

Anatomy & Physiology Study Guide

200+ High-Yield Terms & Concepts

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Anatomy & Physiology Study Guide -- High-Yield Terms & Concepts

*Category: Science / Anatomy & Physiology
(general course support)*

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How to Use This Guide

Anatomy is the study of the structure of the body; physiology is the study of how those structures function. This workbook organizes the highest-yield terms and concepts by body system, in the standard order most A&P courses follow -- from the language of anatomy and basic chemistry, through cells and tissues, then each organ system. Work through the tables to test yourself on definitions, key facts, and functional relationships. Each concept pairs key facts with a study tip and a concrete example so you can build both recall and understanding. This is a general study aid -- pair it with your textbook, lecture notes, and lab materials for full preparation.

PART 1 -- THE LANGUAGE OF ANATOMY & FUNDAMENTALS (12 Concepts)

Understand how the body is organized and the standard terminology used to describe it.

#	Term	Key Facts	Study Tip	Example
1	Anatomy	The study of the structure of the body and its parts.	Distinguish anatomy (structure) from physiology (function).	Describing the regions of the skull is anatomy.
2	Physiology	The study of how the body and its parts function.	Structure and function are always related.	Explaining how the heart pumps is physiology.
3	Levels of Organization	The body is organized from atoms to molecules, cells, tissues, organs, organ systems, and the organism.	Memorize the hierarchy in order.	Cells group into tissues, tissues into organs.
4	Anatomical Position	The standard reference position: standing erect, feet forward, palms facing forward.	Use this position for all directional terms.	The palms face forward in the anatomical position.
5	Anatomical Planes	Imaginary flat surfaces: sagittal (left/right), frontal/coronal (front/back), transverse (upper/lower).	Picture slicing the body in each plane.	A transverse plane divides the body into superior and inferior parts.
6	Directional Terms	Terms locating structures: superior/inferior, anterior/posterior, medial/lateral, proximal/distal.	Learn pairs together.	The nose is anterior to the ears and medial to the eyes.
7	Body Cavities	Internal spaces housing organs: cranial, thoracic, abdominal, pelvic, and others.	Identify which cavity holds which organs.	The heart and lungs lie in the thoracic cavity.

8	Dorsal vs. Ventral Cavities	The dorsal cavity (cranial + vertebral) is posterior; the ventral cavity (thoracic + abdominopelvic) is anterior.	The nervous system is dorsal; most viscera are ventral.	The spinal cord is in the dorsal cavity; the stomach is ventral.
9	Serous Membranes	Thin membranes lining cavities and covering organs, with a lubricating fluid layer.	Serous fluid reduces friction between organs.	Pleura line the thoracic cavity and cover the lungs.
10	Homeostasis	The maintenance of a stable internal environment within normal ranges.	Most physiology is about maintaining homeostasis.	Body temperature is kept near 37 deg C despite outside changes.
11	Negative Feedback	A control mechanism where a change triggers a response that reverses the change.	Most homeostatic controls are negative feedback.	Rising blood glucose triggers insulin, which lowers it.
12	Positive Feedback	A mechanism where a change is amplified until an endpoint is reached.	Positive feedback accelerates a process.	Uterine contractions strengthen until delivery occurs.

PART 2 -- BASIC CHEMISTRY & BIOMOLECULES (12 Concepts)

A foundation of the chemistry of life needed to understand physiology.

#	Term	Key Facts	Study Tip	Example
1	Atom	The smallest unit of an element, made of protons, neutrons, and electrons.	Protons define the element; electrons bond.	Carbon has 6 protons; nitrogen has 7.
2	Molecule	Two or more atoms held together by chemical bonds.	Molecules are made of atoms joined by bonds.	Water (H ₂ O) is a molecule.
3	Ionic Bond	A bond formed by the transfer of electrons between atoms.	Opposite charges attract to hold ions together.	Sodium and chloride form an ionic bond in salt.
4	Covalent Bond	A bond formed by the sharing of electrons.	Sharing is typically strong and common in biomolecules.	Carbon shares electrons with hydrogen in methane.
5	Water (Polarity & Hydrogen Bonding)	Water is a polar solvent that forms hydrogen bonds and has high heat capacity.	Water's polarity underlies many body functions.	Hydrogen bonds make water cohesive and good at dissolving solutes.
6	pH and Buffers	pH measures acidity/alkalinity; buffers resist pH change.	Normal blood pH is ~7.35-7.45.	Bicarbonate buffers help keep blood pH stable.
7	Carbohydrates	Energy molecules (sugars, starches); sugars, glycogen.	Provide quick energy and structure.	Glucose fuels cellular respiration.
8	Lipids	Fats, phospholipids, and steroids; energy storage and membranes.	Lipids are hydrophobic; form cell membranes.	Phospholipids form the bilayer of cell membranes.
9	Proteins	Polymers of amino acids; enzymes, structure, transport.	Proteins perform most cellular functions.	Enzymes are proteins that speed reactions.

