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ENERGY FLOW IN FOOD CHAINS AND WEBS

A habitat is any place where an organism lives, feeds and reproduces, e.g. earthworms live in the upper layers of the soil or alligators live in swampy water. There are two categories of habitats.

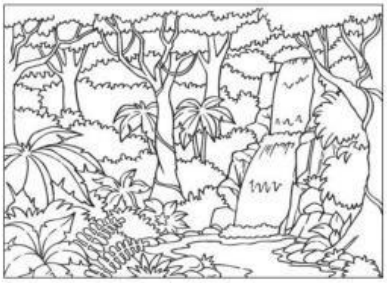
a). Aquatic (water) e.g. ocean, stream, lake, pond
b). Terrestrial (land) e.g. grassland, tree, garden.

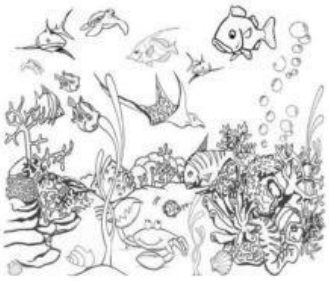
Student's Work

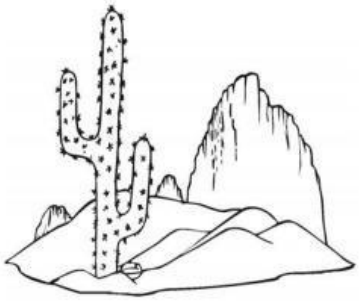
1. Use the following is a list of habitats to label the diagrams below. [7 marks]

FOREST **DESERT** **MOUNTAIN RANGE**

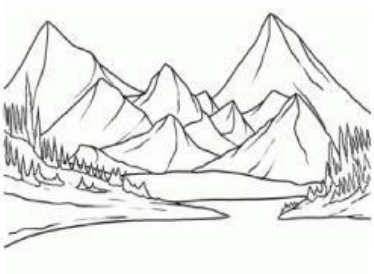
JUNGLE **SWAMP** **LAKE** **OCEAN**

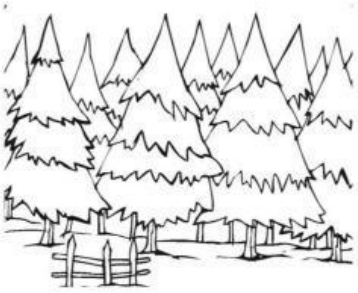






_____ _____ _____





_____ _____ _____

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Energy Flow through the Ecosystem

Regardless of the habitat, there exists what is called 'interdependence' between and among all of the organisms in the habitat. This means that all of the organisms depend on one another for their survival and for the harmonious working of the environment in which they live. Therefore, balance must be maintained in this environment. For this reason, energy can be passed from one organism to another through the act of feeding.

The energy for all living organisms initially comes from the sun. Plants make their food from this energy during the process photosynthesis. This is why plants are called PRODUCERS. Animals get their energy from the food they eat. Some animals eat plants while others eat other animals. Therefore, animals are called CONSUMERS. Hence living things are dependent on one another.

Food Chains and Food Webs

Food chains and food webs show the feeding relationship that occurs between organisms in a habitat or ecosystems. A food chain is the sequence by which energy, in the form of food, passes from plant to animal and then to other animals. Although the food chain shows each organism eating only one thing, do you think this is what really happens in nature?

No. Organisms like variety and usually eat more than one thing. Therefore, we use a food web to show that they eat more than one thing. It is a compilation of food chains from the same habitat and is more complex than a food chain. Removing organisms from or adding organisms to the food chain or web can significantly affect the feeding habits and numbers of the remaining organisms.

Terms Used in Food Chains and Webs

1. Producer: photosynthetic green plant or chemosynthetic bacterium, that are able to make their own food, thereby not dependent on another organism.

