

	<ul style="list-style-type: none"> ▪ Major endocrine glands: names, locations, products ▪ Major types of hormones ▪ Neuroendocrinology — relation between neurons and hormonal systems <p>Endocrine System: Mechanisms of Hormone Action (BIO)</p> <ul style="list-style-type: none"> ▪ Cellular mechanisms of hormone action ▪ Transport of hormones: blood supply ▪ Specificity of hormones: target tissue ▪ Integration with nervous system: feedback control ▪ Regulation by second messengers
<p>3B: Structure and integrative functions of the main organ systems</p> <p>Animals use a number of highly organized and integrated organ systems to carry out the necessary functions associated with maintaining life processes. Within the body, no organ system is an island. Interactions and coordination between organ systems allow organisms to engage in the processes necessary to sustain life. For example, the organs and structures of the circulatory system carry out a number of functions, such as transporting:</p> <ul style="list-style-type: none"> ▪ Nutrients absorbed in the digestive system. ▪ Gases absorbed from the respiratory system and muscle tissue. ▪ Hormones secreted from the endocrine system. ▪ Blood cells, produced in bone marrow, to and from cells in the body to help fight disease. <p>The content in this category covers the structure and function of the major organ systems of the body, including the respiratory, circulatory, lymphatic, immune, digestive, excretory, reproductive, muscle, skeletal, and skin systems. Also covered in this category is the integration of these systems and their control</p>	<p>Respiratory System (BIO)</p> <ul style="list-style-type: none"> ▪ General function <ul style="list-style-type: none"> ○ Gas exchange, thermoregulation ○ Protection against disease: particulate matter ▪ Structure of lungs and alveoli ▪ Breathing mechanisms <ul style="list-style-type: none"> ○ Diaphragm, rib cage, differential pressure ○ Resiliency and surface tension effects ▪ Thermoregulation: nasal and tracheal capillary beds; evaporation, panting ▪ Particulate filtration: nasal hairs, mucus-cilia system in lungs ▪ Alveolar gas exchange <ul style="list-style-type: none"> ○ Diffusion, differential partial pressure ○ Henry's Law (GC) ▪ pH control ▪ Regulation by nervous control <ul style="list-style-type: none"> ○ CO₂ sensitivity <p>Circulatory System (BIO)</p> <ul style="list-style-type: none"> ▪ Functions: circulation of oxygen, nutrients, hormones, ions and fluids, removal of metabolic waste ▪ Role in thermoregulation ▪ Four-chambered heart: structure and function

<p>and coordination by the endocrine and nervous systems.</p>	<ul style="list-style-type: none"> ▪ Endothelial cells ▪ Systolic and diastolic pressure ▪ Pulmonary and systemic circulation ▪ Arterial and venous systems (arteries, arterioles, venules, veins) <ul style="list-style-type: none"> ○ Structural and functional differences ○ Pressure and flow characteristics ▪ Capillary beds <ul style="list-style-type: none"> ○ Mechanisms of gas and solute exchange ○ Mechanism of heat exchange ○ Source of peripheral resistance ▪ Composition of blood <ul style="list-style-type: none"> ○ Plasma, chemicals, blood cells ○ Erythrocyte production and destruction; spleen, bone marrow ○ Regulation of plasma volume ▪ Coagulation, clotting mechanisms ▪ Oxygen transport by blood <ul style="list-style-type: none"> ○ Hemoglobin, hematocrit ○ Oxygen content ○ Oxygen affinity ▪ Carbon dioxide transport and level in blood ▪ Nervous and endocrine control <p>Lymphatic System (BIO)</p> <ul style="list-style-type: none"> ▪ Structure of lymphatic system ▪ Major functions <ul style="list-style-type: none"> ○ Equalization of fluid distribution ○ Transport of proteins and large glycerides ○ Production of lymphocytes involved in immune reactions ○ Return of materials to the blood <p>Immune System (BIO)</p> <ul style="list-style-type: none"> ▪ Innate (nonspecific) vs. adaptive (specific) immunity ▪ Adaptive immune system cells <ul style="list-style-type: none"> ○ T-lymphocytes ○ B-lymphocytes
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	<ul style="list-style-type: none"> ▪ Innate immune system cells <ul style="list-style-type: none"> ○ Macrophages ○ Phagocytes ▪ Tissues <ul style="list-style-type: none"> ○ Bone marrow ○ Spleen ○ Thymus ○ Lymph nodes ▪ Concept of antigen and antibody ▪ Antigen presentation ▪ Clonal selection ▪ Antigen-antibody recognition ▪ Structure of antibody molecule ▪ Recognition of self vs. nonself, autoimmune diseases ▪ Major histocompatibility complex <p>Digestive System (BIO)</p> <ul style="list-style-type: none"> ▪ Ingestion <ul style="list-style-type: none"> ○ Saliva as lubrication and source of enzymes ○ Ingestion; esophagus, transport function ▪ Stomach <ul style="list-style-type: none"> ○ Storage and churning of food ○ Low pH, gastric juice, mucal protection against self-destruction ○ Production of digestive enzymes, site of digestion ○ Structure (gross) ▪ Liver <ul style="list-style-type: none"> ○ Structural relationship of liver within gastrointestinal system ○ Production of bile ○ Role in blood glucose regulation, detoxification ▪ Bile <ul style="list-style-type: none"> ○ Storage in gall bladder ○ Function ▪ Pancreas <ul style="list-style-type: none"> ○ Production of enzymes ○ Transport of enzymes to small intestine
