Chapter	Page	Importance	*System*	Topic	Term	Definition	Also Related To	Understanding
6		**	*Respiratory*		**Mast Cells**	Immune cells in lungs covered with antibodies. Release inflammatory chemicals upon antigen binding to promote immune response. Responsible for respiratory allergic reactions due to reactions with things like pollen and molds.	Immune System	Strong
8	277	**	*Immune*		**Lysozyme**	Enzyme able to attack petidoglycan walls of gram positive bacteria. Found in nasal cavity, tears, and saliva		Unsure
6		****	*Respiratory*		**Bicarbonate Buffer System**	Mechanism where respiratory system controls blood pH via controlling carbondioxide concentrations. Less CO2 in blood = More Basic = Body responds with slower breathing to retain CO2. More CO2 in blood = More Acidic = Body increases breathing rate to remove CO2. Hyperventilation decreases CO2 levels in blood, making blood more basic. Body responds with trying to slow breathing rate.	pH Homeostasis	Unsure
6		*	*Respiratory*		**Intercostal Muscles**	Layers of muscles between ribs. External Intercostal Muscles contract upon inhalation to pull ribcage up and expand intrathoracic volume (chest cavity volume). Internal Intercostal Muscles contract upon forced exhalation only.		Unsure
6		**	*Respiratory*		**Surfactant**	Detergeny covering alveoli to reduce surface tension and prevent alveolus from collapsing on itself. Premature babies do not have surfactant.		Strong
7	228	***	*Cardiovascular*		**LAB RAT**	Left Atrium = Bicuspid Valve (Mitral Valve), Right Atrium, Tricuspid Valve. Could also remember LAMB RAT to associate the mitral valve = bicuspid valve.		Strong
7	229	*	*Cardiovascular*		**Intercalated Discs**	Connect muscle cells in the myocardium of the heart. Contain many gap junctions to connect the cytoplasm of adjacent cells and allowing for quicker signal propogation and coordinated ventricular contraction.		Unsure
		*			**Vagus Nerve**	Mostly Parasympathetic Nerve that slows down heart rate when activated. Originates in Medulla Oblongata.		Unsure
		**	*Nervous*		**Medulla Oblongata**	Below the pons. Connects brain to spinal chord.	Hind Brain	Weak
7	235	***	*Cardiovascular*		**Portal Systems**	Transport systems where blood traveling through these systems goes through two capillary beds in series before returning to the heart. The three portal systems are the Hepatic (Gut -> liver), hypophyseal (Hyopthalamus -> anterior pituitary), and renal (glomerulus -> vasa recta).		Unsure
7	238	**	*Cardiovascular*		**Hematocrit**	Measure of how many Red Blood Cells are in blood, given as a percentage of total cells in blood.		Weak
		****	*Renal System*		**Kidney**	Secretes erythropoietin to stimulate red blood cell development and thromboprotein which stimulates platelet development.		Unsure
7	241	**	*Cardiovascular*		**Hematopoietic Stem Cell**	Stem cell which can differentiate to create Red Blood Cells, White Blood Cells, and Platelets.		Unsure
7	243	**	*Cardiovascular*		**Rh Factor**	Surface Protein expressed in red blood cells in the presence of allele called D. Leads to (+) or (-) blood type classifications. Dominant allele.		Strong
7	250	**	*Cardiovascular*		**Bohr Effect**	Shifting of oxyhemoglobin curve to the right. Can be due to decreased pH and increasing the H+ concentration in the blood. H+ binds to hemoglobin allosterically and reduces affinity for oxygen. This allows more oxygen to be delivered to tissues. Decreased pH can be caused by increased CO2 and lactic acid in blood. Right shift of curve can also be caused by increased temperature, and 2,3-bisphosphoglycerate (2,3-BPG) in		Unsure
7	251	**	*Cardiovascular*		**Fetal Hemoglobin**	(HbF) has higher affinity for oxygen than adult hemoglobin (HbA) in order to pull oxygen from mother's hemoglobin and onto fetal hemoglobin. Results in left shifted oxyhemoglobin dissociation curve		Unsure
8	273	**	*Immune*		**Humoral Immunity**	Division of adaptive immunity that includes antibodies and B-cells which act within the blood rather than within cells.		Unsure
8	273	**	*Immune*		**Thymus**	Gland that matures T-cells. Located between the lungs, just above the heart.		Unsure
