

# APES Unit 1 Study Guide

## Ultimate Review Packet (1.1 - 1.3)

### 1.1 - Introduction to Ecosystems

- a. **Explain** the difference between ecosystem, habitat, and environment: **ecosystems are the interaction of living & nonliving things in a specific area while the environment refers to the natural world more broadly. A habitat is the specific env. conditions a given species needs to survive**
- b. **Explain** the difference between symbiosis and mutualism: **Symbiosis just refers to any close interaction where species live in close proximity, even if it's harmful to one species (such as a parasite living in its host.) Mutualism is a specific type of symbiosis that benefits both species**

Relationship	+, -, 0 for Organism #1	+, -, 0 for Organism #2	Example
Mutualism	+	+	<i>Bees &amp; plants they pollinate, coral &amp; algae</i>
Predation	+	-	Lions eating zebras or deer eating leaves
Commensalism	+	0	Birds nesting in trees
Competition	-	-	Plant species competing for ground water

### 1.2 - Terrestrial Biomes

- a. Define biome: **An area that shares an average yearly temperature and precipitation pattern**
- b. **Identify** a biome with lower annual precip. and temp. averages than the tropical rainforest: **temperature forest, boreal forest, woodland/shrubland, temperate grassland**
- c. **Identify** a desert species and **describe** how it's adapted to the avg. annual temp. & precip of its biome: **cacti have thick, waxy cuticles or membranes to conserve water and prevent high temperatures from causing water loss**
- d. **Describe** how a warming global climate may impact the distribution of tropical rainforests: **a warming global climate would expand the range of tropical rainforests north and south from the tropics as subtropical regions warm and receive more rainfall**

### 1.3 - Aquatic Biomes

- a. **Describe** an adaptation of the mangrove tree that enables it to tolerate the salinity levels of estuaries
1. **Thicker membranes/leaf pores that prevent salt from entering/pump salt out**
  2. **Stilt-like roots that prop plants up and out of the water/provide an anchor against waves/tides**
- b. **Identify** TWO unique characteristics of estuaries
1. **Mouth of a river emptying into an ocean (Mixing of fresh and saltwater)**
  2. **High productivity due to sediments deposited by river**
- c. **Explain** why estuaries are highly biodiverse ecosystems: **high plant productivity due to nutrient-rich sediments deposited by river supports wide diversity of animal species**

# APES Unit 1 Ultimate Review Packet (1.4 - 1.6)

## Biogeochemical Cycle Terminology

- Reservoir: things that temporarily store matter
- Source: processes that move matter around between reservoirs
- Sink: reservoirs that store more matter than they give off

## 1.4 - Carbon Cycle

- Explain** why the atmosphere is a consequential carbon reservoir: the level of carbon held in the atmosphere plays a role in determining earth's temperature; as carbon levels in the atmosphere increase, earth's atmospheric/global temperature increases
- Explain** the difference between carbon sources and sinks carbon sources return carbon to the atmosphere while carbon sinks remove carbon from the atmosphere, storing more carbon than they release.
- Identify** a carbon source and a carbon sink
  - Sources:** fossil fuel combustion, decomposition, respiration, volcanoes, forest fires
  - Sinks:** sedimentary rock, old-growth forests (redwoods/sequoias), soil,
- Explain** why the carbon released from burning fossil fuels has a different effect on atmospheric carbon levels than the carbon released from cellular respiration: the carbon released from burning fossil fuels has been out of atmospheric circulation for millions of years, adding carbon to the atmosphere that was not recently there, whereas cellular respiration releases CO<sub>2</sub> into the atmosphere that was recently taken out of the atmosphere by photosynthesis

## 1.5 - Nitrogen Cycle

- Describe** TWO ways that the N cycle differs from the C cycle: Nitrogen cycles much more quickly through its reservoirs and the nitrogen in the atmosphere is biologically unavailable to plants
- Describe** nitrogen fixation: process of N<sub>2</sub> gas from the atmosphere being converted into biologically available nitrogen such as ammonia (NH<sub>3</sub>) or nitrate (NO<sub>3</sub>)
- Identify** a biotic and abiotic form of N fixation  
Biotic: Soil bacteria/ Rhizobacteria  
Abiotic: Lightning strikes/FF combustion
- Describe** assimilation: plants taking in nitrogen from the soil or animals taking in nitrogen by eating plants
- Describe** ammonification: soil microbes or bacteria converting organic matter/waste into ammonium (NH<sub>4</sub>)/ammonia (NH<sub>3</sub>)
- Describe** nitrification: soil bacteria converting ammonium (NH<sub>4</sub>) into nitrate (NO<sub>3</sub>)
- Describe** denitrification: soil bacteria converting NO<sub>3</sub>/NO<sub>2</sub> into N<sub>2</sub>O/N<sub>2</sub> gas

## 1.6 - Phosphorus Cycle

- Describe** TWO ways that the P cycle differs from both the N and C cycles: phosphorus has no gas phase so it doesn't enter the atmosphere, the major phosphorus reservoir is rocks and sediments which makes its cycling much slower than C or N
- Describe** the difference between weathering and erosion, in the context of the phosphorus cycle: weathering is the breakdown of rocks into smaller pieces called sediments, which often contain phosphate; erosion is the transport of these sediments by the wind and the rain, carrying the phosphate in them into new ecosystems
- Explain** how one of these differences from above makes phosphorus a limiting nutrient in many ecosystems: Because rocks and sediments are the main reservoirs, phosphorus enters ecosystems via the slow processes of weathering and erosion from rocks or sediment transport, making its supply limited in many ecosystems