10	Nucleic Acids	DNA and RNA; store and transmit genetic information.	DNA holds genes; RNA carries information.	DNA in the nucleus encodes proteins.
11	ATP	Adenosine triphosphate, the cell's main energy currency.	ATP releases energy when a phosphate is removed.	Muscle contraction uses ATP for energy.
12	Enzymes	Proteins (catalysts) that speed chemical reactions without being used up.	Enzymes are specific and reusable.	Salivary amylase speeds starch digestion.

PART 3 -- THE CELL & MEMBRANE (14 Concepts)

The cell is the basic unit of life; the membrane controls what enters and leaves.

#	Term	Key Facts	Study Tip	Example
1	Cell	The basic structural and functional unit of the body.	All body functions begin at the cellular level.	Nerve, muscle, and blood cells have different functions.
2	Plasma Membrane	The phospholipid bilayer with embedded proteins that surrounds the cell.	It is selectively permeable.	The membrane allows some substances through but not others.
3	Nucleus	The organelle containing DNA and directing cell activities.	The nucleus is the control center.	DNA in the nucleus directs protein synthesis.
4	Cytoplasm	The fluid and organelles inside the cell outside the nucleus.	Contains organelles and the cytosol.	Metabolic reactions occur in the cytoplasm.
5	Ribosomes	Organelles that synthesize proteins.	Ribosomes read mRNA to build proteins.	Ribosomes assemble amino acids into proteins.
6	Endoplasmic Reticulum (ER)	Rough ER (with ribosomes) makes proteins; smooth ER makes lipids.	Rough = protein, smooth = lipid.	Rough ER is abundant in protein-secreting cells.
7	Golgi Apparatus	Modifies, packages, and ships proteins and lipids.	The Golgi is the cell's post office.	Proteins are packaged into vesicles for export.
8	Mitochondria	Organelles that produce ATP through cellular respiration.	Mitochondria are the cell's powerhouses.	Active muscle cells have many mitochondria.
9	Lysosomes	Organelles that digest waste and debris with enzymes.	Lysosomes are the cell's recycling center.	A lysosome breaks down a worn-out organelle.
10	Diffusion	Movement of particles from high to low concentration (passive).	Passive; no energy needed.	Oxygen diffuses into cells where it is lower.

11	Osmosis	The diffusion of water across a selectively permeable membrane.	Water moves toward higher solute concentration.	Water moves into a cell placed in a hypotonic solution.
12	Facilitated Diffusion	Passive transport through membrane channels/carriers.	Uses transport proteins, not energy.	Glucose enters many cells via a carrier protein.
13	Active Transport	Movement against the concentration gradient requiring ATP.	The sodium-potassium pump is an example.	The Na ⁺ /K ⁺ pump moves ions against their gradients.
14	Cellular Respiration	The process producing ATP from glucose and oxygen.	Produces ATP, carbon dioxide, and water.	A cell converts glucose and O ₂ into ATP.

PART 4 -- TISSUES (10 Concepts)

The four primary tissue types and their functions.

#	Term	Key Facts	Study Tip	Example
1	Epithelial Tissue	Tissue covering surfaces and lining cavities; protection, secretion, absorption.	Lines and covers; one free surface.	Skin epidermis and the lining of the gut are epithelial.
2	Connective Tissue	Tissue that binds, supports, and protects; includes bone, blood, and fat.	Widely distributed; has a matrix.	Bone, cartilage, blood, and adipose are connective tissues.
3	Muscle Tissue	Tissue specialized for contraction; skeletal, cardiac, and smooth.	Three types with different control.	Skeletal muscle moves bones; cardiac muscle pumps the heart.
4	Nervous Tissue	Tissue specialized for transmitting electrical signals.	Neurons conduct impulses.	Neurons transmit signals from the brain to muscles.
5	Simple vs. Stratified Epithelium	Simple (one layer) for absorption; stratified (multiple layers) for protection.	Simple = thin, stratified = thick/protective.	The lung lining is simple squamous; skin is stratified.
6	Areolar Connective Tissue	Loose connective tissue that cushions and binds organs.	Found beneath epithelia.	Areolar tissue underlies the skin's epidermis.
7	Adipose Tissue	Fat tissue that stores energy and insulates.	Adipose stores triglycerides.	Adipose cushions organs and stores fat.
8	Hyaline Cartilage	Smooth, flexible cartilage at joints and in the nose and trachea.	Most common cartilage type.	Articular cartilage caps the ends of bones at joints.
9	Bone (Osseous) Tissue	Hard connective tissue with a mineralized matrix.	Bone supports and protects.	The femur is made of bone tissue.
10	Blood	A fluid connective tissue with red and white cells in plasma.	Blood is a connective tissue of cells in plasma.	Red blood cells carry oxygen.