8	278	*	*Immune*		**Complement**	Proteins that nonspecifically will punch holes in the cell membranes of bacteria, making them osmotically unstable. Can use the classical pathway which requires antibody binding, or alternative pathway which doesn't)		Weak
8	278	*	*Immune*		**Interferon**	Proteins produced by cell upon viral infection to block cellular and viral protein production. Decrease permeability of cell membrane and upregulate MHC class 1 and class 2 molecules on cell surface to signal immune system. Responsible for malaise, tiredness, muscle soreness, and fever during viral infections.		Weak
8	279	*	*Immune*		**Major Histocompatibility Complex**	(MHC) binds to pathogenic peptides (antigens) and carries it to cell surface where it can be recognized by other immune cells. Produced by virally infected cells via interferons. Also produced by macrophages. MHC-1 is produced by all cells and carries many proteins to cell surface. When foreign proteins are presented, immune cells know that the presenting cell is infected and needs to be destroyed. Called endogenous pathway. MHC-2 mainly displayed by professional antigen presenting cells like macrophages, dendritic cells, and some B-cells. Takes antigens from environment, processes them inside the cell, then displays them. Called exogenous pathway.		Weak
8	281	*	*Immune*		**Pattern recognition receptors**	(PRR) able to recognize category of invaders (bateria, virus, fungus, parasite) in order to initiate appropriate cytokine response. These receptors are presented on macrophages and dendritic cells.		Weak

Chapter	Page	Importance	*System*	Topic	Term	Definition	Also Related To	Understanding
8	281	*	*Immune*		**Natural Killer Cells**	Detect and destroy cells with downregulated MHC. Includes cancer cells and some virally infected cells		Weak
8	281	*	*Immune*		**Neutrophils**	Most populous leukocyte in blood. Short lived (5 days). Dead neutrophils are responsible for formation of pus. Follow bacteria via chemotaxis and phagocytize them. Can also destroy opsonized cells.	Granulocyte	Weak
8	281	*	*Immune*		**Eosinophils**	Release large amounts of histamine upon activation for inflammation. Contain bright, red-orange ganules.	Granulocyte	Weak
8	281	*	*Immune*		**Histamine**	Released by Eosinophils and Basophils. Cause inflammation by inducing vasodilation and increased leakiness of blood vessels so additional immune cells can enter tissue.		Weak
8	281	*	*Immune*		**Basophils**	Have large, purple granules. Least populus leukocyte. Produce large amount of histamine in response to allergens. Closely related to mast cells.	Granulocyte	Weak
8		**	*Immune*					
		****	*Endocrine*	Pancreas	**Islets of Langerhans**	Pancreatic bundles of cells that release hormones. Include alpha, beta, and delta cells, which release glucagon, insulin, and somatostatin respectively.		Weak
9	310	***	*Digestive*	Digestion	**Mastication**	Chewing: mechanical breakdown of food into smaller particles to increase surface area for enzymatic digestion and lessen risk of obstruction of digestive tract		Unsure
9	310	***	*Digestive*	Digestion	**Salivary Amylase (ptyalin)**	Enzyme in saliva capable of hydrolyzing starch into smaller sugars.		Unsure
9	310	****	*Digestive*	Digestion	**Lipase**	Enzyle in saliva that catalyzes the hydrolysis of lipids.		Unsure
9	311	***	*Digestive*	Digestion	**Epiglottis**	Cartilaginous structure that folds down to cover larynx during swallowing, so food doesn't enter and lead to choking.		Strong
9	311	***	*Digestive*	Digestion	**Peristalsis**	Involuntary, rhythmic contraction of smooth muscle that propels food down digestive tract. Can be reversed during emesis (vomiting) to move contents from the stomach, out the mouth.		Strong
9	312	***	*Digestive*	Digestion	**Stomach Anatomy**	Consists of the Fundus (top), Body (middle), Pylorus (bottom), and Antrum (exit). Lesser curvature is the inside curve, Greater Curvature is the outside curve. Rugae is the internal, folded lining of the stomach.		Weak
9	312	***	*Digestive*	Digestion	**Gastric Glands**	Dominant glands in the Fundus and Body. Stimulated by the Vagus Nerve of the Parasympathetic Nervous System. Contain three main cell types: Mucous Cells, Chief Cells, and Parietal Cells.	Mucous Cells, Chief Cells, Parietal Cells	Weak
