Food Chains and Webs --- "What's for dinner?"

Every organism needs to **obtain energy** in order to live. For example, **plants get energy from the sun**, some animals eat plants, and some animals eat other animals.

A **food chain** is the sequence of **who eats whom** in a biological community (an ecosystem) to obtain nutrition. A food chain starts with the **primary energy source**, usually the **sun** or boiling-hot deep sea vents. The next link in the chain is an **organism that makes its own food** from the primary energy source -- an example is **photosynthetic plants** that make their own food from sunlight (using a process called **photosynthesis**) and **chemosynthetic bacteria** that make their food energy from chemicals in hydrothermal vents. These are called **autotrophs** or **primary producers**.

Sample Food Chains

Trophic Level	Grassland Biome	Pond Biome	Ocean Biome
Primary Producer	grass	algae	phytoplankton
Primary Consumer	grasshopper	mosquito larva	zooplankton
Secondary Consumer	rat	dragonfly larva	fish
Tertiary Consumer	snake	fish	seal
Quaternary Consumer	hawk	raccoon	white shark

Next come organisms that eat the autotrophs; these organisms are called **herbivores** or **primary consumers** -- an example is a rabbit that eats grass. The next link in the chain is animals that eat herbivore - these are called **secondary consumers** -- an example is a snake that eats rabbits. In turn, these animals are eaten by larger **predators** -- an example is an owl that eats snakes. The **tertiary consumers** are eaten by **quaternary consumers** -- an example is a hawk that eats owls. Each food chain ends with a **top predator** and animal with **no natural enemies** (like an alligator, hawk, or polar bear).

Food Chain Questions

1. **What travels through a food chain or web?**

2. **What is the ultimate energy for all life on Earth?**

3. **Food chains start with what?**

4. **The 1st organism in a food chain must always be what type of organism?**

5. **Name 2 food making processes.**

6. **Where do chemosynthetic bacteria get their energy?**

7. **Define herbivore.**

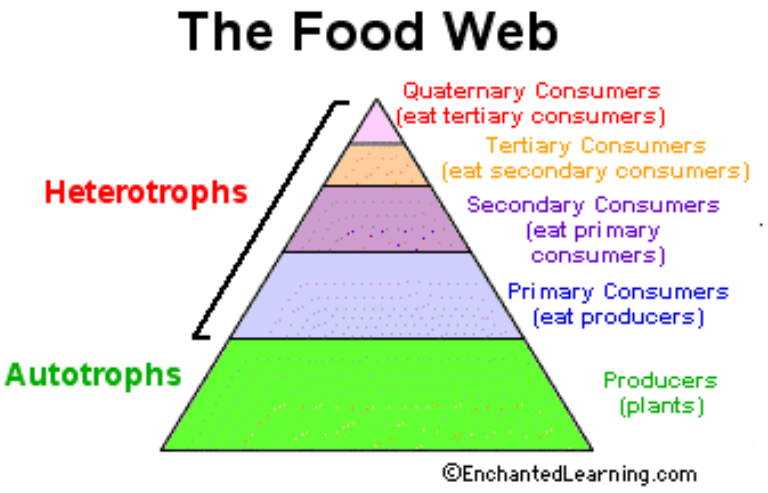
8. **Herbivores are also called _____.**

9. **What are animals called that feed on herbivores?**

10. **Secondary consumers are eaten by larger _____.**

11. **_____ consumers eat secondary consumers.**

12. **Make a food chain with a producer and 3 consumers.**



The arrows in a food chain show the flow of **energy**, from the sun or hydrothermal vent to a top predator. As the energy flows from organism to organism, energy is lost at each step. A network of many **food chains** is called a **food web**.

Trophic Levels:
The trophic level of an organism is the position it holds in a food chain.

1. **Primary producers** (organisms that make their own food from sunlight and/or chemical energy from deep sea vents) are the base of every food chain - these organisms are called **autotrophs**.
2. **Primary consumers** are animals that eat primary producers; they are also called **herbivores** (plant-eaters).
3. **Secondary consumers** eat primary consumers. They are **carnivores** (meat-eaters) and **omnivores** (animals that eat both animals and plants).
4. **Tertiary consumers** eat secondary consumers.
5. **Quaternary consumers** eat tertiary consumers.
6. Food chains "end" with top predators, animals that have little or no natural enemies.

