Name_____

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BIOLOGY A
HW Reading Guide RUBRIC
Unit 1B – Ecology (Matter and Energy)

Unit 1B Homework:	STAMP	Complete	Incomplete	Missing
Energy Flow in Ecosystems		10	5	0
Cycling of Materials in Ecosystems		10	5	0
Carbon Cycle Diagram		10	5	0
Carbon Cycle Questions		10	5	0
Nitrogen Cycle Diagram		10	5	0
Nitrogen Cycle Questions		10	5	0
Global Change		10	5	0

Overall Effort

	Complete	Satisfactory	Little / Missing
Effort	10 Time and effort went into each reading guide, compete sentences, all questions answered	5 Some effort, appears rushed in some places, not always compete sentences, and missing some questions	0 Very little effort or often incomplete

Unit 1B Homework: Energy Flow in Ecosystems

Stamp

Learning Target:

1. Describe the transfers and transformations of matter and/or energy in an ecosystem (e.g., sunlight transforms to chemical energy during photosynthesis, chemical energy and matter are transferred when animals eat plants or other animals, carbon dioxide produced by animals by respiration is used by plants and transformed to glucose during photosynthesis).

Please read pgs 345-349 before you begin. The book is mainly used for informational purposes and background information. Not all questions will require use of the textbook.

Food Chains: Look at the examples of food chains below:

A) Sun → Cactus → Ant → Scorpion → Hawk

B) Sun → Cactus → Lizard → Snake → Fox

C) Sun → Oak Tree → Pill bug → Centipede → Shrew → Owl

D) Sun → Oak Tree → Caterpillar → Bird

E) Sun → Seaweed → Limpet → Whelk → Crab → Raccoon

After taking a close look at the examples of food chains, answer the following questions about them:

1) Identify at least 2 things that each of the food chains have in common.
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2) Identify at least 2 things that are different from one food chain to the next.
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   -

3) What is the energy source for all of these food chains? _____

4) Every organism requires energy to carry out life processes such as growing, moving, and reproducing. What types of organisms are able to use the sun's energy directly to carry out these life processes?
   _____

5) Organisms that can convert solar energy to chemical energy that can be used by cells are called ***producers***. List 3 examples of producers from the food chain examples.
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6) **Consumers** are organisms that obtain energy by feeding on the producers or other consumers. List 3 examples of consumers from the food chains on page 1.

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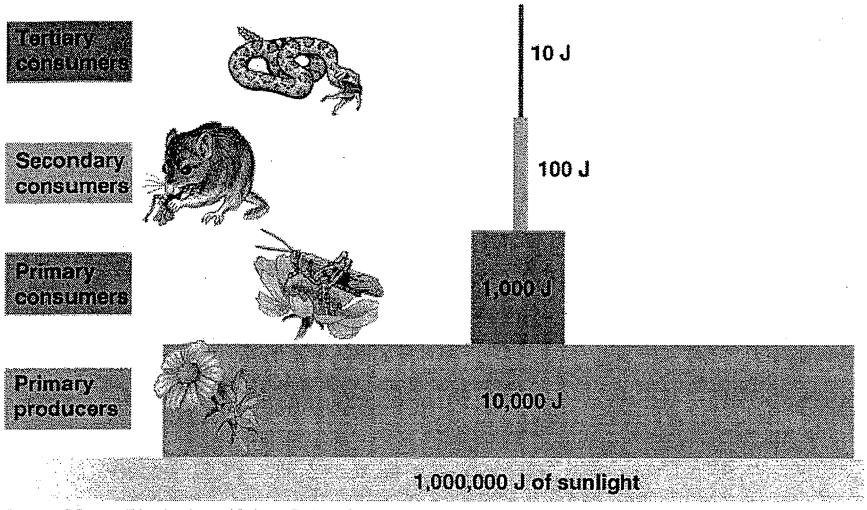
7) Three types of consumers are ***herbivores, carnivores, and omnivores***. Define these three terms and give an example of each from the food chains on page 1. (See page 346 in textbook for definitions if needed.)

