oxygen-poor
- blood enters heart thru atrias
- heart contracts -> blood flows in and out of ventricles -> body or lungs
- valves: connective tissue btwn atria and ventricles

The Heart (cont)

- valaves prevent blood flow back to atrias
- valaves keep lood dlow one way -> increase pumping efficiency of heart
- each contraction begins in sinoatrial node (in right atrium)
- these cells are called pacemaker b/c they set the pace for heart as a whole
- atria contracts -> blood flos into ventricles
- ventricles contract -> blood flows out
- nuerotransmitters increase (sympathetic) /decrease (parasympathetic) heart rate

Blood Vessels

- blood flows thru heart → arteries → capill-aries → veins → heart
- walls of these vessles contain smooth muscle, connectivue tissue, & endothelium
- oxygen-rich blood flows to aorta (large blood vessel)
- arteries carry blood away from heart
- arteries have a thick, elastic layer to allow stretching and absorb under pressure
- capillaries are smallest blood vessels
- they are typically less than 1mm long, diameter is so small that red blood cells travel single file
- brings nutrients & oxygen to tissues & absorbs CO2 & waste products
- veins resturn blood to heart
- large veins have valves
- veins foud near skeletal muscles
- blood flow thru veins happens b/c of gravity

weak veins -. weak valves -> varicose veins

Blood Pressure

- heart contracts -> produces a wave of fluid pressure in arteries (blood pressure)
- blood pressure decreases as heart relaxes but is still in the system
- this allows blood to flow thru body

Blood Pressure (cont)

- sphygmomanometer: used to measure bp
- sesnory receptors detect level of bp & send messages to medulla oblongata in brain stem
- bp too high -> nuerotransmitters cause smooth muscles in blood vesseld to relax
- bp too low -> neurotransmitters cause blood vessels to contract & elavate bp
- kidneys also regulate bp by removing water from blood

Diseases of Circulatory System

- cardiovascular diseases: heart diseas & stroke
- atherosclerosis: a condition in which fatty deposits called plaque build up on the inner walls of the arteries
- hypertension: froces heart to work harder & increases risk of heart attack & stroke
- atherosclerosis creates blood clots which leads to stroke/heart attack
- excersise, no smoking, reduced stress, and controled diet helps reduce these diseases

Blood Plasma

- plasma: white colored fluid in blood
- plasma is made up of 90% water and 10% dissolved gases, salts, nutrients, enzymes, hormones, waste products, and plasma proteins
- plasma proteis are divided into: albumins, globulins, and fibrinogens
- albumins regulate osmotic pressure & blood volume
- globulins fight viral & bacterial infections
- albumins & globulins transport fatty acids, hormones, & vitamins
- fibrogen is protein respinsible for ability of blood to clot

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Published 1st May, 2023.
Last updated 1st May, 2023.

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Blood Cells

- blood consists of red blood cells, white blood cells, and platelets
- RBCs transport oxygen
- they get their color from hemoglobin: iron-containing protein
- they are produced from cells in bone marrow
- RBCs do not have nuclei
- old RBCs are destroyed in liver and spleen
- WBCs or leukocytes don't have hemoglobin
- produced with RBCs in bone marrow
- WBCs contain nuclei
- WBCs guard against infection, fight parasites, & attack bacteria (army)
- hemophilia: genetic disorder that results from a defective protein in the clotting protein
- some act as phagocytes (eating cells)
- some produce histamites for allergies
- some are lymphocytes that produce antibodies
- blood clotting is made possible by plasma proteins and cell fragments called platelets
- platelet: fragmnets of cytoplasm
- blood vessels injured -> clumping of platelets -> clot forms -> loss of blood stops

The Lymphatic System

- a network of vessels, nodes, & organs called the lymphatic system collects the fluid that is lost by the blood and returns it back to the circulatory system
- the fluid is called lymph
- lymph nodes are along lymph vessels
- lymph nodes trap bacteria and other microorganisms that cause disease
- lymoh nodes also absorb nutrients
- lymphoctyes called T cells (recognizes invaders) mature in the thymus before they can function in the immune system
- the spleen destroys damaged RBCs and platelets & harbors phagocytes

What is Respiration?

- cellular respiration is the release of energy from the breakdown of food molecules in the presence of oxygen
- respiration is the process of gas exchange: the relsease of CO2 and the uptake of oxygen between the lungs and the environment

The Human Respiratory System

- exchange of oxygen and carbon dioxide between the blood, air, and tissues
- air goes from: nose, pharynx, larynx, trachea, bronchi, lungs
- pharynx: a passageway for air & food
- epiglottis: a flap of tissue that covers the trachea entance when u swallow
- mucus: moistens the air and traps inhaled particles of dust & smoke
- cilia: sweep trapped particles and mucus towards the pharynx
- mucus and dust particles are swallowed or spit out to keep lungs clean
- at the top of trachea is the larynx
- larynx: contains two highly elastic folds of tissue known as vocal cords
- bronchi: 2 large passageways in the chest cavity
- each bronchus leads to a lung
- in each lung, bronchus divides into bronchioles
- bronchioles subdivide until they reach millions of tiny air sacs called alveloi

Gas Exchange

- gas echange is the disffusion of oxygen & CO2 in your lungs
- hemoglobin makes the process more efficient

Breathing

- movement of air into and out of lungs
- diaphragm: large, flat muscle at bootomof chest cavity

Breathing (cont)

- breath in: diaphragm contracts and rib cage rises, atmoshepheric pressure fills lungs with air & vice versa

How Breathing Is Controlled

- medulla obloganta controlls breathing
- cells monitory your CO2 to tell medulla obloganta to breathe

Tobacco and the Respiratory System

- 3 most danegrous substances: nicotine, carbon monoxide, and tar
- nicotine: a stimulant drug that increases heart rate and bp
- carbon monoxide: a poisonous gas that blocks transport of oxygen by heoglobin in the blood
- tar causes cancer
- tobacco paralyzes cilia
- smoking can cause chronic bronchitis (bronchi swollen and clogged with mucus), emphysema (loss of elasticityin tissues of lungs), and lung cancer
- smoking can develop heart disease and/or asthama

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