When any organism dies, it is eventually eaten by **detrivores** (like vultures, worms and crabs) and broken down by **decomposers** (mostly bacteria and fungi), and the exchange of energy continues.

Some organisms' position in the food chain **can vary as their diet differs.** For example, when a bear eats berries, the bear is functioning as a **primary consumer**. When a bear eats a plant-eating rodent, the bear is functioning as a **secondary consumer**. When the bear eats salmon, the bear is functioning as a **tertiary consumer** (this is because salmon is a secondary consumer, since salmon eat herring that eat zooplankton that eat phytoplankton, that make their own energy from sunlight). Think about how **people's place in the food chain varies - often within a single meal!**

Food Web Questions

1. What is used to indicate the flow of energy in a food chain or web?

2. What happens to energy as we move from step to step in a chain or web?

3. Define food web.

4. What is meant by trophic levels?

5. Define autotroph.

6. The 1st trophic level consists of _____ consumers called _____.

7. Name the 2nd trophic level (both names).

8. Secondary consumers may be _____ eating meat or _____ that eat both plants and animals.

9. What is the 3rd trophic level called?

10. What is the 4th trophic level called?

11. At the 5th trophic level would be _____ consumers that eat _____ consumers.

12. Give an example of 3 detrivores. On what do they feed?

13. What organism feeds on dead plants and animals and helps recycle them?

14. Both _____ and _____act as decomposers

15. Can an organism fill more than one trophic level --- yes or no? Give an example.

Numbers of Organisms:

In any **food web**, **energy is lost each time one organism eats another**. Because of this, there have to be many **more plants than there are plant-eaters**. There are **more autotrophs than heterotrophs**, and more plant-eaters than meat-eaters. Each level has about **10% less energy** available to it because **some of the energy is lost as heat** at each level. Although there is **intense competition** between animals, there is also **interdependence**. When one **species goes extinct**, it can affect an entire chain of other species and have unpredictable consequences.