8) Each link or organism in a food chain represents a feeding level or **trophic level.** A **food chain** shows the transfer of matter and energy from one trophic level to the next. The consumer that feeds on a producer is called a **primary consumer**. A consumer that feeds on the primary consumers is called a **secondary consumer**. The next level consumer is called a **tertiary consumer** and the next is a **quaternary consumer**. **Draw one of the food chains represented on page one (<u>using pictures</u>) and label its producer, primary consumer, secondary consumer, tertiary consumer and quaternary consumer (if your food chains contains one). Include the SUN!** (See page 345 in textbook for an example diagram of a food chain if needed).

9) **Scavengers** eat the wastes and remains of dead organisms (**detritus**) – they pick up the leftovers. **Decomposers** obtain energy by feeding and breaking down detritus and recycling minerals back into the soil. **List two scavengers and two decomposers. (These are not listed in the above food chains. See pages 346-347 in textbook if needed for decomposers).**

10) As energy moves through a food chain it is transformed from one form into another. Producers transform solar energy into the chemical energy of food (glucose) through a process called photosynthesis. They then transform this chemical energy (glucose) into another chemical form of energy called ATP through a process called cellular respiration. Organisms use this energy (ATP) for all of their life activities. **Can you diagram what you just read about below? What might a plant or animal require energy for?**

Energy Pyramids:



11) Energy is not recycled within an ecosystem, but flows through it and out. Only 10% of the energy from each part of a food chain moves on to the next level. Where do you think the other 90% goes? (Read page 348 - 349 in textbook if needed)

12) Draw an energy pyramid (similar to the one shown above) that represents the food chain that you drew in #8 and label the direction of energy flow. (Read page 348-349 in textbook if needed)

Food Webs:

Food chains show the feeding relationships in one part of an ecosystem. Since ecosystems have many different species of plants, animals and other organisms, consumers have a variety of food sources. A **food web** is a diagram that shows all of the feeding relationships in an ecosystem.

13) Refer to the food web on page 347. How is the food "web" different from the food "chain" on page 346? Explain.

14) Try your best to diagram a food web below (or on the back of this handout if you need more space) using the following organisms: deer, rabbit, grass, oak tree, raccoon, mosquito, wood pecker, eagle, and bear. Don't forget to include the sun!

Unit 1B Homework: Cycling of Materials in Ecosystems

Stamp

Learning Target:

2. Describe the cycle of carbon through ecosystem (e.g., carbon dioxide in air becomes large carbon-containing molecules in the tissues of plants through photosynthesis, these molecules can be cycled to animals that consume the plants, then returned as carbon dioxide to the atmosphere through cellular respiration, combustion, and decomposition).
3. Describe the cycle of nitrogen through ecosystems (e.g., nitrogen in air is taken in by bacteria in soil, then made directly available to plants through the soil, and returned to the soil and atmosphere when the plants decompose).

Carbon Cycle:

Unlike energy, matter cycles within an ecosystem. The carbon atom is essential to all life. All organic molecules contain carbon. The general cycle is for producers to incorporate carbon from the air of the ecosystem into organic compounds (glucose). Consumers feed on these producers, incorporating some of these compounds into their bodies and releasing some back into the environment as waste products (carbon dioxide), which are then taken back in by plants.

Please read pgs 350-352

1. All organisms require these 6 elements. List them below.

2. What is a biogeochemical cycle? Try to explain in your own words without copying exactly what the book says. Root words may help, bio = life and geo = earth.

3. Why is **carbon** an important **element** in the ecosystem? Where do we find carbon compounds?

4. Why is **carbon dioxide** an important **compound** in the ecosystem? (what is it used for?)

5. How is CO_2 created in the ecosystem? Look at figure 13: Carbon cycle for help.

6. How does erosion return carbon atoms into the air and water?

7. Draw the Carbon Cycle below. Highlight or circle the 3 ways carbon is returned to the atmosphere. Be neat, take your time, you could even include color.

Nitrogen Cycle:

Nitrogen gas comprises about 78 percent of the earth's atmosphere. This element is necessary to build proteins and nucleic acids (DNA and RNA). Nitrogen enters both plants and animals during respiration, but is not utilized and is exhaled again. Certain microorganisms can convert this nitrogen gas into useable forms such as ammonium and nitrate during the process of **Nitrogen Fixation.** This process is most efficiently accomplished in nature by the action of certain bacteria. They accomplish this nitrogen fixation process in **symbiotic** association with certain plants such as clover, bean and pea.

