SAT Biology Review: Human Systems Summary

System	Purpose	Functional Unit	Synopsis	Test Notes
Skeletal	Structure, support, muscle attachment, mineral storage, blood production		Bone and cartilage: support Ligaments: connect bone to bone Tendons: connect muscle to bone	You do not have to know the names of the bones
Muscular	Movement	Sarcomere	Smooth muscle: involuntary, slow, weak, make up organs Skeletal muscle: voluntary, fast, strong, striated Cardiac muscle, involuntary, fast, strong, only in heart	Know how actin and myosin in a sarcomere contract muscle
Integumentary	Protection, waterproof barrier		Skin: outer epidermis, lower dermis	
Circulatory	Transport O_2, nutrients; remove CO_2, urea	Capillary	Blood: plasma, red blood cells, white blood cells, platelets. Vessels: artery (away from heart, thick walls, smooth muscle), capillary (site of diffusion, single RBC thick), vein (back to heart, thin walls, valves) Heart: Right atrium, right ventricle-deoxygenated blood received from body then sent to lungs. Left atrium, left ventricle-oxygenated blood received from lungs then sent to body	Know role of cells in blood Know heart anatomy. Be able to trace flow of blood through the heart.
Respiratory	Diffusion of O_2 into blood, Diffusion of CO_2 out	Alveolus	Gasses must dissolve in water first Gasses only move through diffusion Diffusion occurs from air in alveoli into blood in surrounding capillaries Lungs fill through negative pressure breathing	
Digestive	Mechanical digestion Chemical digestion Absorption	Villus and microvillus	Mechanical digestion: crush food into smaller pieces-mastication; stomach churning; bile-emulsification of fat Chemical Digestion: starch in mouth by salivary amylase; proteins in stomach by pepsin; all nutrients in duodenum by pancreatic enzymes (Trypsin, Lipase, Amylase) Absorption: amino acids, sugars, nucleotides in capillaries in villi; fatty acids in lacteal. Only monomers can be absorbed	Know where the four biomolecules are digested.
Excretory	Filtration Osmoregulation	Nephron	Plasma seeps out of Glomerulus into Bowman's Capsule. Filtration: proximal tubule; good molecules pumped back into blood stream, foreign molecules/waste continue out. Water reabsorption: varied amounts of water reclaimed from Loop of Henle by controlling salt ions pumped out of tissue	

Endocrine	Communication (primarily for maintaining homeostasis)		Endocrine glands: ductless glands produce hormones Hormones: prostaglandins are short range; steroids turn on/off genes producing new proteins; protein hormones turn on/off existing proteins Negative feedback: hormone levels vary inversely with their stimulus (as body temperature goes up, thyroxin levels go down)	Questions about what glands produce what hormones and on hormone function are possible.
Nervous	Communication (primarily for sensing/ interpreting internal environment and movement)	Neuron	Sensory neuron: sense environment. Interneuron: interpret signals; Motor neuron: control muscles Neurons: cell body with many dendrites, long axon wrapped in myelin sheath with nodes of Ranvier in-between, ends in terminus at a synapse. Impulse: Electrical signal travels from one end of nerve to other via moving Na^+ and K^+. Signal sped by jumping over the nodes. At the terminus, neurotransmitters diffuse across the synapse to the target cell. Reflex arc: Sensory neuron picks up signal, interneuron in spine interprets signal, motor neuron moves muscle Brain: cerebrum-rational thinking, memory; cerebellum-balance, muscle coordination; medulla- homeostasis, life-support	Questions about eye and ear structure are possible.
Reproductive	Produce egg or sperm Development of new organism		Testes produce sperm, swim through uterus, down fallopian tube to fuse with egg. Fertilize egg implants in uterus. Development- blastula, gastrula, formation of endoderm, mesoderm and ectoderm. Endoderm forms digestive system, mesoderm forms muscle and blood, ectoderm forms skin and nerves	Know the menstrual cycle Know the fate of the three germ layers.
Immune	Defense against invaders		Nonspecific defenses (kill any foreigners)- barriers (skin, stomach acid, sweat, tears), macrophages (cells phago-cytose foreigners), complement system blows open cells Antibodies: Y-shaped proteins made by B cells. Antibodies are unique, each recognizing a different antigen (or target). Bind to and flag or neutralize target Specific defenses: T cells recognize invaders, attract B cells (to make antibodies) and macrophages (to kill them). Some B cells become memory cells, which can respond to the same invader even faster the next time.	