2. Consumer: heterotrophic organism that feeds on other organisms; they cannot make their own food.

3. Herbivore: an animal that eats mainly plants.

4. Carnivore: an animal that eats mainly meat.

5. Omnivore: an animal that eats a variety of foods (both plants and meat).

6. Predator: an animal that hunts and kills another for food.

7. Prey: an animal that is hunted and killed for food.

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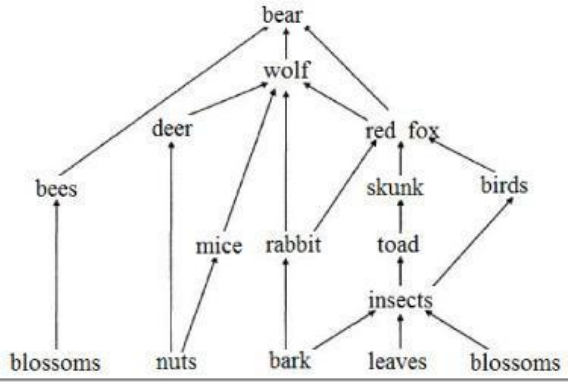
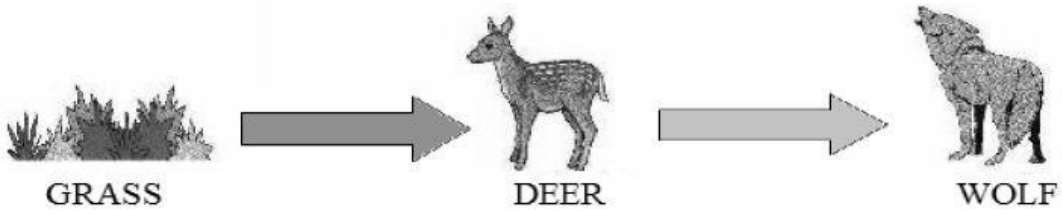
Drawing Food Chains and Food Webs

Food chains don't have to look fancy with all sorts of diagrams. Words and arrows are good enough. Just ensure that the arrowheads are pointing in the correct directions (towards the organism which is feeding).

FOOD CHAIN	FOOD WEB
1. Each organism is only fed on by ONE organism and each organism only feeds on ONE other organism 2. The producer always comes first. 3. The herbivore is placed second on the chain. 4. The consumers are placed next on the chain. 5. The arrows always point away from what is being eaten. 6. The food chain is usually drawn horizontally. grass→ grasshopper→ lizard→ bird	1. Each organism is fed on by more than one organism and each organism feeds on more then one organism. 2. The producers always come first. 3. The herbivores are placed second on the web. 4. The consumers are placed next on the web. 5. The arrows always point away from what is being eaten. 6. The food web is usually drawn vertically. 

Food Chains and Food Webs are Full of Information

Look at the food chain below.



Each of the organisms can be referred to by other names because of the roles they play. This is shown in the diagram below.

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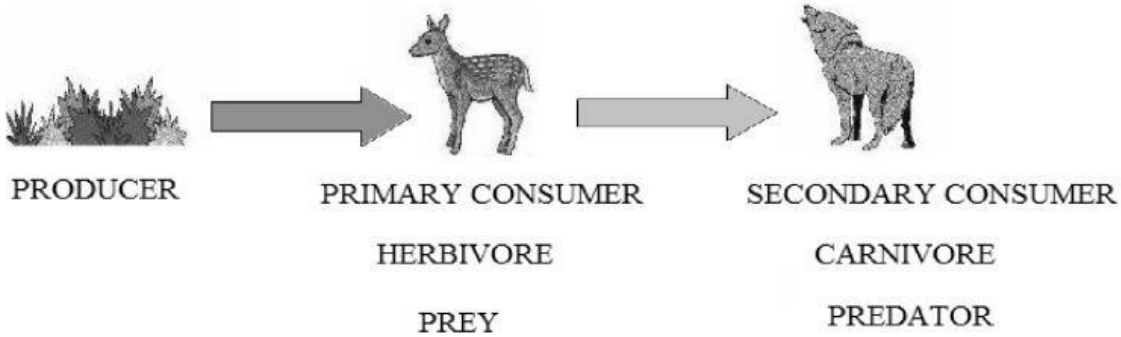
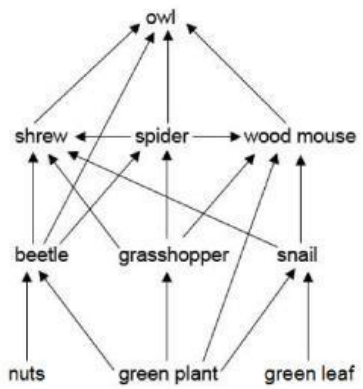


If there were another organism feeding on the wolf, the wolf would then also be called prey. The organism feeding on it would be the TERTIARY consumer, carnivore and predator. Anything else feeding after the tertiary consumer would be called the COMPLEX consumer, along with any other applicable designation.

These designations also apply to food webs as shown below.



