3. The Nitrogen Cycle

a. Approximately 78 % of the Earth's atmosphere is made up of *Nitrogen*.

b. Why must nitrogen be "*fixed*?" it is not in a usable form for plants and animals

c. What is the Nitrogen Cycle? the movement of N through the Earth and atmosphere

d. As you learn about the Nitrogen cycle, fill in the chart which identifies and describes the four main processes.

Nitrogen Fixation	converting N into usable form by bacteria, lightning, factories
	Animals eat the plants full of usable, fixed nitrogen.
Denitrification	
	Animals release wastes loaded with nitrogen which can be used as fertilizers.

e. What are the three methods which can be used to fix nitrogen?

- bacteria
- lightning
- factories – very expensive!

f. Describe how *lightning* is used for nitrogen fixation.

- high energy lightning breaks N apart and it combines with oxygen in the air

g. Describe the symbiotic relationship between *nitrogen fixing bacteria and plants*.

- bacteria live in the plant roots and get to eat sugar produced by the plant
- plants get to use the N

i. This is an example of mutualistic symbiosis.

h. Pause the video and draw a (simple) picture which illustrates the Nitrogen Cycle in the space below.

on back →

4. The Carbon Cycle

a. Let's review, what is the purpose of photosynthesis? to make food for plant

i. Photosynthesis takes place in the chloroplast.

b. Let's review, what is the purpose of cellular respiration? to use food for energy

i. Cellular respiration takes place in the mitochondria.

c. What is the Carbon Cycle? a series of processes through which carbon atoms rotate

d. In what forms does carbon *EXIST*? CO_2 in atmosphere, limestone, dead organic matter, fossil fuels (oil, coal)

e. Through what process does carbon *ENTER* the biotic environment? photosynthesis

f. How does carbon *RETURN* to the atmosphere? respiration, decomposition, burning

g. Describe the impact humans are having on the carbon cycle. we are using fossil fuels too fast!

h. Summarize the carbon cycle.

Carbon cycles through living things and the atmosphere.

i. Explain the concerning connection between burning fossil fuels and global warming. A specific amount of carbon in the atmosphere is necessary to maintain Earth's temp.

j. Pause the video and draw a (simple) picture which illustrates the Carbon Cycle in the space below.

on back →

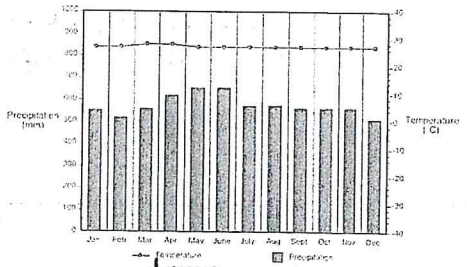
c. Chose a terrestrial biome and describe its temperature, rainfall, plants and animals.
Desert (hot days, cool nights, less than 10 in. rain/year, cacti, grasses, shrubs, snakes, lizards, rodents...

d. Can you think of any adaptations *plants in the coniferous forest* might have? Thick fur for cold winters. The ability to hibernate in winter

e. Use the top left graph to answer the following question: Which biome has an average annual precipitation of 150cm and an average annual temperature of 10°C?
temperate forest

f. Use the top right graph to answer the following question: Which biome would you expect to find closer to the equator, the temperate deciduous forest or the coniferous forest?
temp. deciduous

g. You would expect the climatogram seen to the right to represent data from which biome?



temp rain

4. Aquatic Biomes

a. Approximately 97.5 % of all water on Earth is salt water.

b. The most ***biodiverse*** aquatic ecosystems, both freshwater and marine, are the *shallowest zones*. Why are these zones able to support such a large number and variety of living organisms? There is more sunlight and dissolved oxygen in the more shallow zones. They will also be warmer

5. Ecosystem Interactions

a. Define habitat.
where an organism lives

b. An organism's niche is the role that an organism has in its environment.

i. Give an example of an organism's niche.
A rabbit feeds on grass. A bird collects grass and twigs

6. Community Ecology

a. A ***limiting factor*** is anything which limits the size of a population. Give 4 examples of limiting factors.
disease, parasites, competition for space, water...

b. What is the maximum number of a certain species that an ecosystem can hold? the ecosystem's carrying capacity

c. The graph illustrates an ecosystem with a carrying capacity for approximately _____ deer.

d. What is the difference between *density dependent and density independent* limiting factors?
↳ depends on how crowded the population is

e. Give 2 examples of each, density dependent and density independent factors.
↳ disease, predators, parasites
↳ rainfall, fires, storms

7. Ecological Succession

a. Describe ***ecological succession***. process of change in an ecosystem

b. *Primary succession* takes place on newly exposed rock which lacks topsoil.

i. Identify events which can lead to primary succession.
volcanic eruption, melted glacier

ii. Summarize the process of primary succession.
pioneer species → grasses → shrubs → small trees → large trees

c. *Secondary succession* takes place in a newly cleared area where the soil remains.

i. Identify events which can lead to secondary succession.
flood, fire, hurricane, tornado

ii. Summarize the process of secondary succession.
grasses, small bushes & trees → larger trees

8. Community Interactions

a. Define competition.
2 organisms sharing the same resource

b. Predation takes place when one organism hunts and kills another. The predator is the hunter, ~~which~~ the prey is the hunted.

