

## Final Exam Study Guide

**Hypothesis**- a testable explanation of observations which leads to Making predictions - if the hypothesis is correct - Testing the predictions - Analyze and interpret the results

**Theory**- a widely accepted explanation of a cause and effect relationship resulting in observable phenomena and outcomes in the natural world. Many independent scientists have extensively tested these theories. (Gravity, evolution, plate tectonics, climate change)

**Law**- when a theory has been so extensively tested and confirmed that the scientific community accepts it as a fundamental basis of science. (Conservation of mass/energy)

**Triple Bottom Line**- human well-being rests on a foundation of three pillars of society

**-Economic, Environment, Social**

\*Human population and consumption are driving our environment to the limits of what it can support

**Sustainability**- living within our means- consuming resources at the rate they are replenished without depleting them for future generations.

**\*\*2 main drivers of environmental change- population growth and consumption\*\***

**Tragedy of the Commons**- when you have a communally shared resource that any one can access, without regulation it will be overused because it is in everyone's individual advantage to take advantage of it.

Ex: cattle overgrazing in the "commons"

Overfishing

Deforestation

Solutions:

Private ownership

Community organization and self-regulation

-Government regulation \*\* most effective

\*Solutions have problems too

**Ecological Footprint**- The **ecological footprint** is a measure of human demand on the Earth's ecosystems. It is a standardized measure of demand for natural capital that may be contrasted with the planet's ecological capacity to regenerate.<sup>[1]</sup> It represents the amount of biologically productive land and sea area necessary to supply the resources a human population consumes, and to assimilate associated waste.

-Conservation of Mass

-1<sup>st</sup> law of thermodynamics- conservation of energy

-2<sup>nd</sup> law of thermodynamics- energy transfer increases entropy

An **Ecosystem** consists of all living and nonliving things that occur and interact in a particular area

Forest, marine, prairie, arctic

**\*\*Ecosystems border one another, interact, and can overlap\***

What happens in one ecosystem doesn't necessarily stay in one ecosystem

**\*\*Ecosystems provide vital services we depend on**

**Terrestrial (land based)**

-Warm and moist conditions lead to higher productivity- wetlands, tropical forest

-Dry and cold conditions have low net primary productivity- desert and tundra

**Aquatic**

-Productivity increases with light (which depends on depth) and availability of nutrients (which depends on currents and proximity to chemical sources)

Ecosystem cycles → water cycle, carbon cycle, nitrogen cycle, phosphorus cycle

Events (natural): hurricanes, landslides, and earthquakes

Events (human induced): chemical spills, explosions

Ecosystem cycles (aka biogeochemical cycles) move matter and energy between parts of the Earth system

- in cycles, matter and energy are moved by processes such as transport and deposition from one reservoir to another
- Ex- water, carbon, nitrogen, phosphorus cycle

**Water Cycle Reservoirs:**

Ocean, ice caps/ glaciers, ground water, soil water, atmosphere, lakes, rivers, land plants.

**Water Cycle Processes**

- Water falls thru precipitation as rain or snow

- Water evaporates from liquid to vapor or sublimes directly from vapor to solid

- Water vapor is released from plants through transpiration

- Water flows on the surface as runoff into streams, lakes, ponds and the ocean

- Water infiltrates into the soil, recharging aquifers and replenishing the groundwater.

-Water is discharged from groundwater sources and flows into surface waters

### Human Impact on Water Cycle

- Damming rivers slows movement of water into the ocean and increases evaporation
- Constraining/directing the flow of rivers (Mississippi) prevents maintenance of deltas and ecosystem services
- Land use changes has increase surface water runoff
- Use of surface water and ground water has caused water table and lake levels to drop in many places
- Increasing temperature are causing ice and snow to melt, causing more warming and melting through ice-albedo feedback

### Carbon Cycle Reservoirs

**Sedimentary rock** (including fossil fuels), **ocean**, soil and soil biota, **atmosphere**, and land plants & animals

### Carbon Cycle processes

- Carbon burial in sediments
- Decomposition of carbon from plants and animals
- Weathering of rocks releases carbon
- Runoff from surface transports carbon
- Emissions from volcanoes/ hydrothermal vents release carbon
- Ocean/ atmosphere molecular exchange at surface
- Respiration from plants and animals
- Photosynthesis
- Fossil fuel extraction/ combustion
- Deforestation/land use emissions

### Human impacts on Carbon cycle

- Deforestation releases carbon into the atmosphere
- Clearing land for agriculture releases carbon into the atmosphere
- Increased population and demand for animal based foods increases the release of methane (ch<sub>4</sub>) to the atmosphere
- wastes release methane to the atmosphere
- Extraction of fossil fuels from earths sediments moves carbon to the atmosphere through combustion

**Species-** population or group of populations of organisms

**Natural Selection:** The process whereby inherited characteristics that enhance survival and reproduction are passed on more frequently to future generations than those that do not.

**Evolution-** genetically based change in the appearance, functioning, and or behavior of organisms across generations, often by the process of natural selection