DESIGNATIONS

TERTIARY CONSUMER, CARNIVORE, PREY, PREDATOR

SECONDARY CONSUMERS, CARNIVORES, PREY

PRIMARY CONSUMERS, HERBIVORES

PRODUCERS

Similarities between Food Chains and Food Webs

Both food chains and food webs start with a producer and have arrows pointing away from what is eaten by the consumers because the arrows show the flow of ENERGY and not of food. As we go across the food chain or up the food web, the numbers of organisms must decrease. This is so because if there are more predators than prey, the prey will all be eaten very quickly and the predators remaining will die from starvation. Therefore, prey should always outnumber predators if both are to survive.

The numbers of organisms also decrease because as the energy is transferred from organism to organism, it decreases so that it will benefit fewer and fewer organisms.

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Differences between Food Chains and Food Webs

The food web:

1. is more complex than a food chain and is actually made up of a number of food chains
2. provides a more realistic interaction among organisms in an ecosystem
3. is normally drawn upwards while food chains are drawn horizontally from left to right.

Student's Work

Insert arrows to show possible feeding relationships among the organisms below, thus constructing a food web. [5 marks]

cat

chicken lizard beetle

grasshoppers bees butterfly

grass flowers seeds

Predator-prey Relationships

On a food chain, the organism that hunts and kills its food is called the predator. Herbivores are not considered as predators because they do not "hunt and kill" plants. The organism that is hunted and killed for food is called the prey. Plants are not considered as prey because they do not run and hide from their consumers. Examples of predator-prey relationships

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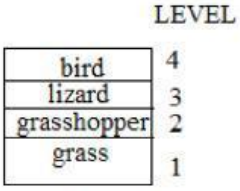
are lions hunt zebras, tigers hunt rodents like rats, birds hunt lizards and humans hunt many different animals for food.

Trophic Level Diagrams

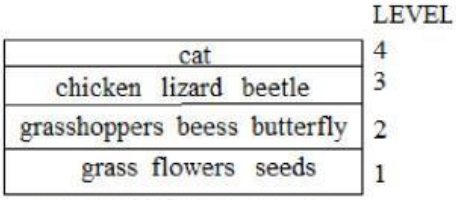
Trophic level means "feeding" level and the trophic level diagram shows which organisms are feeding on each level of a food chain or web. For example, the following food chain has four trophic levels:

grass→ grasshopper→ lizard→ bird

The food web in which you just drew the arrows also has four trophic levels. The trophic level diagrams for both the food chain and the food web are shown below. Food chains and food webs do not usually have more than four trophic levels because there is not usually enough energy passed on to the organisms on the upper trophic levels to maintain life. You can usually tell which organisms belong on the same trophic level because they eat the same things and exist in similar numbers.



TROPIC LEVEL DIAGRAM
FOOD CHAIN



TROPHIC LEVEL DIAGRAM OF
FOOD WEB

Decomposers

Decomposers are micro-organisms such as bacteria or fungi that feed on the dead remains of organisms, therefore breaking them down so that they can become part of the environment once more. They are very important to food chains and food webs because once an organism dies, decomposers ensure that they are broken down and returned to nature.

Student's Work

1). Write the words **TRUE** or **FALSE** on the lines after each of the following statements. [5]

a. The producer is a plant and is usually placed first on the food chain. _____

b. The arrows point towards what is being eaten. _____

c. The arrows show the movement of energy along the food chain. _____

d. Carnivores and omnivores both eat meat. _____

e. Herbivores also eat meat but their teeth are not as sharp as those of carnivores. _____

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2). a. An example of an aquatic habitat is a stream or a pond. Write three more examples of aquatic habitats. [3 marks]

_____ _____ _____

b). An example of a terrestrial habitat is a mountain or a garden. Write three more examples of terrestrial habitats. [3 marks]

_____ _____ _____

c). From one of your aquatic habitats above, construct a food chain with four organisms. [4]

I_____

d). From one of your terrestrial habitats above, construct a food chain with four organisms. [4]

II_____

3). a. Complete the table below using the names of the following animals. Some of the words may be placed in more than one column. [36 marks]

BANANA	ELEPHANT	LION	RABBIT
CABBAGE	FLOWER	LIZARD	SEEDS
CATERPILLAR	FROG	MONGOOSE	SPIDER
CHICKEN	GRASS	MONKEY	SNAKE
COW	HUMAN	PEANUTS	TIGER