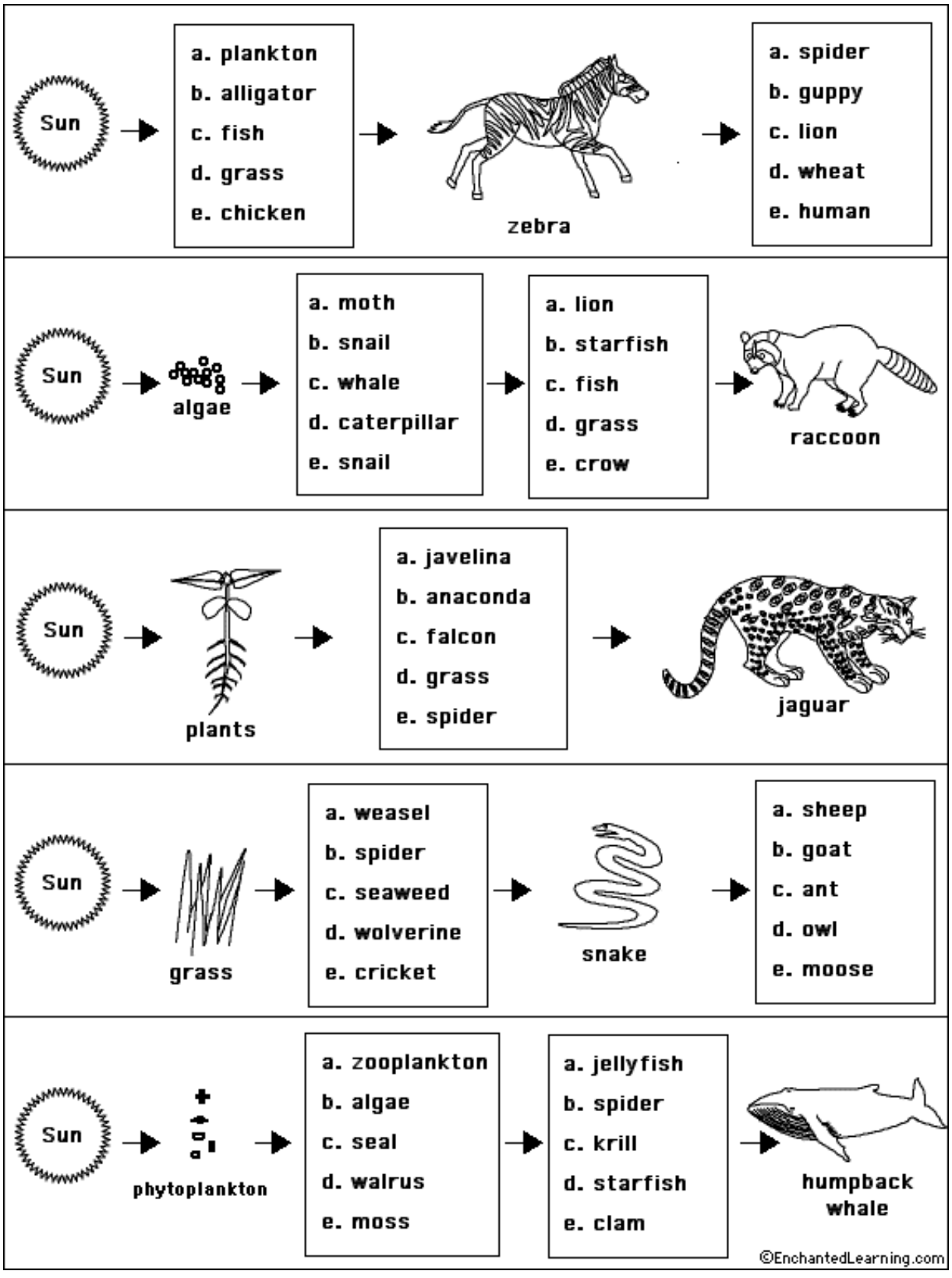
1. **In food chains and webs, what trophic level must you have more of than others?**
2. **Each trophic level has how much LESS energy?**
3. **What may happen if a species goes extinct?**

Equilibrium

As the number of **carnivores in a community increases**, they eat more and more of the herbivores, decreasing the herbivore population. It then becomes harder and harder for the carnivores to find herbivores to eat, and the population of carnivores decreases. In this way, the carnivores and herbivores stay in a **relatively stable equilibrium**, each limiting the other's population. A similar equilibrium exists between plants and plant-eaters.

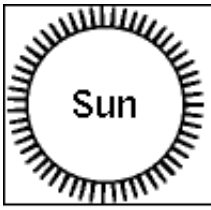
Complete the Food Chains Worksheet

Circle the organisms that complete the food chains below.

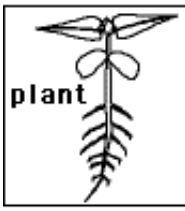


Food Chain Worksheet

Read the passage then answer the questions below.

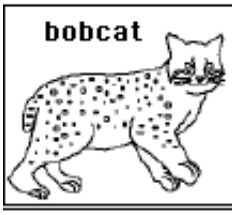


A food chain is a sequence of who eats whom in a biological community. It starts with a primary energy source, like the sun or boiling-hot deep sea vents. The arrows in the chain show the flow of food energy.



The energy source provides the energy for organisms that are able to convert that raw energy into their own food. These organisms (such as plants, phytoplankton, and algae) are called autotrophs or primary producers.

The next link in the chain is organisms that eat autotrophs like plants and algae. These organisms are called primary consumers or herbivores. Some examples are rabbits, deer, tadpoles, and caterpillars.



The next link is organisms that eat primary consumers. These organisms are called secondary consumers. Some examples are bobcats and lions. Chains can be longer than this. The animal at the end of a chain is the top predator (it has no natural enemies).

Questions

1. What do the arrows in a food chain represent? _____

_____

2. A food chain starts with an _____ source.

3. Organisms that make their own food are called _____

or _____.