8. Organisms need what two elements to build proteins? _____ and _____
9. How do animals reuse organic phosphorous?

10. Why are most organisms unable to use Nitrogen in the form of Nitrogen gas?

11. What is **Nitrogen-fixation**?

12. Where are nitrogen fixing bacteria found?

13. Draw the Nitrogen Cycle below. Highlight or circle the 4 important stages. Be neat, take your time, you could even include color.

Unit 1B Homework: Carbon Cycle

Stamp

Learning Target:

2. Describe the cycle of carbon through ecosystem (e.g., carbon dioxide in air becomes large carbon-containing molecules in the tissues of plants through photosynthesis, these molecules can be cycled to animals that consume the plants, then returned as carbon dioxide to the atmosphere through cellular respiration, combustion, and decomposition).

Reading: The Carbon Cycle. As you read, color the **Carbon Cycle Diagram** on the next page. You will need the following colors: green, yellow, blue, purple, orange, brown, red. Then answer the questions on page 3.

Energy flows from the sun into the biosphere, but nutrients do not enter the biosphere from an outside source. Essentially, the same pool of nutrients has circulated for the billions of years that the Earth has been in existence. Some nutrients, called **macronutrients**, are used by organisms in large quantities. Macronutrients include carbon, hydrogen, oxygen, nitrogen and phosphorus. These nutrients are passed back and forth between living and nonliving components of the ecosystem in processes that we call **biogeochemical cycles**.

Material substances are incorporated into organic compounds by primary producers. Primary producers are then consumed by secondary consumers, and decomposers are ultimately responsible for releasing the material back into the nonliving environment.

We will begin our study of the carbon cycle with the **atmosphere** (A), which is Earth's major reservoir of carbon, in the form of carbon dioxide. Carbon enters the biotic (living) part of the ecosystem through **photosynthesis** (B). Plants of the **forest** (C) take the carbon in carbon dioxide and fix it in organic compounds such as glucose, starch, cellulose, and other carbohydrates. **Cellular respiration in plants** (D) returns carbon dioxide to the atmosphere.

- **Color the photosynthesis arrow (B) green and the cellular respiration arrow (D) yellow.**

Plants are primary producers. In the course of **plant consumption** (E), carbon passes into primary consumers, animals. When **animal consumption** (F) occurs, or when the primary consumer is eaten, carbon passes to a secondary consumer, represented by the lion in the diagram. **Cellular respiration** (G) takes place in cells of the primary and secondary consumers, and carbon is released back into the environment as carbon dioxide.

- **Color the plant consumption arrow (E) blue and the animal consumption arrow (F) purple. Color the cellular respiration arrow (G) from the animals yellow.**

When the primary and secondary consumers die, their organic matter enters the soil through the process of **decay** (H). It is broken down by the decomposers, or **detritus feeders** (I), which are small animals and microorganisms that subsist on decaying matter such as fallen leaves, dead bodies, and animal waste. Earthworms, mites, centipedes, insects, and crustaceans are detritus feeders. Thus, **cellular respiration in detritus feeders** (J) also returns carbon to the atmosphere.