9	312	***	*Digestive*	Digestion	**Mucous Cells**	Produce bicarbonate-rich mucous that protects the muscular walls of the stomach from the harshly acidic and proteolytic environment.	Gastric Glands	Weak
9	312	***	*Digestive*	Digestion	**Chief Cells**	Secrete pepsinogen in the stomach, the inactivated form of pepsin.	Gastric Glands	Weak
9	312	***	*Digestive*	Digestion	**Parietal Cells**	Secrete hydrochloric acid into the stomach to lower the pH and cleave pepsinogen into pepsin. Low pH also helps kill most harmful bacteria and denature proteins and break down some intramolecular bonds that hold food together. Parietal cells also secrete intrinsic factor.	Gastric Glands	Weak
9	312	***	*Digestive*	Digestion	**Pepsin**	Enzyme produced from pepsinogen being cleaved by hydrogen ions in the stomach. Cleaves peptide bonds near aromatic amino acids, resulting in short, peptide fragments. Uniquely most active at low pH.	Chief Cells	Weak
9	313	***	*Digestive*	Digestion	**Intrinsic Factor**	Glycoprotein secreted by the parietal cells in the gastric glands in the stomach. Involved in the proper absorption of vitamin B12	Parietal Cells	Weak
9	313	***	*Digestive*	Digestion	**Pyloric Glands**	Dominant glands in the Antrum and Pylorus sections of the stomach. Contain G-cells that secrete gastrin.	G-Cells	Weak
9	313	***	*Digestive*	Digestion	**G-Cells**	Cells in the pyloric glands of the stomach that secrete Gastrin	Pyloric Glands	Weak
9	313	***	*Digestive*	Digestion	**Gastrin**	Peptide Hormone that induces the parietal cells in the stomach to secrete more HCl and also signals the stomach to contract. Secreted by G-cells	G-Cells	Weak
9	313	***	*Digestive*	Digestion	**Chyme**	Acidic, semifuild mixture in the stomach resulting from the digestion of solid food.		Weak
9	313	***	*Digestive*	Digestion	**Pyloric Sphincter**	Sphincter that controls movement of chyme from the stomach to duodenum		Unsure
9	313	***	*Digestive*	Digestion	**Small Intestine**	Responsible for continued digestion and absorption of nutrients. Approximately 7 meters long. Consists of three segments: Duodenum, Jejunum, and Ileum. The majority of chemical digestion takes place in the duodenum while the majority of absorption takes place in the jejunum and ileum.		Unsure
9	313	***	*Digestive*	Digestion	**Duodenum**	Site of chemical digestion in the small intestine. Releases tons of enzymes such as brush border enzymes, secretin, and cholecystokinin.		Unsure
9	313	***	*Digestive*	Digestion	**Brush Border Enzymes**	Enzymes present on the inside surface of cells lining the duodenum that are released in the presence of chyme. These enymes break down dimers and trimers of biomolecules into absorbable monomers. Include disaccharidases and peptidases		Unsure
9	313	***	*Digestive*	Digestion	**Lack of Digestive Enzyme**	Intestines can't cleave disaccharaide for digestion. This increases osmolarity and pulls water into the intestines to form diarrhea. Bacteria in the small intestine are able to break down disaccharides, but result in methane gas as a biproduct, resulting in farts.		Strong

Chapter	Page	Importance	*System*	Topic	Term	Definition	Also Related To	Understanding
9	314	***	*Digestive*	Digestion	**Bile**	Complex fluid of bile salts, pigments, and cholesterol. Produced by the liver and stored in the gallbladder before secretion into the small intestine.		Unsure
9	314	***	*Digestive*	Digestion	**Bile Salts**	Have hydrophobic and hydrophilic regions to act as an emulsifier in the duodenum to allow fats and cholesterol to form micelles and giving access to pancreatic lipase digestion (a water soluble enzyme). The creation of micells increases surface area of fats for aided digestion by lipases. Formation of micelles is a form of mechanical digestion.		Strong
9	315	***	*Digestive*	Digestion	**Pancreatic Juices**	Secreted by pancreas into duodenum due to stimulation by cholecystokinin (CCK). Complex mixture of ezymes in bicarbonate-rich solution. This basic solution neutralizes chyme to allow for ideal pH for enzymatic digestion (most active around pH 8.5). Contains enzymes to digest carbohydrates, fats, and proteins.	Acinar Cells	Unsure
9	316	***	*Digestive*	Accessory Organs of Digestion	**Acinar Cells**	Cells that make up the bulk of the pancreas and participate in its exocrine functions. Produce pancreatic juices.	Pancreatic Juices	Unsure