PART 5 -- INTEGUMENTARY SYSTEM (10 Concepts)

The skin and its derivatives; the body's largest organ.

#	Term	Key Facts	Study Tip	Example
1	Integumentary System	The skin, hair, nails, and glands; protects and regulates temperature.	Largest organ system by surface area.	Skin covers and protects the entire body.
2	Epidermis	The outer, avascular layer of stratified squamous epithelium.	No blood vessels in the epidermis.	The top layer of skin is the epidermis.
3	Dermis	The thicker connective-tissue layer containing blood vessels, nerves, and glands.	Vascular; contains hair follicles and glands.	Sweat glands and blood vessels lie in the dermis.
4	Hypodermis (Subcutaneous)	The fatty layer deep to the dermis that insulates and anchors skin.	Not part of the skin proper.	The hypodermis stores fat and attaches skin to muscle.
5	Keratin	A tough protein in skin, hair, and nails that waterproofs and protects.	Keratin hardens and protects.	Keratin makes nails hard.
6	Melanin	The pigment produced by melanocytes that colors skin and absorbs UV.	Melanin protects against UV damage.	Darker skin has more melanin.
7	Sweat Glands	Eccrine and apocrine glands that secrete sweat to cool the body.	Eccrine is most widespread.	Sweating cools the body by evaporation.
8	Sebaceous Glands	Glands secreting oil (sebum) that lubricates skin and hair.	Sebum keeps skin moist and inhibits bacteria.	Sebaceous glands release oil onto the skin.
9	Thermoregulation	Regulation of body temperature via sweating and blood flow.	Vasodilation/vasoconstriction and sweating regulate heat.	The skin dilates vessels and sweats to cool down.

10	Vitamin D Synthesis	Skin produces vitamin D when exposed to UV.	UV triggers vitamin D production in skin.	Sunlight exposure enables vitamin D synthesis.
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PART 6 -- SKELETAL SYSTEM (16 Concepts)

Bones, joints, and the framework that supports the body.

#	Term	Key Facts	Study Tip	Example
1	Skeletal System	The bones, cartilage, and joints; support, protection, movement, storage, blood cell production.	Functions include support, protection, movement, mineral storage, hematopoiesis.	The skeleton supports the body and protects organs.
2	Functions of Bone	Support, protection, movement, mineral storage, and blood cell formation.	Remember the five functions.	Bone stores calcium and produces blood cells.
3	Compact Bone	Dense, hard outer bone that resists stress.	Compact bone forms the shaft (diaphysis).	The hard outer wall of the femur is compact bone.
4	Spongy Bone	Porous bone with red marrow; lighter and at bone ends.	Spongy bone (cancellous) houses red marrow.	Spongy bone is found at the ends of long bones.
5	Osteoblast	Bone-forming cell that deposits bone matrix.	OsteoBLASTs build bone.	Osteoblasts create new bone during growth.
6	Osteoclast	Bone-destroying/ resorbing cell.	OsteoCLASTs clear away bone.	Osteoclasts resorb bone to release calcium.
7	Osteocyte	A mature bone cell that maintains bone.	Osteocytes keep bone tissue healthy.	Mature bone cells monitor and maintain matrix.
8	Long Bone	A bone longer than wide, with a shaft and two ends.	Long bones act as levers.	The femur and humerus are long bones.
9	Axial Skeleton	The skull, vertebral column, and rib cage.	Axial = central axis.	The skull and vertebral column are axial.
10	Appendicular Skeleton	The limbs and their girdles (pectoral and pelvic).	Appendicular = the appendages.	The arms and legs are appendicular.
11	Vertebral Column	The spine of vertebrae protecting the spinal cord and supporting the body.	33 vertebrae: 7 cervical, 12 thoracic, 5 lumbar.	The cervical vertebrae are in the neck.