# APES Unit 1 Ultimate Review Packet (1.7 - 1.10)

## 1.7 - Hydrologic Cycle

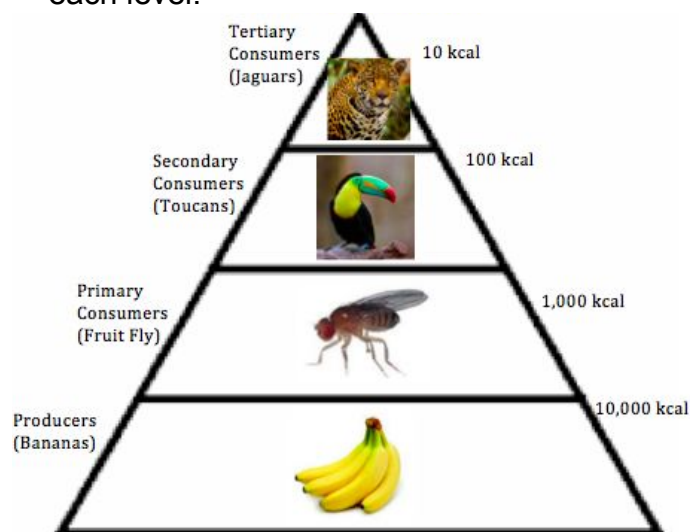
- Identify** the source of energy driving the hydrologic cycle: **heat/energy from sun/solar radiation**
- Identify** a step of the hydrologic cycle and **explain** how the sun's energy drives that step
  - Evaporation:** sunlight hits liquid water, heating it into a vapor that enters the atmosphere
  - Precipitation:** water vapor in the atmosphere condenses as the air cools due to its increased elevation away from the warmth of earth's surface (from solar radiation) and falls as rain/snow
- Describe** how vegetation density influences infiltration and transpiration in a given ecosystem: **in general, more densely vegetated ecosystems will have higher rates of infiltration as their roots absorb water from the soil and increase infiltration; more densely vegetated ecosystems will also generally lead to increased transpiration as there are more plants photosynthesizing and releasing water vapor from their stomata as a result**
- Identify** the largest freshwater reservoir on earth: **Ice caps & glaciers**

## 1.8 - Primary Productivity

- Define** Primary Productivity: **RATE** at which **plants/producers in an area convert sunlight into glucose or other biological molecules**
- Identify** the units used to measure primary productivity: **kilocalories/m<sup>2</sup>/year or energy/area/time**
- Define** respiration loss: **the energy a plant (or any organism) uses up for its own cellular respiration**
- Write out the formula for calculating NPP:  
 **$NPP = GPP - RL$**
- NPP Practice Problems** Show your work and include units in your setup and answer (*g C refers to grams of Carbon biomass*)
  - Fremont High School's football field has a GPP of 1221 g C/m<sup>2</sup>/yr and a respiration loss equivalent to 450 g C/m<sup>2</sup>/yr. **Calculate** the NPP  
 **$NPP = 1221 \text{ g C/m}^2/\text{yr} - 450 \text{ g C/m}^2/\text{yr} = 771 \text{ g C/m}^2/\text{yr}$**
  - The Fremont Links Golf Course has an NPP of 1,100 g C/m<sup>2</sup>/yr and a respiration loss equivalent to 350 g C/m<sup>2</sup>/year. **Calculate** the GPP.  
 **$1,100 \text{ g C/m}^2/\text{yr} = GPP - 350 \text{ g C/m}^2/\text{yr}$**   
 **$GPP = 1,100 + 350 = 1,450 \text{ g C/m}^2/\text{yr}$**
  - Mr. Smedes' alfalfa patch has an NPP of 304 kcal/m<sup>2</sup>/yr and a GPP of 421 kcal/m<sup>2</sup>/yr. **Calculate** the respiration loss.  
 **$304 \text{ kcal/m}^2/\text{yr} = 421 \text{ kcal/m}^2/\text{yr} - RL$**   
 **$421 = 304 + RL \rightarrow RL = 421 - 304 = 117 \text{ kcal/m}^2/\text{yr}$**

## 1.9 & 1.10 - Trophic Levels & 10% Rule

- Create a trophic pyramid below with organisms found in a tropical rainforest. Label each level.



- Starting with 10,000 kcal of energy at the producer level, identify the level of energy available at each level.
- Explain** the 2nd law of thermodynamics as it to trophic pyramids and the 10% rule: **Each time energy is transferred from one trophic level to the next roughly 90% of it is lost as heat, leaving only 10% of it available to the next trophic level**
- Explain** why it takes a very large amount of land to support tertiary consumers : **Because of the 10% rule/2nd law of thermodynamics, only 0.1% of energy from the producer level is available to tertiary consumers, meaning far far more primary producer biomass is needed to support a tertiary consumer**

# APES Unit 1 Ultimate Review Packet (1.11)

## 1.11 - Food Webs

- a. **Describe** what the arrows in a food web indicate: **the direction of the transfer of both energy and matter**
- b. **Describe** how a decrease in the populations of secondary consumers in an ecosystem would impact both the primary consumer level and the primary producer level: **with decreased numbers of secondary consumers, primary consumer populations would rise due to less predation. This could lead to a decrease in primary producer species that the primary consumers eat.**
- c. **Identify** an organism that is both a tertiary and quaternary consumer in the food web below. **Leopard seal**
- d. **Identify** an organism that is only a secondary consumer in the food web below. **Squid, Blue whale, Fish,**