PRODUCERS	CONSUMERS	HERBIVORES	CARNIVORES

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b). Which two organisms above was found both in the carnivores and herbivores section? [2]

_____ and _____

c). What do we call these types of organisms that are both carnivores and herbivores? [1]

_____

d). Make three different food chains using the animals above. Each food chain must have at least FOUR organisms and each organism can only be used ONCE. [12 marks]

I_____

II_____

III_____

4). What is wrong with the following food chains? [2 marks each]

a. corn → flower → bees→ bird

I_____

b. grass ← grasshopper ← frog ← snake

I_____

c. butterfly → snake → eagle

I_____

d. grass→ grasshopper→ chicken→ human→ roach

I_____

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5). a. How many food chains can you count in the food web below?_____

b. Name an omnivore from the food web below. _____

c. How many trophic does the food web have? _____

d. Name an organism from the food web below that is a primary, secondary and tertiary consumer all at once.

_____

e. What do you think would happen to the green plants and spiders if the grasshoppers left the area suddenly?

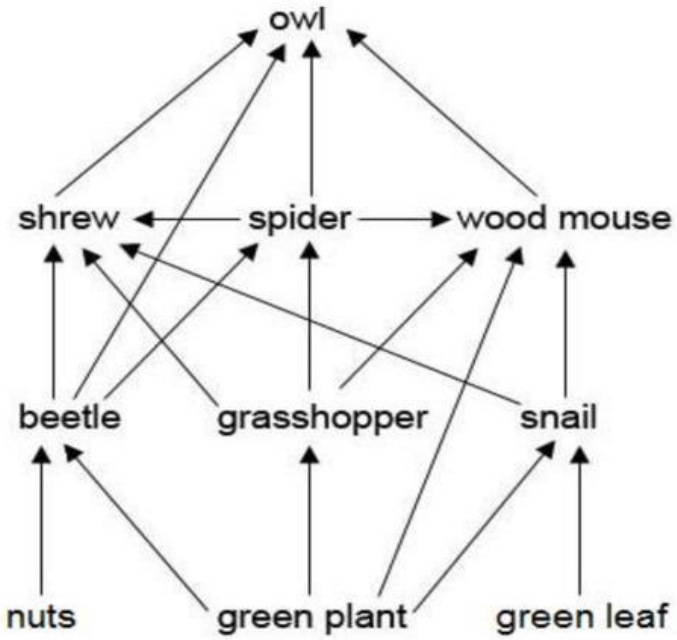
Green plants_____

_____

Spiders _____

_____

[8 marks]



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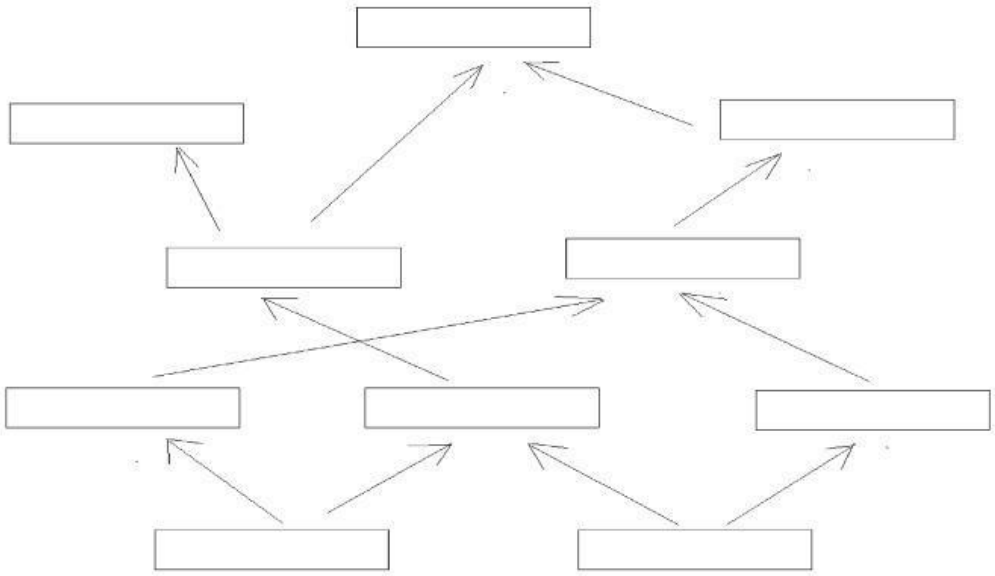
6). Drag the organisms to the correct regions to complete the food web below. [10 marks]

WATER SNAKE	SMALL FISH	WATER BEETLES	SEA GULL	SEA WEED
TADPOLES	MOSS	MOSQUITO LARVAE	BIG FISH	TURTLE



Answer the following questions based on the food web which you drew above.