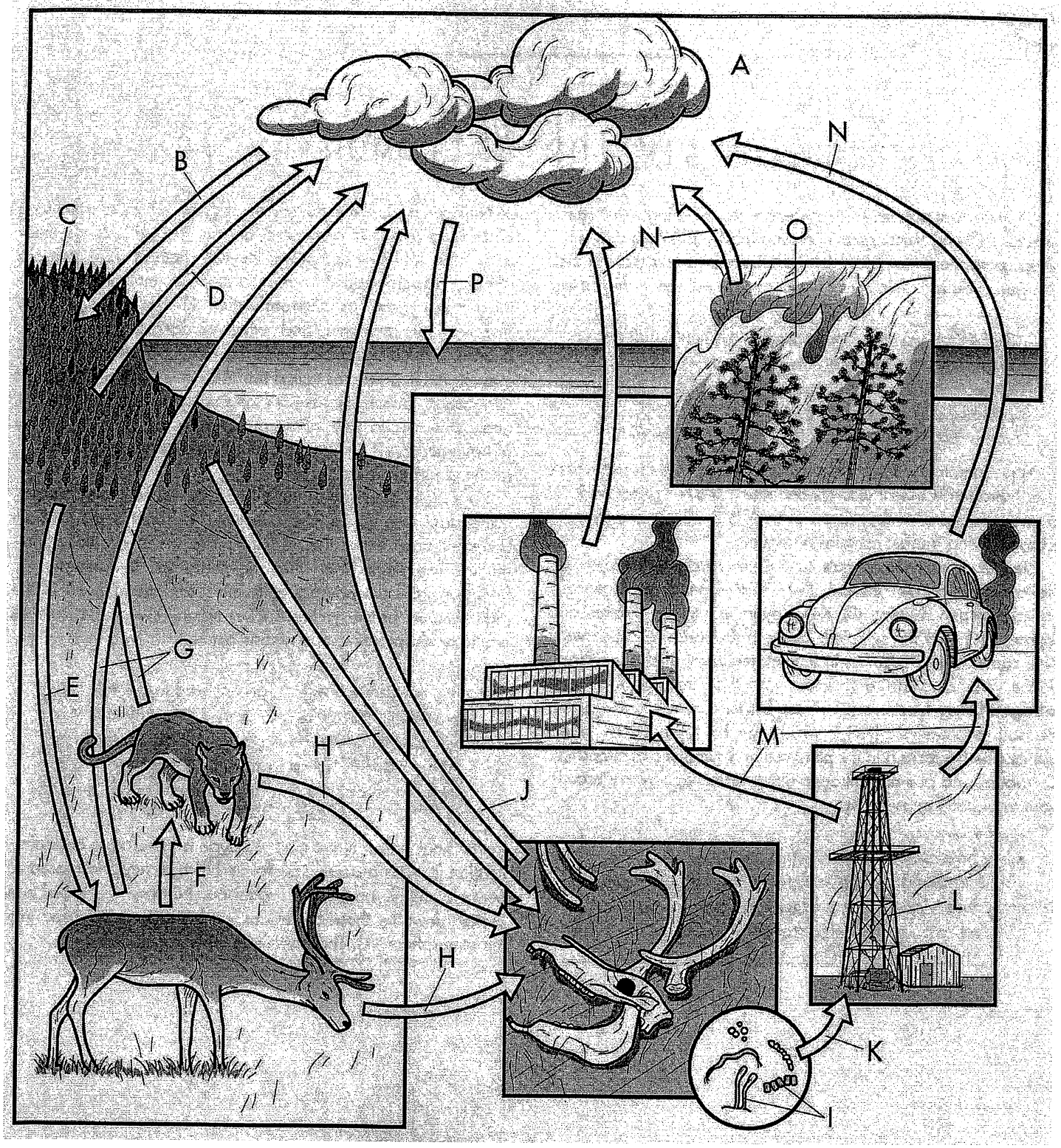
- **Color the arrows representing the work done by the decomposers (H and I) orange. Color the detritus feeders' cellular respiration arrow (J) yellow too.**

Throughout history, much carbon has been **converted to fossil fuel** (K). High pressure and temperature transform carbon-containing organic matter into coal, oil, and natural gas. **Fossil fuel processing** (L) follows. There are many **uses for fossil fuels** (M). Some power plants generate electricity using fossil fuels, and automobiles are powered by gasoline. The **products of the combustion** (N) of fossil fuels include carbon dioxide and other carbon compounds that enter the atmosphere. Carbon also enters the environment from the burning of wood and plants that occurs during **forest fires** (O).

- **Color the fossil fuels arrows (K and M) brown and the products of combustion arrows (N and O) red.**

A final aspect of the carbon cycle is **exchange with oceans** (P). Some carbon dioxide from the air dissolves in oceans and combines with calcium to form calcium carbonate, which is incorporated into the shells of mollusks and other creatures. When these shells decay, they transform into limestone, which, over time, dissolves as it is exposed to water. Carbon is released from the limestone and may return to the atmosphere.

Carbon Cycle Diagram:



A – Atmosphere
B – Photosynthesis
C – Forest
D – Respiration in Plants
E – Plant Consumption
F – Animal Consumption
G – Respiration in Animals
H – Decay
I – Detritus Feeders
J – Respiration in Detritus Feeders
K – Conversion to Fossil Fuel
L – Fossil Fuel Processing
M – Use for Fossil Fuel
N – Products of Combustion
O – Forest Fire
P – Exchange with Oceans

Carbon Cycle Questions: The answers can be found in the Caron Cycle Reading on the first page.