9	316	***	*Digestive*	Accessory Organs of Digestion	**Pancreatic Enzymes**	Secreated by Acinar Cells. Pancreatic Amylase: Digests carbohydrates. Trypsinogen: Activated by Enteropeptidase (produced in Duodenum) to form trypsin, which then activates chymotrypsinogen. Procarboxypeptidases A and B to protein digestion. Pacreatic Lipase: Breaks down fats into free fatty acids and glycerol	Acinar Cells	Unsure
9	317	***	*Digestive*	Accessory Organs of Digestion	**Duodenal Papillae**	Secretion point of pancreatic juices into duodenum from pancreatic ducts.There is a major and a minor duodenal papilla.	Pancreatic Juices	Unsure
9	317	****	*Digestive*	Accessory Organs of Digestion	**Liver**	- Regulates blood sugar via glyogenesis, glycogenolysis, gluconeogenesis, and the storage and release of fats. - Converts Ammonia (waste product of amino acid metabolism) into Urea - Detoxifies chemicals such as drugs and alcohol - Produces Bile - Synthesizes albumin and clotting factors		Unsure
9	318	***	*Digestive*	Accessory Organs of Digestion	**bilirubin**	Major pigment in Bile, which is the byproduct of the breakdown of hemoglobin. Inability to process or excrete bilirubin results in Jaundice.		Unsure
9	318	***	*Digestive*	Accessory Organs of Digestion	**Gallbladder**	Stores and concentrates bile. CCK stimulates the gallbladder to contract and push bile into the billiary tree, which merges with the pancreatic duct before entering the duodenum via the duodenal papillae. Gallbladder stones made of cholesterol or bilirubin can cause inflammation of the gallbladder and blockage of both the biliary tree and pancreatic ducts.		Unsure
9	322	**	*Digestive*	Absorption and Defecation	**Villi**	Small, fingerlike projections from the epithelial lining of the small intestine. Each villus is covered in microvilli. This greatly increases surface area for absorption. Each villus contains a capillary bed for absorption of water soluble nutrients and small fatty acids into the blood and a lacteal to transport fats into the lymphatic system		Strong
9	322	**	*Digestive*	Absorption and Defecation	**Lacteal**	Lymphatic channel that takes up fats for transport into the lymphatic system. Located in the Villi.		Unsure
9	323	**	*Digestive*	Absorption and Defecation	**Hepatic Portal System**	Portal system in which blood first travels through capillaries in the villi of the small intestine to absorb nutrients, then again through the capillaries in the liver for nutrients to be processed and for toxins to be removed.		Strong
9	324	**	*Digestive*	Absorption and Defecation	**Chylomicrons**	Packaged triglycerides and esterified cholesterol that gets transferred from the mucosal cells of the villi of the small intestine into the lacteal for insertion into the lymphatic system		Weak
9	324	**	*Digestive*	Absorption and Defecation	**Fat Soluble Vitamins**	Vitamins A, D, E, and K. Easily dissolve into chylomicrons to enter body. Failure to digest or absorb fat may lead to deficiencies in fat soluble vitamins.		Unsure
9	325	**	*Digestive*	Absorption and Defecation	**Water Soluble Vitamins**	Vitamin B complex and C. Absorb directly from small intestine into blood plasma.		Unsure
9	325	**	*Digestive*	Absorption and Defecation	**Cecum**	Outpocketing of the Large Intestine that accepts fluid exiting the small intestine through the ileocecal valve and is the site of attachment of the appendix. Home to many aerobic bacteria that produce a symbiotic relationship that helps produce vitamin K and biotin (vitamin B7).		Weak
9	325	**	*Digestive*	Absorption and Defecation	**Appendix**	Originally thought to be vestigial, but now thought to aid in warding off bacterial infections and repopulating the large intestine with normal flora after diarrhea.		Unsure
9	325	**	*Digestive*	Absorption and Defecation	**Colon**	A part of the large intestine that's main function is to absorb water and salts from indigested material left over from the small intestine. Absorbs less water than the small intestine, but still aids in formation of feces. Too much or too little absorption causes constipation or diarrhea respectively.		Weak