9. Symbiotic Relationships

a. What is a long, close term relationship between two different species? symbiosis

b. Fill in the chart on the three symbiotic relationships. Use smiley, sad or straight faces for "symbols."

Symbiotic Relationship	"Symbols"	Description	Example
Mutualism	☺ ☺	both benefit	bird - zebra
Commensalism	☺ 😐	one benefits neither harmed	bird - nest in tree
Parasitism	☺ ☹	one benefits other is harmed	tick - dog

Omnivores - Eat both plants and animals
Scavengers - Eat only dead organisms
Decomposers - break down and release nutrients from dead organisms

Flow of Matter and Energy

You consume matter when you eat food (Carbon, nitrogen, other elements)
Energy flows through levels of the entire ecosystem
Only some energy is transferred from 1 energy level to the next

Food Chains

show how matter and energy move through an ecosystem
Nutrients and energy move from autotrophs to heterotrophs and then decomposers
Ex: grass → rabbit → wolf
Arrows indicate the direction energy is transferred from one organism to the next

Ecological Pyramid

shows how energy flows through an ecosystem
Energy that is transferred from one trophic level to the next is only 10%

Trophic Level

A feeding step in passing of energy and materials

Food Webs

all the possible relationships at each trophic level of a community

Ecology Review #1:

1. Which of the following types of heterotrophs eat other animals?
   a. omnivores & carnivores c. carnivores only
   b. herbivores & omnivores d. carnivores & herbivores
2. Which of the following types of heterotrophs would bacteria and fungi be classified as?
   a. detritivores b. herbivores c. carnivores d. decomposers
3. What is the one-way flow of energy in an ecosystem called?
   a. food chain b. energy castle c. food web d. biomass
4. What is each step in a food chain or food web called?

Limiting Factors

Affect an organism's ability to survive in its environment
Ex: water, food, predators, temperature
Density-dependent: disease, competition, parasites, food
Depend on the density of a population
Density-independent: affects all populations regardless of their density
Temperature, storms, floods, drought, and habitat disruption

Succession

Natural changes and species replacement that takes place in communities in an ecosystem
Occurs in stages
Primary succession - Colonizing bare land where there are no organisms
Pioneer species: 1st species in an area
Secondary Succession - Changes that occur when existing community is disrupted by natural disasters or human actions
Climax Community - Stable, mature community that has little or no changes in species

Biomes

Large group of ecosystems that share the same type of climax community
Aquatic: marine, estuaries, freshwater, swamps
Terrestrial: tundra, taiga, desert, grassland, rain forest, temperate forest

Population Growth

Organisms can grow exponentially
Exponential growth: as a population gets larger, it also grows faster
J-shaped curve (diagram):

Growth will be limited at some point by limiting factors
Food availability, disease (ex: AIDS, influenza, TB, Dutch Elm disease, Pfiesteria), predators, lack of space
Results in an S-shaped curve
Diagram:

Carrying capacity: the number of organisms of a species that an environment can hold

R-strategist (r selected species)
Unstable environment, High fecundity (make lots of babies), Small body size, Dispersed offspring

K-strategist (k selected species)
Stable environment, Fewer offspring, Larger body size, parented offspring

Define these terms:
Birth rate
Death rate
Emigration
Immigration
Zero population growth

Biological Diversity

Biodiversity: the variety of species in a specific area
Loss of biodiversity is increasing
Extinction: disappearance of a species when the last organism dies
Ex:
Endangered species: # of species become low that can lead to extinction (this one is more serious!!)
Ex:
Threatened species: population likely to become endangered
Ex:

Cycles in Nature

Matter is constantly being recycled

Water Cycle

Water evaporates from lakes and oceans to become water vapor in the air
Water vapor in the air condenses to form clouds
More water condensation leads to precipitation, falling as rain, ice, or snow back to the ground
Cycle repeats constantly
Problems with the cycle:

Carbon Cycle

Starts with autotrophs
Makes carbon molecules from CO_2 during photosynthesis
Heterotrophs feed on autotrophs, getting those carbon molecules