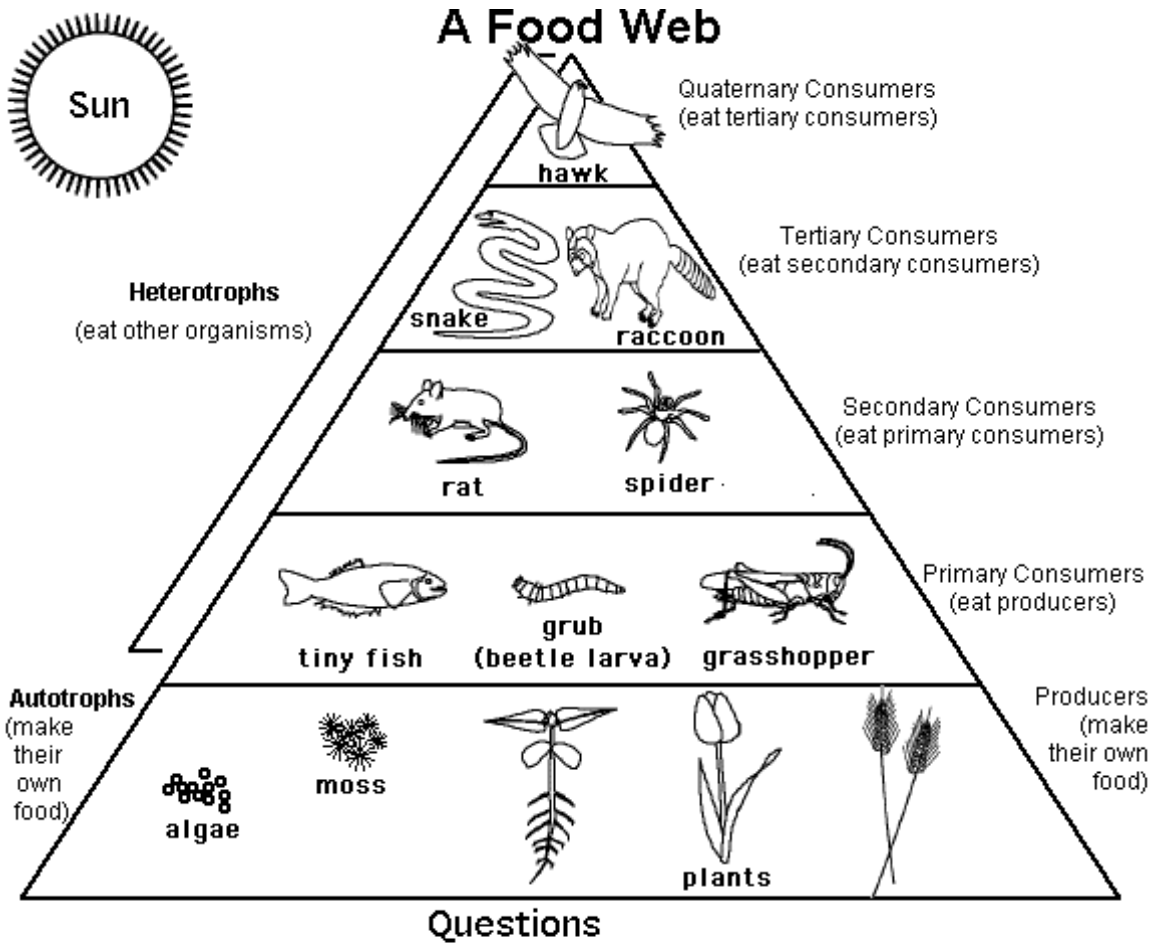
4. Organisms that eat plants are called _____

or _____.

5. An animal with no natural enemies is a _____.

Food Web Worksheet

Read the passage then answer the questions below.



Questions

1. There are many more _____

than there are primary consumers.

2. Organisms that eat other organisms are called _____.

3. Organisms that make thir own food are called _____

or _____.

4. Grass is _____.

5. Zebras (grass-eaters) are _____.

6. Lions (zebra-eaters) are _____

7. Where does the energy come from for all organisms in a food chain or web? _____

Food Chain Quiz - Multiple choice comprehension questions
Color the circle by each correct answer.