1. What are macronutrients? List some examples.

2. Where on Earth is the majority of carbon dioxide located?

3. What is the role of each of the following in the carbon cycle? Give examples.

	Role:	Examples:
Primary producers		
Primary consumers		
Decomposers		

4. Where is most of the Earth's carbon located and in what form?

5. How does carbon enter the biotic part of the ecosystem? (refer to your colored diagram if needed, there are 2 answers.)

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6. Carbon dioxide is returned to the atmosphere in 6 different ways. Explain each and refer to your colored diagram for guidance.

7. What two things can happen to the carbon when primary and secondary consumers die?

8. List 3 examples of detritus feeders. What do detritus feeders contribute to the carbon cycle?

9. What is a fossil fuel? List 3 uses of fossil fuels.

10. How does carbon get in the oceans?

Unit 1B Homework: Nitrogen Cycle

Stamp

Learning Target:

3. Describe the cycle of nitrogen through ecosystems (e.g., nitrogen in air is taken in by bacteria in soil, then made directly available to plants through the soil, and returned to the soil and atmosphere when the plants decompose).

Reading: The Nitrogen Cycle. As you read, color the **Nitrogen Cycle Diagram** on the next page. Then answer the questions on page 3.

THE Nitrogen Cycle:

An important process in ecosystems is the recycling of nitrogen through its living (biotic) and nonliving (abiotic) components. The living components, or biota, of the ecosystem participate in the nitrogen cycle in a number of ways.

Approximately 78% of the air is composed of diatomic nitrogen. Nitrogen is essential to life because it is a key component of amino acids and nucleic acids. Even ATP, the basic energy currency of living things, contains nitrogen.

Neither plants nor animals can obtain nitrogen directly from the **atmosphere** (A). Instead, they must depend on a process called **nitrogen fixation** (B). Key players in nitrogen fixation are **legumes** (C) and the symbiotic bacteria that are associated with their root nodules. Legumes include clover, peas, alfalfa, and soybeans. The bacteria associated with their root nodules are **nitrogen-fixing bacteria** (D). These bacteria convert nitrogen in the soil to ammonia (NH_3), which can be taken up by some plants. The bacteria and the plant are in a symbiotic relationship. Cyanobacteria are also nitrogen-fixing bacteria; they are prominent in aquatic ecosystems.

- **Color the nitrogen fixation arrow (B), the legume (C), and the bacteria (D) purple.**

Nitrogen is fixed into the soil through the actions of free-living bacteria and, as mentioned before, through bacteria that's associated with root nodules of legumes. Both of these methods of fixing nitrogen lead to its incorporation into ammonia (NH_3) in the process known as **ammonification** (E). The soil is a major reservoir for ammonia and other nitrogen-containing compounds. After nitrogen has been fixed, other bacteria convert it into nitrate, in a process called **nitrification** (F). In the first step of nitrification, ***Nitrosomonas*** (G) convert ammonia to nitrite (NO_2), and in the second step, nitrite is converted to nitrate (NO3), by ***Nitrobacter*** (H). The nitrate (NO_3) is then **consumed by plants** (I), as the diagram shows.

- **Color the ammonification arrow (E) yellow and the nitrification arrow (F) orange. Color the nitrogen consumption arrow (I) green.**