9	325	**	*Digestive*	Absorption and Defecation	**Internal and External Anal Sphincters**	Seperate the rectum from the outside. Internal sphincter is involuntary. External is voluntary.		Strong
10	343	****	*Excretory*	Renal	**Vasa Recta**	Capillaries that surround the loop of Henle as the second capillary be in the renal portal system (the first being the glomeruli)		Strong
10	344	****	*Excretory*	Renal	**Bowman's Capsule**	Cuplike structure around glomerulus that leads to the proximal convoluted tubule.		Strong

Chapter	Page	Importance	*System*	Topic	Term	Definition	Also Related To	Understanding
10	344	****	*Excretory*	Renal	**Detrusor Muscle**	Muscular lining of the bladder which contracts after stimulation from the parasympathetic nervous system.		Weak
10	345	****	*Excretory*	Renal	**Micturition reflex**	When stretch receptors in bladder recognize that it is full, they fire parasympathetic neurons to the detrusor muscle and internal urethral sphincter causing them to contract and relax respectively.		Weak
10	345	****	*Excretory*	Renal	**Starling Forces**	Forces that govern the movement of fluid into the Bowmen's Capsule from the Glomerulus. This is a result of the hydrostatic and oncotic forces of the Bowman's Space and Glomerulus capillaries.		Unsure
10	349	****	*Excretory*	Renal	**Countercurrent Multiplier System**	The system in which the Vasa Recta and Nephron flow in opposite directions, allowing more hypertonic blood (high osmolarity) to be exposed to the loop of Henle, allowing for maximum water absorption.		Unsure
10	348	****	*Excretory*	Renal	**Loop of Henle**	Descending Loop: Only permeable to water. Water leaves the loop, creating an increasingly concentrated solution at the end of the loop. Ascending Loop: Only permeable to salts. This allows the highly concentrated fluid at the end of the loop to be reabsorbed by the vasa recta, decreasing concentration by the time the fluid gets to the distal convoluted tubules.		Unsure
10	348	****	*Excretory*	Renal	**Dump the HUNK**	Major waste products excreted in urine are H+, Urea, NH3, and K+.		Unsure
10	349	****	*Excretory*	Renal	**Diluting Segment**	Thicker portion of the ascending loop of Henle with larger cells due to more mitochondria in these cells to facilitate active transport. These cells are pushing out salts against their concentration gradient, since the fluid inside the loop of Henle has become hypotonic compared to the interstitium. This is the only portion of the nephron that can produce urine more dilute than blood.		Unsure
10	348	****	*Excretory*	Renal	**Proximal Convoluted Tubule**	Proceeds the Bowmans Capsule. Amino Acids, Salts, Glucose, Water Soluble Vitamins reabsorbed into the Vasa Recta along with water. About 70% of the filtered sodium is reabsorbed here. H+, K+ NH3, Urea are all secreted here.		Unsure
10	350	****	*Excretory*	Renal	**Distal Convoluted Tubule**	Responds to Aldosterone, which promotes sodium reabsorption. Water will follow the sodium, concentrating the urine and decreasing its volume. Waste products are also secreted here.	Aldosterone	Unsure
10	350	****	*Excretory*	Renal	**Collecting Duct**	Final concentration of urine largely dependent on permability of collecting duct, which is affected by ADH and Aldosterone to increase water absorption and concentrate urine output. Water travels to Vasa Recta, where it reenters blood stream.	Aldosterone, ADH	Unsure
10	351	****	*Excretory*	Renal	**Osmotic vs Oncotic Pressure**	Osmotic Pressure = "Sucking" pressure that draws water into blood Oncotic Pressure = Osmotic Pressure specifically caused by Proteins		Unsure
10	352	****	*Excretory*	Renal	**Renal Bicarbonate Buffer System**	When pH is too high, kidneys can selectively excrete more bicarbonate and reabsorb more H+. When pH is too low, kidneys exctrete more H+ and reabsorb more bicarbonate.		Unsure
10	356	***	*Immune*	Innate Immune System	**Langerhans cells**	Special macrophages that reside within the stratum spinosum of the epidermis. Capable of presenting antigens to T-cells to activate the immune system.		Unsure
11		***	*Musculoskeletal*	Muscles	**Red Fibers**	Slow twitch fibers, high mioglobin content and derive energy aerobically. Lots of Mitochondria		
		***	*Musculoskeletal*	Muscles	**White Fibers**	Fast twitch fibers. Less myoglobin. Contract rapidly, but fatigue more quickly.		