12	Joint (Articulation)	The junction between two or more bones.	Joints allow movement and support.	The knee is a joint between the femur and tibia.
13	Synovial Joint	A freely movable joint with a joint cavity and synovial fluid.	Most limb joints are synovial.	The shoulder and knee are synovial joints.
14	Cartilage	Flexible connective tissue that cushions and shapes joints.	Cartilage reduces friction between bones.	Articular cartilage covers bone ends at joints.
15	Ligament	Connective tissue that connects bone to bone.	Ligaments stabilize joints.	The anterior cruciate ligament stabilizes the knee.
16	Tendon	Connective tissue that connects muscle to bone.	Tendons transmit muscle pull to bone.	The Achilles tendon connects calf muscle to the heel.

PART 7 -- MUSCULAR SYSTEM (12 Concepts)

Muscle contraction and the muscles that produce movement.

#	Term	Key Facts	Study Tip	Example
1	Functions of Muscle	Movement, posture, heat production, and supporting body organs.	Muscles produce movement, posture, and heat.	Skeletal muscle moves limbs and generates body heat.
2	Skeletal Muscle	Striated, voluntary muscle attached to bones.	Voluntary and striated.	The biceps is a skeletal muscle.
3	Cardiac Muscle	Striated, involuntary muscle of the heart.	Involuntary, striated, branched.	The myocardium is cardiac muscle.
4	Smooth Muscle	Non-striated, involuntary muscle in hollow organs.	Involuntary and non-striated.	Smooth muscle lines the digestive tract and vessels.
5	Origin	The less movable attachment of a muscle.	Origin is usually more fixed/proximal.	The biceps origin is on the scapula.
6	Insertion	The more movable attachment of a muscle.	Insertion moves toward origin on contraction.	The biceps insertion is on the radius.
7	Agonist (Prime Mover)	The muscle primarily responsible for a movement.	The prime mover does the main work.	The biceps is the agonist for elbow flexion.
8	Antagonist	A muscle that opposes the agonist.	Antagonists relax as agonists contract.	The triceps antagonizes the biceps.
9	Sarcomere	The functional unit of contraction between Z-lines.	Sarcomeres shorten during contraction.	Actin and myosin slide to shorten the sarcomere.
10	Sliding Filament Theory	Contraction occurs as thin actin filaments slide past thick myosin filaments.	Filaments slide; they do not shorten.	Myosin pulls actin to shorten the sarcomere.
11	Motor Unit	A motor neuron and all the muscle fibers it innervates.	One neuron controls several fibers.	One motor neuron activates many fibers in a large muscle.

12	Neuromuscular Junction	The synapse between a motor neuron and a muscle fiber.	Acetylcholine triggers contraction.	ACh released at the NMJ stimulates the muscle.
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PART 8 -- NERVOUS SYSTEM (20 Concepts)

Communication, control, and integration via neurons and the CNS/PNS.

#	Term	Key Facts	Study Tip	Example
1	Nervous System Functions	Sensory input, integration, and motor output.	Three functions: sense, process, respond.	You feel a hot surface, process it, and pull your hand away.
2	Central Nervous System (CNS)	The brain and spinal cord; the integration center.	CNS = brain + spinal cord.	The brain integrates incoming signals.
3	Peripheral Nervous System (PNS)	Nerves and ganglia outside the CNS.	PNS carries signals to/from the CNS.	A nerve carrying a hand signal is PNS.
4	Neuron	A nerve cell that conducts electrical signals (action potentials).	Neurons transmit impulses.	A sensory neuron carries a pain signal to the CNS.
5	Action Potential	The electrical signal that travels down a neuron.	An all-or-none electrical impulse.	A neuron fires an action potential to send a signal.
6	Resting Membrane Potential	The stable negative charge inside a neuron at rest (~-70 mV).	Maintained by the Na ⁺ /K ⁺ pump.	A resting neuron is polarized at about -70 mV.
7	Dendrites	Neuron branches that receive signals.	Dendrites receive; axon sends.	A dendrite receives input from another neuron.
8	Axon	The long fiber that conducts impulses away from the cell body.	Axons transmit output.	An axon carries the signal toward the next neuron.
9	Synapse	The junction where a signal passes between neurons.	Neurotransmitters transmit across the synapse.	A neurotransmitter crosses the synaptic cleft.
10	Neurotransmitter	A chemical that transmits a signal across a synapse.	e.g., acetylcholine, dopamine, serotonin.	Acetylcholine excites a muscle at the NMJ.
11	Myelin Sheath	The fatty insulation around axons that speeds impulses.	Myelin speeds conduction (saltatory).	Schwann cells myelinate PNS axons.

