## Where do RBC, WBC, and platelets come from?

| | |
|---|---|
| RBC | bone marrow |
| WBC | bone marrow, (B cells: T Cells:thymus gland) |
| Platelets | bone marrow |

## Flow of Blood

Left Ventricle->Pulmonary Artery->Lung->Capillaries-> Pulmonary Vein->Left Atrium->Left Ventricle->Aorta->Aorta Diverges->Blood deliver to upper or lower party->blood returns to the right atrium (upper:superior vena cava/lower:inferior vena cava)->right Ventricle

## 3 Kinds of Vessels

| | |
|---|---|
| Arteries | Arteroles |
| Veins | -Venules |
| Capillaries | Capillary Beds |

## Veins: bring blood to the heart

| | |
|---|---|
| Pulmonary Vein | from *lungs* **to** *heart* |
| Superior Vena Cava | from *upper body* **to** *heart* |
| Inferior Vena Cave | from *lower body* **to** *heart* |

## Arteries carry blood away from the heart

| | |
|---|---|
| Pulmonary Artery | away from the *heart* to the *lungs* |
| Aorta | away from *heart* to *body* |

## Heart Beat

| | |
|---|---|
| Diastole | entire heart is relaxed |
| Systole | Atria contract, ventricles contract |
| Heart Rate | number of beats per minute |
| Pumping | a series of contra-ction and relaxation of the heart muscle |
| Cardiac Muscles | contract and relax **without** stimulation from the nervous system (SA node/pace maker) |
| Cardiac Output | volume of blood pumped by a ventricle per minute |

## Heart Attack

damage or death of the cardiac muscle due to blockage of a coronary artery

## Primary vs. Secondary Immune Response

| | |
|---|---|
| Primary | occurs upon first exposure to an antigen, slower than the secondary immune response, produces effector cells and memory cells that may confer lifelong immunity |
| Secondary | memory cells are activated by a second exposure to the same antigen, initiates a faster and stronger response |

## Urea vs Ammonia

| | |
|---|---|
| Urea | (is from the breakdown of proteins) produced in the vertebrate liver by combining ammonia and carbon dioxide, less toxic, easier to store, highly soluble in water |
| Ammonia | poisonous, to toxic to be store in the body, soluble in water, easily disposed of by aquatic animals, results from breakdown of amino acids from protein |

## Fuctional unit of the Kidney

The nephron

## Trace Urine Through the Urinary System

Glomerular capsule, PCT, descending limb of loop of Henle, ascending limb of loop of Henle, DCT, collecting tubule, papillary duct of renal papillae, minor calyx, major calyx, renal pelvis, ureter, bladder, urethra

## Flow of Filtrate through the Nephron

glomerular capsule, Proximal Convoluted tubule (PCT), Loop of Henle, Distal Convoluted tubule (DCT), Collecting duct

## Processes of the Nephron

| | |
|---|---|
| Filtration | blood pressure forces water and many small molecules through a capillary wall into the start of the capsular space |
| Reabso-rtion | refines the filtrate, reclaims valuable solutes (glucose, salt and amino acids) from filtrate, returns these to the blood, most reabso-rption occurs in the PCT |
| Secretion | substances in the blood are transp-orted into the filtrate. |
| Excretion | the final product, urine, is excreted via the ureters, urinary bladder and urethra |

## APC

a foreign antigen (a nonself molecule) and one of the body's own self proteins, to a helper T Cel

## 2 Divisions of the Nervous System

| | |
|---|---|
| central nervous system (CNS) | which consists of the brain and the spinal cord |
| peripheral nervous system (PNS) | consists of nerves and small concen-trations of gray matter called ganglia. |



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## Myelin

enclose axons, form cellular insulation, speed up signal transmition, is a lipoprotein, is white matter

## Neurotransmitters

| | |
|---|---|
| Acetycholine | in the brain and in the synapses between motor neurons and muscle cells |
| Biogenic amines | important transmitters in the CNS and include serotonin and dopamine, which affect sleep, mood and attention |
| Neuropeptides | consist of relatively short chains of amino acids important in the CNS and include endorphins, decreasing our perception of pain |
| Nitric Oxide | is a dissolved gas and triggers erections during sexual arousal in men |

## Axons vs Dendrites

| | |
|---|---|
| Axons | passes messages from the cell body to other neurons, muscles or glands |
| Dendrites | receive messages from other cells |

## Parts of the brain

| | |
|---|---|
| hypothalmus | (Cerebellum) controls pituitary and ANS, therefore controls homeostasis |
| thalmus | (Cerebellum) relay center for most senses deal with both emotions and most senses |
| medulla oblongata | (Brainstem) controls breathing, heart rate, & swollowing |
| pons | (Brainstem) bridge between forebrain and cerebellum, controls breathing, many important nerves originate here |
| midbrain | (Brainstem) coordinates visual and auditory reflexes |

## Brain Lobes

| | |
|---|---|
| Frontal Lobe | (motor) helps plan movements & involved with personality, control of emotions and expression of emotional behavior |
| Temporal Lobe | Association center for **hearing** and **smell** |
| Occiptal Lobe | Association centers for **vision** |
| Parietal Lobe | Association area for **touch** |

## Axial vs Apendicular Skeleton

| | |
|---|---|
| Axial | skull, vertebrae, ribs |
| Apendicular | shoulder and pelvic girdles, arms and legs |

## Anatomy of a Long Bone

| | |
|---|---|
| Fat-storing central cavity (Medullary Cavity) | contains yellow marrow (fat) |
| Spongy bone | located at the ends of bones, contains red bone marrow, the site of blood cell production (WBC's, RBC's and platelets) |

## Joints

| | |
|---|---|
| sutures | allow no movements (ex. skull and pelvis) |
| ball-and--socket | allow for the greatest range of motion (ex. shoulder and hip) |
| hinge joint | uniaxle, allow for movement in one plane (ex. elbow and interphalangeal) |
| piviot | (ex. radioulnar & atlantoaxial) |

## Thick vs Thin Filament

| | |
|---|---|
| Thick | made of myosin |
| Thin | made of actin(mostly), troponin, tropomyosin binding sites on actin (at rest) |

## Calcium

| | |
|---|---|
| What does it do? | initiates muscle contaction by moving regulatory proteins away from the actin binding sites |
| Where is calcium stored? | endoplasmic reticulum |

## Anaerobic Metabolism vs Aerobic matabolism

| | |
|---|---|
| Anaerobic Metabolism | The amount of energy generated by anaerobic metabolism is less than one-tenth of what is produced by aerobic metabolism. |
| Aerobic matabolism | provides most of the ATP used to power muscle movement during exercise |

## Motor Unit

consists of a neuron, the set of muscle fibers it controls



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| Fast vs Slow Fibers | |
|---|---|
| Fast Fibers | high proportioned in fingers and eyes (white fibers) |
| Slow Fibers | high proportion in postural muscles (red fibers) |



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