		***	*Musculoskeletal*	Muscles	**Myogenic Activity**	Both smooth muscles and cardiac muscles can contract without nervous system input.		
		***	*Musculoskeletal*	Muscles	**Tropomyosin**	Protein that spirals around actin in muscles, covering the myosin binding sites.		
		***	*Musculoskeletal*	Muscles	**Troponin**	Protein on tropomyosin. Has a Ca2+ binding site. When activated by calcium binding, troponin causes tropomyosin to undergo conformational change, exposing myosin binding sites		
		***	*Musculoskeletal*	Muscles	**Myosin**	Motor protein in muscles. Binds to Actin filaments in the cocked position, with ADP + Pi bound. This happens only when actin filaments have exposed myosin binding sites after Ca2+ is bound to troponin. After myosin-actin binding, ADP + Pi dissociate from myosin, causing the power stroke. This contracts the sarcomere. ATP then binds to myosin, freeing it from actin. ATP is hydrolyzed to ADP + Pi, recocking the myosin (which is unbound from actin).		
		***	*Musculoskeletal*	Muscles	**Tetanus**	When muscle contracts do not get the chance to relax at all due to constant stimulation at a high frequency. E.g. after a tough workout, your muscles are still tense, even though you aren't flexing.		
		**	*Musculoskeletal*	Bones	**Harversion Systems**	Structural Unit of Bone, also called Osteons. Have Harversian and Volkmann's Canals (longitudinal and transverse canals) that allow blood vessels, nerves, and lymph vessels to maintain bone health.		
		**	*Musculoskeletal*	Bones	**Endochondral Ossification**	Process of hardening cartilage into bone. Responsible for formation of most of the long bones of the body.		
		**	*Musculoskeletal*	Bones	**Synovial Fluid**	Lubricates the movements of structures in the joint space. Secreted by soft tissue called the synovium, which is enclosed inside of the joint cavity by the synovial capsule.		
	404	****	*Genetics*	Fundamental Concepts	**Penetrance**	The proportion of individuals in the populations carrying an allele who actually express the phenotype.		

Chapter	Page	Importance	*System*	Topic	Term	Definition	Also Related To	Understanding
	404	****	*Genetics*	Fundamental Concepts	**Expressivity**	Different manifestations of the same genotype across the population. Constant expressivity means all individuals with a given genotype experience same phenotype.		
	404	****	*Genetics*	Fundamental Concepts	**Mendel's First Law (Law of Segregation)**	Genes exist in alleles, of which each person has two of (one from each parent). Gametes only carry one allele due to separation during meiosis of the alleles. Only one allele will be fully expressed if two alleles are different, while one is silent (except for codominance and incomplete dominance)		
	405	****	*Genetics*	Fundamental Concepts	**Mendel's Second Law (Law of Independent Assortment)**	Inheriting one gene does not affect the inheritance of another gene. This was later explained by recombination during meiosis. Problematic when linked genes were discovered.		
				Analytical Approaches in Genetics	**Hardy-Weinberg Equations**	p + q = 1, p^2 + 2pq + q^2 = 1 Equations show the frequency of alleles in a population and also the frequency of a given genotype or in the population. There will always be twice as many alleles as individuals in a population.		
				Evolution	**Inclusive Fitness**	Measure of an organism's success in the population. Based on number of offspring, ability to support offspring, and ability of the offspring to support others. Promotes altruism since sacrificing oneself, commonly for offspring, can ensure passing of genes to future generations		
					Punctuated Equilibrium	Some species have "Explosions" of evolutionary change that occur in rapid bursts, rather than slowly over a long period of time.		
					Polymorphism	Natually occuring differences in form between members of the same population, such as light and dark coloration in the same species of butterfly.		
					Adaptive Radiation	Rapid rise of a number of different species from a common anscestor.		