1. A plant is ... ○ A. an autotroph ○ B. a heterotroph ○ C. a primary producer ○ D. A and C	6. A person who eats a chicken that ate grain is a ... ○ A. primary producer ○ B. primary consumer ○ C. secondary consumer ○ D. quaternary consumer
2. A cow is ... ○ A. a primary consumer ○ B. a heterotroph ○ C. an herbivore ○ D. all of the above	7. Primary consumers eat ... ○ A. primary producers ○ B. primary consumers ○ C. secondary consumers ○ D. quaternary consumers
3. Autotrophs ... ○ A. make their own food ○ B. are the base of the food chain ○ C. are primary producers ○ D. all of the above	8. Secondary consumers eat ... ○ A. primary producers ○ B. primary consumers ○ C. tertiary consumers ○ D. quaternary consumers
4. A lion that eats a zebra that ate grass is a ... ○ A. primary producer ○ B. primary consumer ○ C. secondary consumer ○ D. quaternary consumer	9. Tertiary consumers eat ... ○ A. primary producers ○ B. primary consumers ○ C. secondary consumers ○ D. quaternary consumers
5. A bear that eats a fish that ate bugs that ate algae is a ... ○ A. primary producer ○ B. primary consumer ○ C. secondary consumer ○ D. tertiary consumer	10. Quaternary consumers eat ... ○ A. primary producers ○ B. primary consumers ○ C. secondary consumers ○ D. tertiary consumers

Food Chain Quiz #2 - Multiple choice comprehension questions
Color the circle by each correct answer.

1. A heterotroph ... ○ A. is an autotroph ○ B. eats other organisms ○ C. is a primary producer ○ D. A and C ○ E. none of the above	6. A top predator... ○ A. has no natural enemies ○ B. is a meat eater ○ C. is a heterotroph ○ D. all of the above ○ E. none of the above
2. A cow (that eats plants) is ... ○ A. a primary consumer ○ B. a heterotroph ○ C. an herbivore ○ D. all of the above ○ E. none of the above	7. A detrivore ... ○ A. is an autotroph ○ B. eats decomposing matter ○ C. kills animals ○ D. all of the above ○ E. none of the above
3. If a person eats a vegetable, the person is acting as ... ○ A. a primary producer ○ B. a primary consumer ○ C. a secondary consumer ○ D. a tertiary consumer ○ E. a quaternary consumer	8. As nutritional energy passes through the food chain, energy ... ○ A. is lost ○ B. is gained ○ C. remains constant ○ D. increases, then decreases ○ E. decreases, then increases
4. If a person eats a steak (from a cow), the person is acting as ... ○ A. a primary producer ○ B. a primary consumer ○ C. a secondary consumer ○ D. a tertiary consumer ○ E. a quaternary consumer	9. There are more primary producers than there are ... ○ A. primary consumers ○ B. secondary consumers ○ C. tertiary consumers ○ D. quaternary consumers ○ E. all of the above
5. If a person eats a salmon (that ate smaller fish that ate algae), the person is acting as ... ○ A. a primary producer ○ B. a primary consumer ○ C. a secondary consumer ○ D. a tertiary consumer ○ E. a quaternary consumer	10. There are more tertiary consumers than there are ... ○ A. primary consumers ○ B. secondary consumers ○ C. tertiary consumers ○ D. quaternary consumers ○ E. all of the above