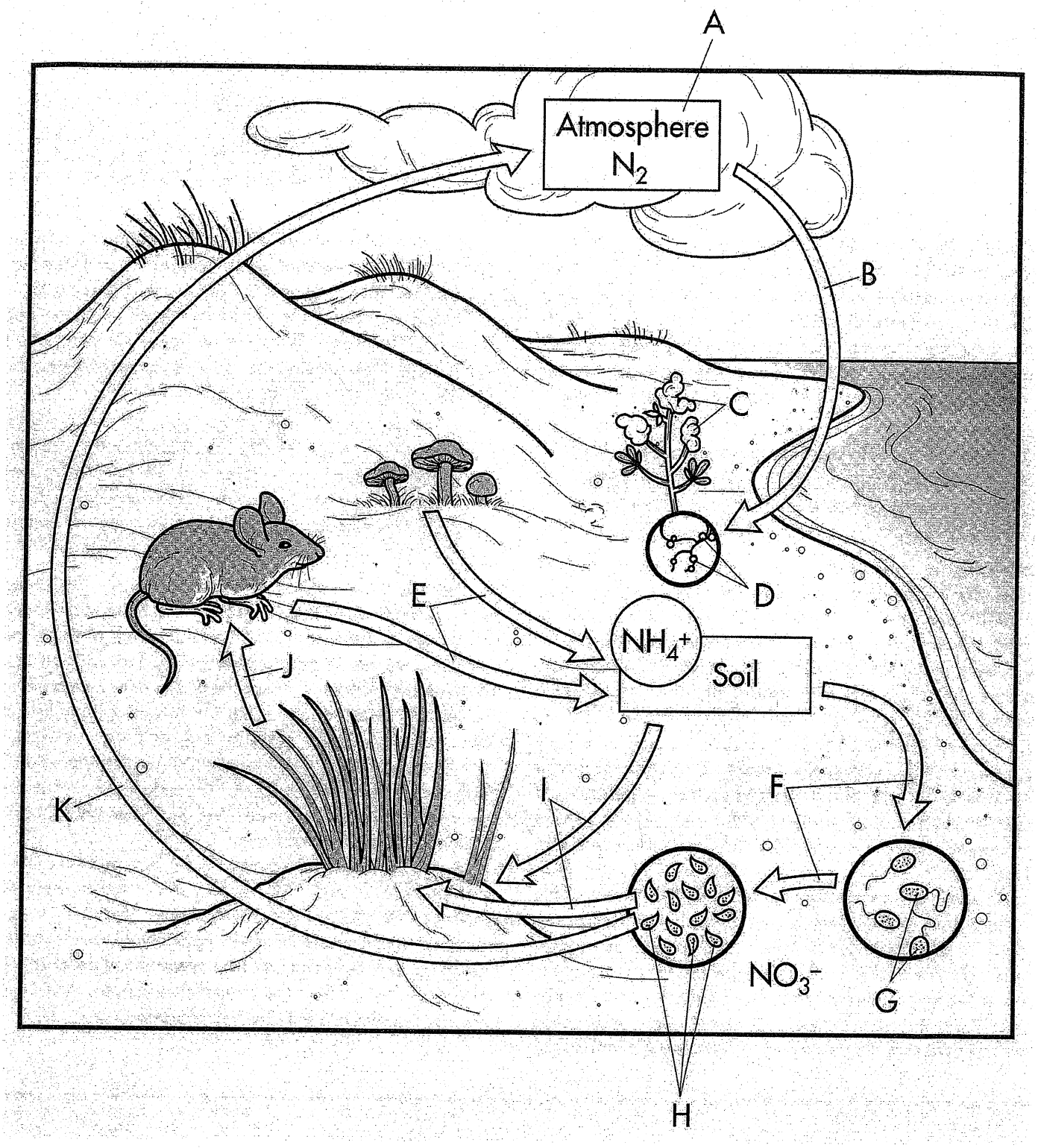
But not all plants consume nitrate; as mentioned before, some plants are able to use the ammonia from the soil. In both cases, nitrogen enters the primary producers in the biotic community. The plants may then be **consumed by animals** (J). Herbivores are the primary consumers, and the nitrogen of the plants is used for the synthesis of key organic compounds such as amino acids, proteins, and nucleic acids.

- **Color the consumption arrow (J) blue.**

The final aspect of the nitrogen cycle is the process of **denitrification** (K). This process is performed by a variety of microscopic bacteria, fungi, and other organisms. Nitrates in the soil are broken down by these organisms, and nitrogen is released into the atmosphere (A). This completes the nitrogen cycle.

- **Color the denitrification arrow (K) red.**

Nitrogen Cycle Diagram:



A – Atmosphere
B – Nitrogen Fixation
C – Legume Plants
D – Nitrogen-Fixing Bacteria

E – Ammonification
F – Nitrification
G – *Nitrosomonas*
H – *Nitrobacter*

I – Consumption by Plants
J – Consumption by Animals
K – Denitrification

Nitrogen Cycle Questions: The answers can be found in the Nitrogen Cycle Reading on the first page.

1. What percent of the air is nitrogen? _____
2. Why is nitrogen essential to life?

3. How do plants and animals get nitrogen if not from the atmosphere?

4. What are nitrogen fixing bacteria?

5. What is a major reservoir for ammonia? _____

6. What do you think it means when the article refers to the Nitrogen and being "Fixed?"

7. Why do herbivores need nitrogen?

8. What is denitrification?

UNIT1B Homework: Global Change

Stamp

Learning Targets:

4. Describe examples of matter cycling that can affect the health of an ecosystem (e.g., composting to improve soil quality, crop rotation, worm bins, fertilizer runoff, bioaccumulation).

