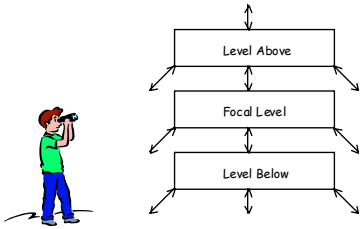


Name: Key

Interactions
(These are just some possible answers.)

| Focal Level | Level Above | Example Effect | Level Below | Example Effect | Same Level | Example Effect |
|---|---|---|---|---|---|---|
| **Biome** | **Not going beyond this level at this time.** | **Not going beyond this level at this time.** | Ecosystem | Vegetation of ecosystem affects rainfall (less vegetation means less transpiration means less moisture in the air means less rainfall). | Biome | Urban biome interacting with desert biome (change of climate and traits of flora and/or fauna within the biomes.). Energy flow and matter cycling. |
| **Ecosystem** | Biome | Climate constrains resources available and organisms that can live there (e.g. freezing temperatures limit water availability). | Community | The types of communities present affects what resources are available and are used (e.g. nitrogen-fixing bacteria). | Ecosystem | Migration patterns of organisms (e.g. elephants, butterflies, etc.), nutrient cycling, and meta-populations. |
| **Community** | Ecosystem | Resources available can constrain NPP (total amount of plant growth) possible. | Population | Types of populations present explain community structure (grassland vs. forest). | Community | Emigration and immigration, (meta-populations). |
| **Population** | Community | Plant community structure affects what animal populations can live there (e.g. antelope live in open grasslands rather than forests). | Organism | Fecundity of individual organisms can affect total population size (bacteria, fungi, reptiles, mammals, plants, algae, ants, fish, etc.). | Population | Presence of a predator/ pathogen/herbivore/etc. can affect the size of another population (fungal predator of nematodes)- trophic interactions. |
| **Organism** | Population | Population dispersal can affect an individual organism's ability to find a mate and reproduce (also, sexual vs. asexual reproduction). | Organ System | If a system fails, the individual becomes sick and may die (e.g. root system excretory system). | Organism | Competition for resources such as food, shelter, water, mates, etc. Parent-child interactions. |
| **Organ System** | Organism | Activity of an individual affects system function and structure (e.g. drugs/food/ exercise), such as circulatory or respiratory function. | Organ | If an individual organ fails (e.g. heart), the entire system may fail (e.g. circulatory system). | Organ System | Root system ability to uptake water affects leaf turgidity (more water equals more turgid). |

| Focal level | Level Above | Example Effect | Level Below | Example Effect | Same Level | Example Effect |
|---|---|---|---|---|---|---|
| **Organ** | Organ System | Blood pressure influences diameter of blood vessels. | Tissue | Nervous tissue formation affects brain function and structure. | Organ | Heart failure can cause liver failure due to accumulation of fluids. |
| **Tissue** | Organ | Amount of brain activity affects connectedness (structure) of nervous tissue. | Cell | Proliferation of cells can change the structure and function of tissue (galls or tumors). | Tissue | Muscle and nervous tissue interact. If nervous tissue is damaged, muscle cannot function and is not toned. |
| **Cell** | Tissue | Connectedness of tissue cells constrains cell-to-cell communication. | Organelle | Type and amount of organelles present explains functions of the cell (e.g. chloroplast or mitochondria). | Cell | Transportation of water or nutrients between cells in vascular system of plants. |
| **Organelle** | Cell | Provides chemical environment in which organelle functions. | Molecule | Structure of molecules forming membranes determines its structure and what can pass through. | Organelle | Ribosomes and endoplasmic reticulum interact in the production and modification of proteins. |
| **Molecule** | Organelle | Rough endoplasmic reticulum modifies protein molecules. | Atom | The atoms that make up molecules determine its chemical and physical properties ($N_2O$ is different from $NH_3$). | Molecule | Molecules react and interact with each other (e.g. nucleic acids; $CO_2$ and $H_2O$). |
| **Atom** | Molecule | Molecule structure can constrain reactivity of atoms (e.g. enzyme shape). | Subatomic Particle | The particles that make up an atom determine its chemical and physical properties (S is different from Ne). | Atom | Reactions occurring between atoms (e.g. oxygen reacting with hydrogen). |
| **Subatomic Particle** | Atom | Energy level in atom determines electron packing (placement in electron shells). Movement of electrons. | **Not going beyond this level at this time.** | **Not going beyond this level at this time.** | Subatomic Particle | The particles are repelled or attracted to each other. |