12	Sensory (Afferent) Neurons	Neurons carrying signals toward the CNS.	Afferent = arriving.	A neuron carries a touch signal to the spinal cord.
13	Motor (Efferent) Neurons	Neurons carrying signals away from the CNS to effectors.	Efferent = exiting.	A neuron carries a command to a muscle.
14	Interneurons	Neurons in the CNS that connect sensory and motor neurons.	Interneurons integrate within the CNS.	An interneuron relays a spinal reflex.
15	Reflex Arc	A rapid, involuntary response pathway through the spinal cord.	Reflexes bypass the conscious brain.	Touching a hot object triggers an immediate withdrawal.
16	Cerebrum	The largest brain region; conscious thought, memory, voluntary movement.	Controls higher functions.	The cerebrum processes thinking and language.
17	Cerebellum	The brain region for coordination and balance.	The cerebellum fine-tunes movement.	The cerebellum helps maintain balance when walking.
18	Brainstem	The region controlling vital functions (breathing, heart rate).	The medulla controls the heart and breathing.	The brainstem keeps the heart beating and lungs breathing.
19	Sympathetic Division	The "fight or flight" division of the autonomic nervous system.	Activates under stress.	Stress speeds the heart via the sympathetic system.
20	Parasympathetic Division	The "rest and digest" division promoting calm, digestion, and recovery.	Conserves energy and promotes digestion.	After a meal, the parasympathetic system aids digestion.

PART 9 -- ENDOCRINE SYSTEM (12 Concepts)

Hormones and the glands that regulate the body.

#	Term	Key Facts	Study Tip	Example
1	Endocrine System	Glands that secrete hormones into the blood to regulate body functions.	Endocrine = internal secretion (hormones).	The thyroid secretes thyroid hormone into the blood.
2	Hormone	A chemical messenger that travels in the blood to target cells.	Hormones act on specific target tissues.	Insulin travels in blood to lower glucose.
3	Pituitary Gland	The "master gland" that controls many other endocrine glands.	The pituitary is controlled by the hypothalamus.	The pituitary secretes TSH to stimulate the thyroid.
4	Hypothalamus	The brain region linking the nervous and endocrine systems.	Controls the pituitary.	The hypothalamus releases hormones that direct the pituitary.
5	Thyroid Gland	Produces thyroid hormone (T3/T4) and calcitonin, controlling metabolism.	Thyroid hormone regulates metabolic rate.	Thyroid hormone raises the body's metabolic rate.
6	Parathyroid Glands	Produce parathyroid hormone (PTH), raising blood calcium.	PTH raises calcium; calcitonin lowers it.	PTH releases calcium from bone.
7	Pancreas	Produces insulin and glucagon to regulate blood glucose.	Insulin lowers, glucagon raises glucose.	Insulin lowers blood glucose after a meal.
8	Adrenal Glands	Produce adrenaline, cortisol, and aldosterone; stress response.	Adrenal medulla = adrenaline; cortex = cortisol.	Cortisol mobilizes energy during stress.
9	Gonads	Ovaries and testes producing sex hormones and gametes.	Estrogen/testosterone regulate reproduction.	The ovaries produce estrogen.

10	Insulin	Hormone that lowers blood glucose by promoting cellular uptake.	Deficiency causes diabetes.	Insulin moves glucose into cells.
11	Glucagon	Hormone that raises blood glucose by releasing stored sugar.	Glucagon opposes insulin.	Glucagon releases glucose from the liver.
12	Negative Feedback in Endocrinology	Hormone levels regulated by feedback loops.	High hormone level suppresses further release.	Rising thyroid hormone suppresses TSH.

PART 10 -- CARDIOVASCULAR SYSTEM (18 Concepts)

The heart, blood vessels, and blood that transport materials.

#	Term	Key Facts	Study Tip	Example
1	Cardiovascular System	The heart, blood vessels, and blood; transports oxygen, nutrients, and wastes.	The system delivers and removes materials.	Blood carries oxygen from the lungs to tissues.
2	Heart	A muscular pump with four chambers (two atria, two ventricles).	Right/left sides pump to lungs/body.	The left ventricle pumps blood to the body.
3	Atria	The upper chambers that receive blood.	Atria receive; ventricles pump.	The right atrium receives venous blood.
4	Ventricles	The lower chambers that pump blood out.	Ventricles are the main pumps.	The left ventricle pumps blood into the aorta.
5	Valves	Structures ensuring one-way blood flow.	Valves prevent backflow.	The mitral valve prevents backflow between left chambers.
6	Pulmonary Circulation	Blood flow from the heart to the lungs and back.	Pulmonary = to the lungs for gas exchange.	Deoxygenated blood goes to the lungs to pick up O ₂ .
7	Systemic Circulation	Blood flow from the heart to the body and back.	Systemic = to body tissues.	Oxygenated blood is delivered to body tissues.
8	Arteries	Vessels carrying blood away from the heart, usually oxygenated.	Arteries carry away; thick walls.	The aorta carries blood from the heart.
9	Veins	Vessels carrying blood toward the heart, usually deoxygenated.	Veins return blood; have valves.	The vena cava returns blood to the heart.
10	Capillaries	Microscopic vessels where exchange of gases and nutrients occurs.	Exchange occurs at capillaries.	Oxygen diffuses from a capillary into tissue.