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	<ul style="list-style-type: none"> ▪ Small intestine <ul style="list-style-type: none"> ○ Absorption of food molecules and water ○ Function and structure of villi ○ Production of enzymes, site of digestion ○ Neutralization of stomach acid ○ Structure (anatomic subdivisions) ▪ Large intestine <ul style="list-style-type: none"> ○ Absorption of water ○ Bacterial flora ○ Structure (gross) ▪ Rectum: storage and elimination of waste, feces ▪ Muscular control <ul style="list-style-type: none"> ○ Peristalsis ▪ Endocrine control <ul style="list-style-type: none"> ○ Hormones ○ Target tissues ▪ Nervous control: the enteric nervous system <p>Excretory System (BIO)</p> <ul style="list-style-type: none"> ▪ Roles in homeostasis <ul style="list-style-type: none"> ○ Blood pressure ○ Osmoregulation ○ Acid-base balance ○ Removal of soluble nitrogenous waste ▪ Kidney structure <ul style="list-style-type: none"> ○ Cortex ○ Medulla ▪ Nephron structure <ul style="list-style-type: none"> ○ Glomerulus ○ Bowman's capsule ○ Proximal tubule ○ Loop of Henle ○ Distal tubule ○ Collecting duct ▪ Formation of urine <ul style="list-style-type: none"> ○ Glomerular filtration ○ Secretion and reabsorption of solutes ○ Concentration of urine ○ Counter-current multiplier mechanism ▪ Storage and elimination: ureter, bladder, urethra
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	<ul style="list-style-type: none">▪ Osmoregulation: capillary reabsorption of H₂O, amino acids, glucose, ions▪ Muscular control: sphincter muscle <p>Reproductive System (BIO)</p> <ul style="list-style-type: none">▪ Male and female reproductive structures and their functions<ul style="list-style-type: none">○ Gonads○ Genitalia○ Differences between male and female structures▪ Hormonal control of reproduction<ul style="list-style-type: none">○ Male and female sexual development○ Female reproductive cycle○ Pregnancy, parturition, lactation○ Integration with nervous control <p>Muscle System (BIO)</p> <ul style="list-style-type: none">▪ Important functions<ul style="list-style-type: none">○ Support: mobility○ Peripheral circulatory assistance○ Thermoregulation (shivering reflex)▪ Structure of three basic muscle types: striated, smooth, cardiac▪ Muscle structure and control of contraction<ul style="list-style-type: none">○ T-tubule system○ Contractile apparatus○ Sarcoplasmic reticulum○ Fiber type○ Contractile velocity of different muscle types▪ Regulation of cardiac muscle contraction▪ Oxygen debt: fatigue▪ Nervous control<ul style="list-style-type: none">○ Motor neurons○ Neuromuscular junction, motor end plates○ Sympathetic and parasympathetic innervation○ Voluntary and involuntary muscles
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	<p>Specialized Cell — Muscle Cell (BIO)</p> <ul style="list-style-type: none"> ▪ Structural characteristics of striated, smooth, and cardiac muscle ▪ Abundant mitochondria in red muscle cells: ATP source ▪ Organization of contractile elements: actin and myosin filaments, crossbridges, sliding filament model ▪ Sarcomeres: “I” and “A” bands, “M” and “Z” lines, “H” zone ▪ Presence of troponin and tropomyosin ▪ Calcium regulation of contraction <p>Skeletal System (BIO)</p> <ul style="list-style-type: none"> ▪ Functions <ul style="list-style-type: none"> ○ Structural rigidity and support ○ Calcium storage ○ Physical protection ▪ Skeletal structure <ul style="list-style-type: none"> ○ Specialization of bone types, structures ○ Joint structures ○ Endoskeleton vs. exoskeleton ▪ Bone structure <ul style="list-style-type: none"> ○ Calcium-protein matrix ○ Cellular composition of bone ▪ Cartilage: structure and function ▪ Ligaments, tendons ▪ Endocrine control <p>Skin System (BIO)</p> <ul style="list-style-type: none"> ▪ Structure <ul style="list-style-type: none"> ○ Layer differentiation, cell types ○ Relative impermeability to water ▪ Functions in homeostasis and osmoregulation ▪ Functions in thermoregulation <ul style="list-style-type: none"> ○ Hair, erectile musculature ○ Fat layer for insulation ○ Sweat glands, location in dermis
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	<ul style="list-style-type: none">○ Vasoconstriction and vasodilation in surface capillaries▪ Physical protection<ul style="list-style-type: none">○ Nails, calluses, hair○ Protection against abrasion, disease organisms▪ Hormonal control: sweating, vasodilation, and vasoconstriction
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