Please read pgs 386-395

Acid Rain

1. How does acid rain form?

2. Why is acid rain more sever in the Midwest?

3. What is the average pH of acid rain? _____

4. How does acid rain affect ecosystem health?

The Ozone Layer

5. What is the function of the ozone layer?

6. Where is the ozone concentration the lowest? _____

7. How does ozone depletion affect human health?

8. What causes ozone depletion?

9. What have we done to decrease the ozone depletion on Earth?

Global Temperatures

10. What is causing global warming?

11. Define "the greenhouse effect."

12. What do you think the earth would be like if there were no greenhouse effect?

13. What does Figure 4 tell you about the level of CO_2 in the atmosphere since 1960?

14. Can you list at least three possible effects of rising global temperatures on the Earth.

15. List at least three things that could be done to lessen global warming.

16. What are the impacts of too much carbon dioxide in the environment? What has caused increase in CO2 in the atmosphere in the past and more recently?

Effects of Ecosystems

Biomagnification

17. What is a carcinogenic chemical?

18. What are the 3 types of agricultural chemicals? _____, _____, _____

19. What happens to the levels of DDT detected in food chains as you move throughout trophic levels to the top of the chain?

20. What do scientists call the concentration of pollutant's in the bodies of organisms as you move up the food chain? _____

21. Before 1971, DDT was a commonly used pesticide in the U.S. Explain how the top level predatory birds were affected by the build-up of this toxin in their tissues (Use Figure 6 to aid in your explanation).

22. Read Loss of Resources pages 392-393 and fill out the table below.

	Causes	Effects	Possible Solutions
Extinction of Species			
Loss of Topsoil			
Ground-Water Pollution and Depletion			

23. Describe two examples in which technology has caused the growth rate of the human population to increase.

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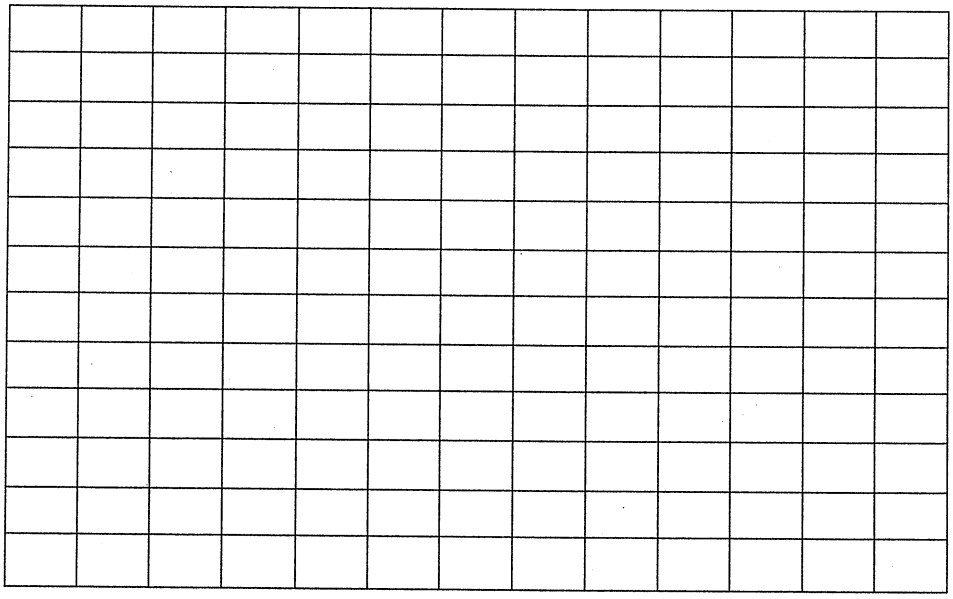
24. Create a graph of the data in Table 1: Number of Years to Add 1 Billion People. Graph time on the x-axis (from 1800 to 2035) and human population on the y-axis (1 billion to 12 billion). Remember that the scale on the x and y axis needs to have equal intervals. ****Remember to include labels and units on each axis and a title.**

Title_____



25. On your graph above, predict what the human population will be in the year 2040:_____
Add this prediction to your graph.