11	Cardiac Cycle	One heart contraction-relaxation cycle (systole and diastole).	Systole = contraction; diastole = relaxation.	The heart contracts (systole) to pump blood.
12	Blood Pressure	The force of blood against vessel walls.	Recorded as systolic/diastolic.	A BP of 120/80 is normal.
13	Sinoatrial (SA) Node	The heart's natural pacemaker.	SA node sets the heart rate.	The SA node initiates each heartbeat.
14	Red Blood Cells (Erythrocytes)	Cells that carry oxygen via hemoglobin.	RBCs transport oxygen.	Hemoglobin carries oxygen to tissues.
15	White Blood Cells (Leukocytes)	Cells that fight infection.	WBCs defend against pathogens.	Neutrophils engulf bacteria.
16	Platelets	Cell fragments involved in blood clotting.	Platelets form clots.	Platelets plug a wound and trigger clotting.
17	Plasma	The liquid portion of blood carrying cells, nutrients, and wastes.	Plasma is the fluid matrix.	Plasma transports glucose and hormones.
18	Hemoglobin	The oxygen-carrying protein in red blood cells.	Hemoglobin binds oxygen in the lungs.	Hemoglobin releases O ₂ in tissues.

PART 11 -- LYMPHATIC & IMMUNE SYSTEM (10 Concepts)

Defense against pathogens and fluid balance.

#	Term	Key Facts	Study Tip	Example
1	Lymphatic System	Network returning excess fluid (lymph) to the blood and supporting immunity.	Returns leaked fluid to circulation.	Lymph vessels return tissue fluid to the blood.
2	Lymph	Excess tissue fluid collected by lymphatic vessels.	Lymph is fluid in lymphatic vessels.	Edema results when lymph drainage is blocked.
3	Lymph Nodes	Small organs that filter lymph and house immune cells.	Nodes filter pathogens.	Lymph nodes in the neck swell during infection.
4	Innate Immunity	Non-specific defenses present from birth (skin, inflammation, phagocytes).	Innate = general, immediate.	The skin blocks pathogens; phagocytes engulf them.
5	Adaptive Immunity	Specific immunity that develops after exposure (antibodies, memory).	Adaptive = specific and has memory.	Antibodies neutralize a specific virus after vaccination.
6	Antigen	A molecule that triggers an immune response.	Antigens are recognized as foreign.	A viral protein is an antigen.
7	Antibody	A protein (immunoglobulin) that binds specific antigens.	Antibodies mark pathogens for destruction.	An antibody binds to a virus, tagging it.
8	Helper T Cells	Lymphocytes that coordinate the immune response.	Helpers activate B and cytotoxic T cells.	A helper T cell activates a B cell.
9	B Cells	Lymphocytes that produce antibodies.	B cells make antibodies.	A B cell produces antibody against a pathogen.
10	Vaccine	A preparation that triggers immunity without causing disease.	Vaccines create memory cells.	A flu vaccine generates protective antibodies.

PART 12 -- RESPIRATORY SYSTEM (12 Concepts)

Gas exchange and breathing.

