

Starr Chapter:

VIRUSES: bacteriophages, **Enveloped Viruses**, **HIV**, Viroids, Prions. **Lytic, lysogenic life cycles**. **Bacteriophages**,.

PLANT Form and Function: Ground tissue, Vascular tissue, Dermal tissue. Apical Meristems. **Shoots** (stems, leaves, flowers, fruits, seeds), **roots** (primary, lateral; root hairs, root cap). Xylem UP (water & minerals), Phloem DOWN (photosynthetic products, sugars/sucrose). Vascular Bundles: **Xylem** vessels and tracheids, **Phloem** sieve-tube members and Companion cells. Epidermis – cuticle, cutin, stomata. Cotyledons, **Eudicots, Monocots**. Leaf – mesophyll, epidermis, stomata. Water transport: **Endodermis, Casparian strip**. Soil – sand, silt, clay, humus. Leaching, Erosion. Macronutrients (9) = C/H/Mg/N/K/ P/O/Ca/S; Micronutrients = (Cl/Zn/Fe/Cu/Bo/Mo/Mn). **Transpiration, Cohesion-Tension Theory. Translocation, Pressure-Flow Theory. Flowers:** Stamens (filaments, anthers), Pollen, Carpels (stigma, style, ovary), ovules, sepal. Pollination, pollinators, **Pollen Tube, Double-fertilization**, triploid endosperm, seed, Fruit (fleshy, dry = nut). Seed dispersal.

NERVOUS SYSTEM: **Neurons** – cell body/dendrites; input, basal trigger, axon conducting, axon termini/neurotransmitter output. **Sensory neurons, interneurons, motor neurons. Glial cells** support neurons. *Resting membrane potential, **action potential**, threshold stimulus, Na⁺ channels, K⁺ channels, Na/K pump* - ATP, positive feedback loop; “**All or Nothing**” response, Threshold, **Reflex Arc**. Synapse, presynaptic membrane, postsynaptic membrane, synaptic cleft, **neurotransmitters** (acetylcholine, epinephrine, serotonin, dopamine, GABA). Nerves – **myelin** sheath, neuroglial **Schwann cells**, nodes, **Saltatory Conduction**. Central Nervous system, peripheral nervous system (somatic, **autonomic**—internal organs; **parasympathetic** – slow and calm at rest; **sympathetic** – fight or flight response.

IMMUNITY: Jenner- smallpox vaccine; Pasteur - vaccinations. Barriers: dry skin, natural microflora/lactic acid bacteria; mucous-coated membranes, **lysozyme**, cilia linings, urine flow.

Nonspecific- (tissue damage, invasion): phagocytes, clotting, **complement** activation (Membrane Attack Complexes), **Inflammation** – **mast cells**/ histamines & prostaglandins – redness, warmth, swelling, pain; **interleukins**. Specific- Immune System: *self/nonself, specificity, diversity, memory*. **Antigen, effector cells, memory cells, MHC** markers, **Antigen-presenting cells**, phagocytes, macrophages & dendritic cells, antigen-MHC complexes, **helper T cells** (signals, **interleukins**), **B cells** (plasma cells secrete antibodies), **cytotoxic T cells, Natural Killer Cells**. Bone marrow, Thymus gland. Immunoglobulins (IgG, A, E, M), T-Cell Receptors, Clonal selection of B cells, Primary & secondary immune responses. Lymph nodes. Antibody-mediated response, cell-mediated response: *touch-killing, apoptosis, perforins*. Allergy/ anaphylaxis, Autoimmunity (MS), Immune Deficiency (AIDS, SCID).

Community Interactions: habitat, community, trophic/feeding levels, niche, mutualism (*lichens, mycorrhizae, yuccas/moths*), commensalism, parasitism & predation, interspecific competition. **SYMBIOSIS**. **Competitive exclusion**, resource partitioning. **Predator/prey coevolution & population cycling** (“peaks and catastrophes”). Prey defenses: camouflage, warning coloration, mimicry, moment-of-truth defenses. **Succession:** Primary, secondary, **Pioneer species**, Climax community. Self-promoting Diversity.

ECOSYSTEMS: **Autotrophs-** primary producers, **heterotrophs** – consumers (*herbivores, carnivores, parasites, decomposers, detritivores*). *Omnivores, scavengers*. Ecosystem, **Trophic Levels**, food chain, **food web**. Pyramid of Energy Flow. Biogeochemical cycles – hydrologic, **carbon**, etc. **Nutrient recycling, but one-way flow of energy from sun (energy pyramid)**. **Greenhouse effect** (CO₂, H₂O, O₃, N₂O, CH₄, CFCs), *global warming*.

***Principles of Biology* CUMULATIVE Final portion (Spring 2005): STUDY QUESTIONS**

Possible Short Essay Topics (be prepared to draw diagrams as well!):

- *The most likely Exam questions are underlined, but ALL questions below are excellent review tools for the rest of the exam!!*
1. List and draw 4 major differences between Mono cot and Eudicot (Dicot) plants.
 2. Diagram and label the direction of flow of water and dissolved minerals in a plant vascular system. What forces are important in this one-directional flow? Include the name of the theory that explains the process. What regulates which minerals get into the vascular system?
 3. Diagram and label the direction of flow of water and photosynthesized sugars (sucrose) from source to sink in the plant vascular system. How are sugars “loaded” for transport? What forces drive the transport? Include the name of the theory that explains the transport process.
 4. Describe and contrast Resting Potential and Action Potential in a nerve cell (diagram). How does an action potential start, and how does it propagate (continue along) to the end of the neuron?
 5. How do Schwann cells speed up nerve conduction of a signal? Once an action potential reaches a nervous synapse, how does the signal cross that gap to the target tissue?
 6. List and Describe 5 NON-specific host defenses in mammals. How do these prevent infection by invading microbes?
 7. Compare the cell types (white blood cells) involved in humoral/ antibody immunity with those involved in T-cell immunity. How do each of these white blood cell types function to prevent infection.
 8. Diagram and explain the cycling of predator and prey populations in reproductive seasons. List and give examples of 4 defenses prey can use to avoid predators.
 9. Describe or diagram, and give examples, as to how a food web can form in an ecosystem. In what direction (list the five basic trophic levels, in order of source to final resistance), and how much energy flows at each step through a typical food web.
 10. Describe the major steps, including marine, land, and organismal sources and destinations for the flow of a major biogeochemical cycle.