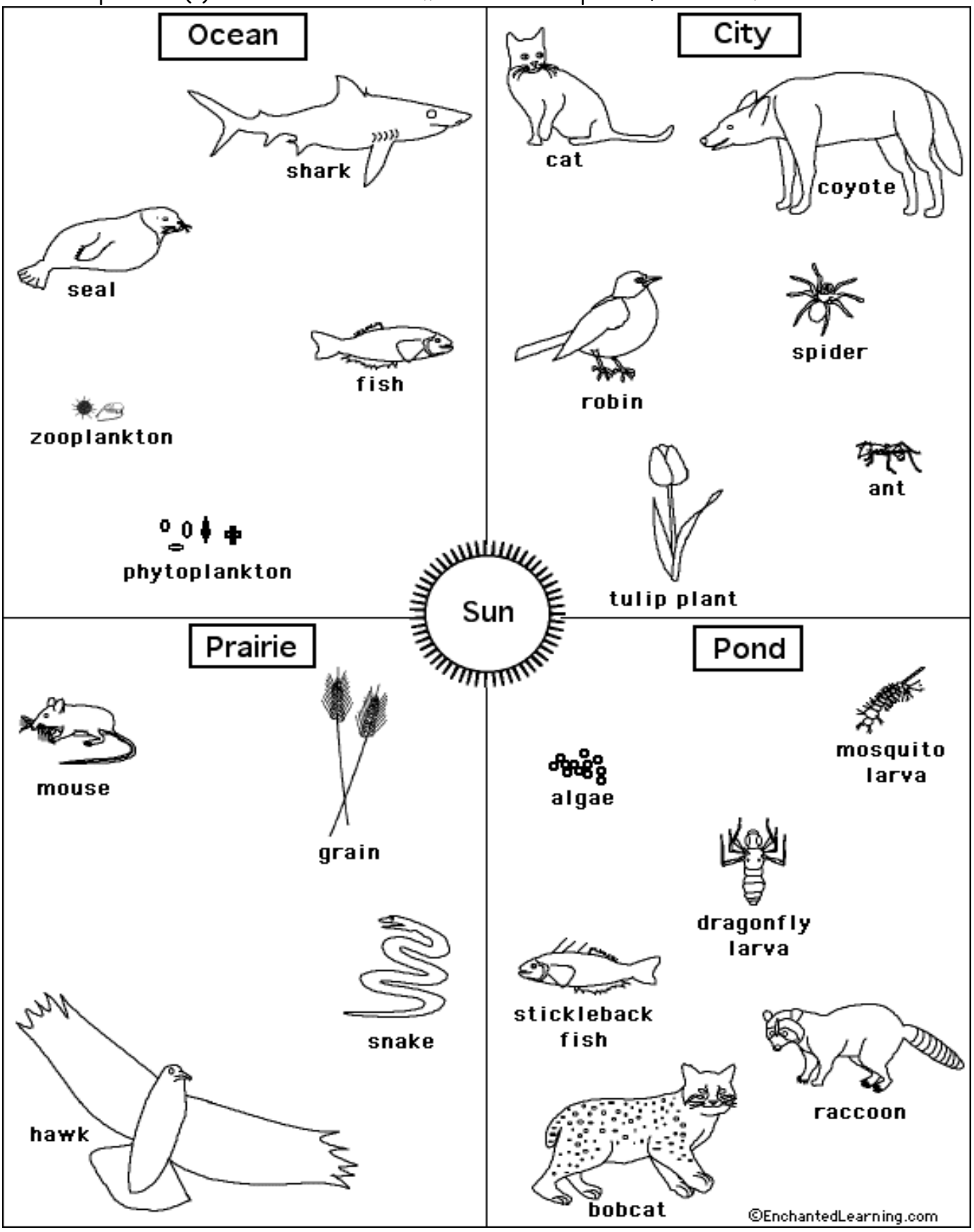
Match each Food Chain Word to its Definition.

Draw a line from each word on the left to its definition.