#	Term	Key Facts	Study Tip	Example
1	Respiratory System	Organs that bring in oxygen and remove carbon dioxide.	Gas exchange is the primary function.	The lungs exchange O ₂ and CO ₂ .
2	Upper Respiratory Tract	Nose, nasal cavity, pharynx, larynx.	Warms, filters, moistens air.	The nose filters and warms inhaled air.
3	Lower Respiratory Tract	Trachea, bronchi, bronchioles, lungs.	Airway to the exchange surfaces.	The trachea carries air to the bronchi.
4	Trachea (Windpipe)	The airway with C-shaped cartilage rings.	Cartilage keeps it open.	The trachea conducts air to the bronchi.
5	Bronchi & Bronchioles	Branching air passages within the lungs.	Bronchi branch into bronchioles.	Air travels from the bronchi into bronchioles.
6	Alveoli	Microscopic air sacs where gas exchange occurs.	Alveoli are the exchange surface.	Oxygen diffuses from alveoli into blood.
7	Lungs	Paired organs containing airways and alveoli.	Each lung holds millions of alveoli.	The lungs are the site of gas exchange.
8	Ventilation	The process of breathing (inhalation and exhalation).	Ventilation is air movement in/out.	The diaphragm contracts to inhale.
9	Gas Exchange	Diffusion of O ₂ into blood and CO ₂ out of blood at the alveoli.	Exchange occurs via diffusion.	O ₂ moves from alveoli into capillaries.
10	Diaphragm	The main muscle of breathing.	It flattens on inhalation.	Contraction of the diaphragm pulls air in.
11	Oxygen Transport	Oxygen carried by hemoglobin in red blood cells.	Most O ₂ binds to hemoglobin.	Hemoglobin carries O ₂ from lungs to tissues.
12	Carbon Dioxide Transport	CO ₂ carried in blood as bicarbonate, bound, and dissolved.	CO ₂ is carried partly as bicarbonate.	CO ₂ diffuses into blood and is carried to the lungs.

PART 13 -- DIGESTIVE SYSTEM (14 Concepts)

Breakdown and absorption of nutrients.

#	Term	Key Facts	Study Tip	Example
1	Digestive System	Organs that break down food and absorb nutrients.	Ingestion, digestion, absorption, elimination.	The system processes food into absorbable nutrients.
2	Mechanical Digestion	Physical breakdown of food (chewing, churning).	Mechanical = chewing/churning.	Teeth chew food into smaller pieces.
3	Chemical Digestion	Breakdown of food by enzymes.	Chemical = enzymes split molecules.	Enzymes break starch into sugars.
4	Mouth & Saliva	Chewing and salivary enzymes (amylase) begin digestion.	Salivary amylase digests starch.	Saliva begins breaking down carbohydrates.
5	Esophagus	The tube carrying food from mouth to stomach.	Uses peristalsis.	Food moves down the esophagus by peristalsis.
6	Stomach	A muscular sac that churns food and secretes acid and enzymes.	Acid + pepsin digest protein.	The stomach churns food into chyme.
7	Small Intestine	The main site of digestion and absorption.	Most absorption occurs here.	Nutrients are absorbed through the intestinal lining.
8	Villi	Fingerlike projections increasing the small intestine's surface area.	Villi increase absorption.	Villi absorb digested nutrients into blood.
9	Large Intestine (Colon)	Absorbs water and forms feces.	Water absorption occurs here.	The colon reabsorbs water from waste.
10	Liver	Produces bile; processes nutrients and detoxifies.	The liver produces bile and metabolizes.	The liver makes bile stored in the gallbladder.
11	Gallbladder	Stores and concentrates bile.	Gallbladder stores bile.	Bile is released to digest fats.
12	Pancreas (Digestive)	Secretes digestive enzymes and bicarbonate.	Pancreatic enzymes digest all food types.	The pancreas releases enzymes into the small intestine.

13	Peristalsis	Wave-like muscle contractions moving food along.	Peristalsis propels food.	Peristalsis moves food through the esophagus.
14	Absorption	Movement of digested nutrients into blood/lymph.	Absorption occurs mainly in the small intestine.	Glucose is absorbed into the bloodstream.

PART 14 -- URINARY SYSTEM & FLUID/ACID-BASE (14 Concepts)

Filtration of blood, urine formation, and fluid/pH balance.

#	Term	Key Facts	Study Tip	Example
1	Urinary System	Kidneys, ureters, bladder, urethra; filters blood and produces urine.	Removes wastes and regulates fluid.	The kidneys filter blood to form urine.
2	Kidney	Organ that filters blood and forms urine.	Regulates water, electrolytes, pH, waste.	The kidney removes urea from the blood.
3	Nephron	The functional unit of the kidney.	Each kidney has about a million nephrons.	A nephron filters blood and reabsorbs water.
4	Glomerulus	The capillary network where blood filtration begins.	Filters blood into the tubule.	Blood plasma is filtered at the glomerulus.
5	Filtration	Pressure-driven movement of fluid and solutes out of the blood.	Occurs at the glomerulus.	The glomerulus filters water and small solutes.
6	Reabsorption	Movement of needed substances back into the blood.	The tubules reabsorb water and nutrients.	Water and glucose are reabsorbed from the filtrate.
7	Secretion	Movement of additional wastes into the tubule.	Secretion removes more wastes.	Hydrogen ions are secreted to regulate pH.
8	Ureter	The tube carrying urine from the kidney to the bladder.	Ureters transport urine.	Urine travels down the ureter to the bladder.
9	Urinary Bladder	The organ that stores urine.	Bladder stores and expels urine.	The bladder fills and then empties.
10	Urethra	The tube carrying urine out of the body.	Urethra conducts urine out.	Urine leaves the body through the urethra.
11	ADH (Antidiuretic Hormone)	Hormone promoting water reabsorption to concentrate urine.	ADH conserves water.	ADH increases water reabsorption in dehydration.
12	Aldosterone	Hormone promoting sodium reabsorption and water retention.	Aldosterone raises blood volume/pressure.	Aldosterone causes sodium and water reabsorption.