1. How many carnivores are on your food web? _____[1 mark]

2. Name any two organisms that are on the same trophic level.

_____[2 marks]

3. Name two secondary consumers.

_____[2 marks]

4. Name TWO predator-prey relationships. [4 marks]

Predator_____ Prey _____

Predator_____ Prey_____

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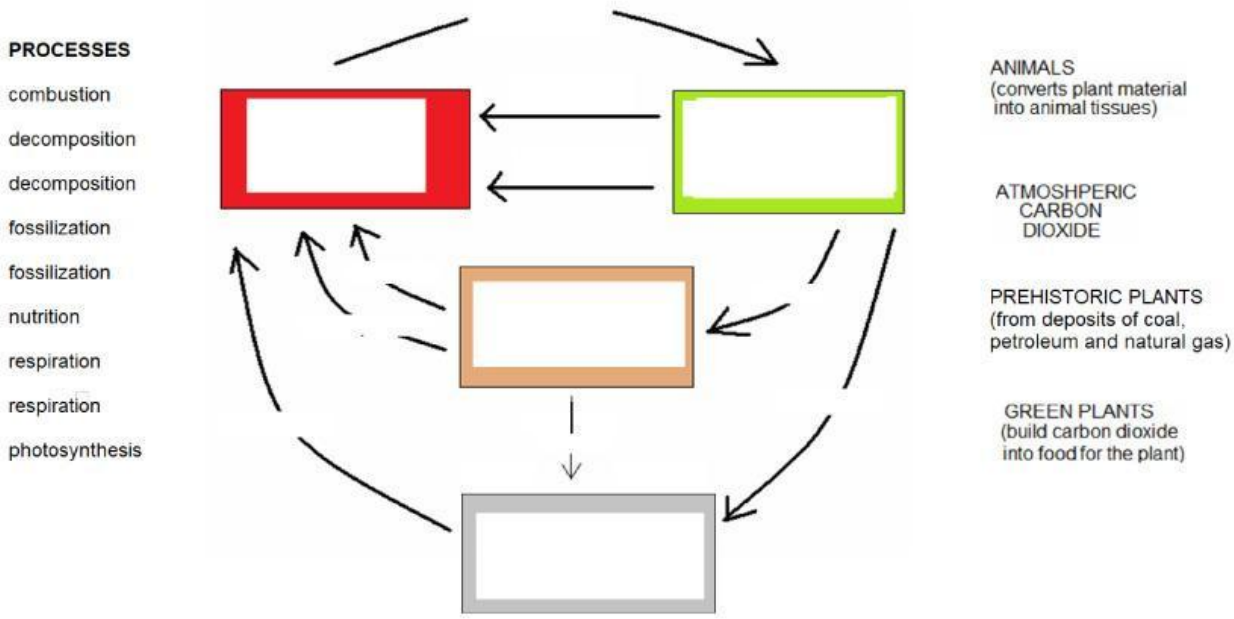
CARBON CYCLE

The _____ _____ is the sequence in which carbon is constantly being used and reused in various forms in the _____. Below is a diagram of the carbon cycle. Notice on the carbon cycle diagram that carbon dioxide being removed from and returned to the atmosphere.



REMOVAL OF CARBON DIOXIDE FROM THE ATMOSPHERE

Carbon dioxide is _____ from the atmosphere by the process of _____. Plants use the sun's energy, _____ _____ and water to make _____, _____and other _____. Animals then eat the plants

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as part of their _____ and therefore get _____ into their bodies. Sometimes when the plants and animals die, they become hard deep under the Earth's crust (_____) and become fossils that later become fossil fuels like _____ and _____.

RETURN OF CARBON DIOXIDE TO THE ATMOSPHERE

Carbon dioxide is _____ to the atmosphere by _____, _____ and _____.

When _____ feed on dead organisms, they use this food in _____ to make energy releasing _____ _____ into the atmosphere. When _____ and _____ respire, they also release carbon dioxide into the atmosphere as a by-product.

Lastly, when_____ _____ such as oil and coal are burned (_____) in fireplaces, cars and other modes of transportation, _____ _____ is released as part of the_____.

LIVEWORKSHEETS