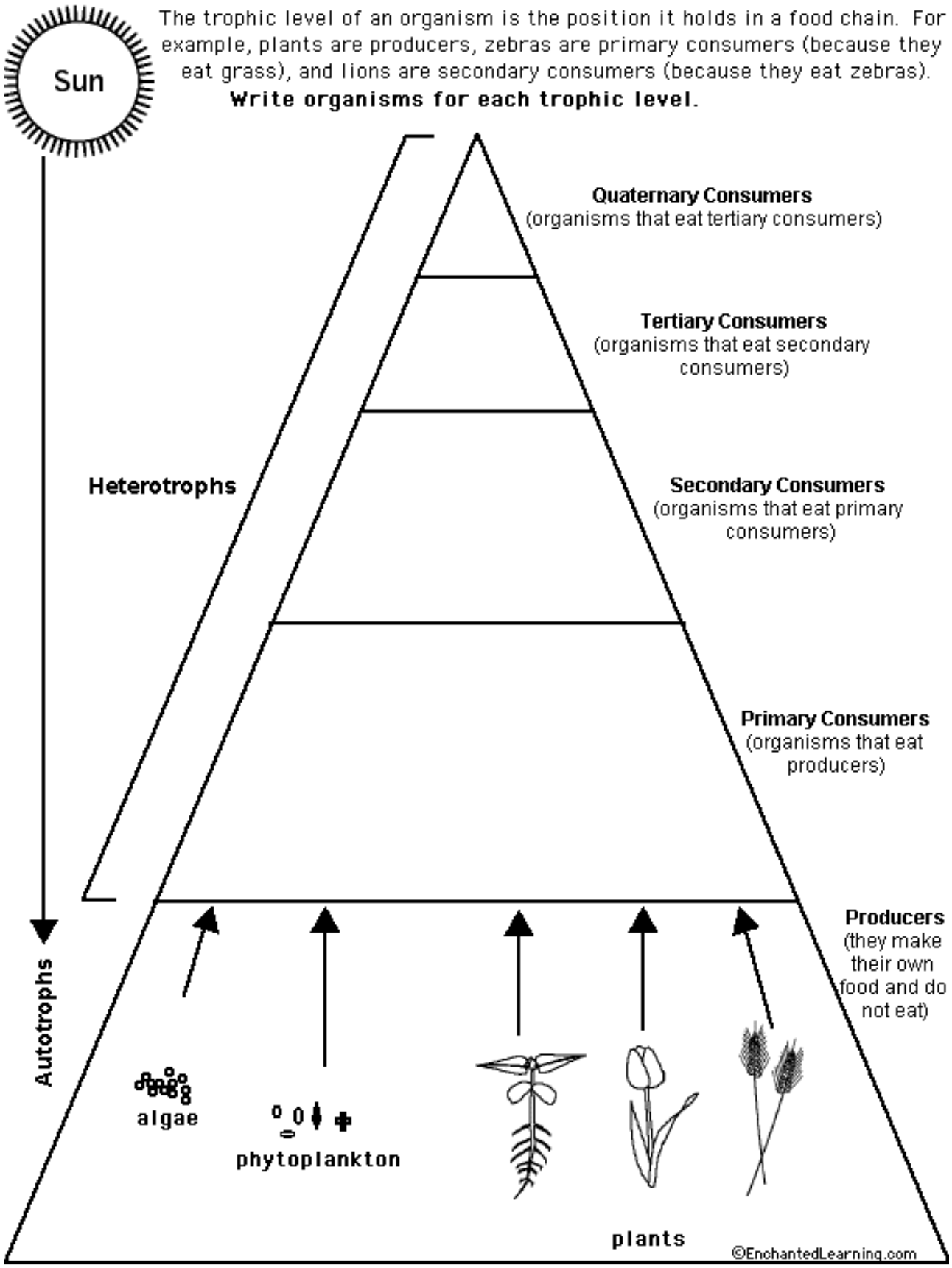
food chain	The network of all the inter-related food chains in a biological community.
food web	The sequence of who eats whom in a biological community.
autotroph	An organism that gets its energy by eating other organisms.
heterotroph	An organism that makes its food from light or chemical energy without eating.
carnivore	An organism that eats plants.
herbivore	An organism that eats meat.
primary consumer	A meat-eater that eats primary consumers.
secondary consumer	A meat-eater that eats tertiary consumers.
tertiary consumer	A meat-eater that eats autotrophs.
quaternary consumer	A meat-eater that eats secondary consumers.

ENERGY TRANSFER in BIOMES

For each biome, **fill in arrows that trace the transfer of energy** from the sun to a top predator. **Label** the producer(s) and each order consumer and **color** all parts of the chain.



Food Chain Trophic Levels - Worksheet



Choose a **freshwater ecosystem** --- pond, stream, lake, wetland, bayou, etc. After choosing your ecosystem, put as many organisms as you can at each trophic level on the pyramid below.

ECOSYSTEM _____