13	Blood pH Regulation	Kidneys and lungs regulate acid-base balance.	Bicarbonate buffers and kidneys excrete acid.	The lungs exhale CO ₂ ; kidneys excrete H ⁺ .
14	Fluid Balance	Maintaining proper water and electrolyte levels.	Intake and output must balance.	Kidney output adjusts to maintain fluid balance.

PART 15 -- REPRODUCTIVE SYSTEM (10 Concepts)

Reproduction and gamete production.

#	Term	Key Facts	Study Tip	Example
1	Reproductive System	Organs producing gametes and hormones and supporting reproduction.	Gonads produce gametes and sex hormones.	Ovaries and testes are the gonads.
2	Gonads	The reproductive organs (ovaries in females, testes in males).	Gonads make gametes and hormones.	The testes produce sperm and testosterone.
3	Gametes	Reproductive cells (sperm and ova) with half the chromosome number.	Gametes are haploid.	A sperm cell has 23 chromosomes.
4	Ovary	The female gonad producing ova and estrogen/progesterone.	Ovaries produce eggs and hormones.	An ovary releases an ovum during ovulation.
5	Testes	The male gonads producing sperm and testosterone.	Testes produce sperm and testosterone.	The testes produce millions of sperm.
6	Ovulation	The release of an ovum from the ovary.	Occurs mid-cycle.	An ovum is released around day 14 of the cycle.
7	Menstrual Cycle	The monthly hormonal cycle of the female reproductive tract.	Regulated by hormones.	The cycle prepares the uterus for possible pregnancy.
8	Fertilization	The union of sperm and ovum to form a zygote.	Fertilization forms a zygote.	A sperm fertilizes an ovum in the fallopian tube.
9	Endocrine Regulation of Reproduction	Hormones (FSH, LH, testosterone, estrogen) control reproduction.	FSH/LH from the pituitary drive the gonads.	LH triggers ovulation.
10	Placenta	The organ nourishing the fetus and exchanging gases/nutrients/wastes.	The placenta connects mother and fetus.	The placenta delivers oxygen and nutrients to the fetus.

PART 16 -- HOMEOSTASIS & INTEGRATION (8 Concepts)

How systems work together to maintain a stable internal environment.

#	Term	Key Facts	Study Tip	Example
1	Homeostatic Mechanisms	Regulated processes that maintain stable internal conditions.	Most use negative feedback.	Body temperature, blood glucose, and pH are regulated.
2	Feedback Loop Components	Receptors detect change; control center compares; effectors respond.	Remember: receptor - control center - effector.	A receptor senses cold and the body shivers to warm.
3	Set Point	The normal range or target value a variable is regulated to.	The body defends a set point.	The set point for body temperature is about 37 deg C.
4	Thermoregulation	Regulation of body temperature by the hypothalamus.	Vasodilation/sweating cool; shivering warms.	The hypothalamus triggers sweating to cool the body.
5	Integration of Systems	Organ systems work together to maintain homeostasis.	Systems cooperate for a common goal.	The respiratory and cardiovascular systems deliver O ₂ .
6	Endocrine-Nervous Integration	The nervous and endocrine systems coordinate rapid and slow responses.	Neurons respond fast; hormones act longer.	Stress triggers both nerve signals and hormones.
7	Fluid and Electrolyte Homeostasis	Regulation of water and ion balance by the kidneys and hormones.	Kidneys and hormones maintain balance.	ADH and aldosterone regulate water and sodium.
8	Acid-Base Homeostasis	Regulation of blood pH through buffers, lungs, and kidneys.	pH is tightly regulated.	Lungs exhale CO ₂ and kidneys excrete H ⁺ to stabilize pH.

End of workbook. Review system by system, connect structure to function, and good luck in your anatomy & physiology course.