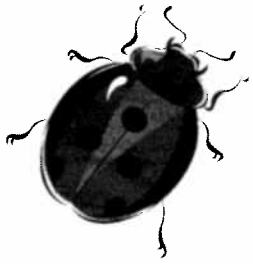
Insect Cards

butterfly 	**ant** 	**damselfly** 	**grasshopper** 
fly 	**dragonfly** 	**moth** 	**ladybug** 

butterfly 	**ant** 	**damselfly** 	**grasshopper** 
fly 	dragonfly 	moth 	ladybug 

Images courtesy Clip Art

Using a Dichotomous Key

A simple dichotomous key can be a useful tool to identify and organize objects by physical traits. Physical traits are important for learning how to classify things. Keys are made following these basic rules:

- Observing the physical characteristics of objects to be identified by using the key
- Identifying the most general trait that can be used to divide the organisms into categories. For this activity, we are using wings. The number of legs would not be a good trait to use when trying to narrow down the species of an insect because all insects have six legs.
- Two choices are written for each number. One choice has a trait, and the other choice is NOT the trait. A different trait for a choice is not generally used. For example, since the trait we're using is wings, we would not use antenna as a choice.
- Each step in the key should narrow down identification. Choices should not be confusing.
- There should be one less numbered step than the total number of objects to be identified.

Follow the teacher instructions to complete the key. Be sure that you understand the process for using the key.

1. a) can see wings b) can't see wings	..... *go to step 3* ..... *go to step 2*
2. a) has exoskeleton covering wings b) doesn't have exoskeleton covering wings as it has no wings to cover	..... *go to step 4* .....
3. a) holds wings straight out to sides b) doesn't hold wings out to sides	.... *go to step 5*
4. a) has rounded wing covers b) doesn't have rounded wing covers	....
5. a) folds wings together over back b) doesn't fold wings together over back	..... *go to step 6* ..... *go to step 7*
6. a) wings are transparent b) wings are not transparent	....
7. a) wings lay in a flat, triangular shape b) wings do not lay in a flat, triangular shape	....

Using a Dichotomous Key and Script KEY

Lead students through the key one step at a time. It is necessary that students understand how a dichotomous key is organized and what it does. They will have to use a different key later in the lesson. Students may recognize some of the insects, but they may not know how to use a key to identify them by physical characteristics.

1. Distribute the Handout: **Using a Dichotomous Key** to each student. Explain to them that you will lead them thorough the identification and grouping of the insects based on the trait concerning wings.

2. Read the first paragraph to the students. Refer them back to the description that they wrote for the term "dichotomous key".

3. Say:
   - **Look at the choices in step 1. Divide your cards into two groups based on the given criteria. Place them in two separate rows.** *Model, monitor, correct, and continue*

1. a) can see wings butterfly, damselfly, fly, dragonfly, moth b) can't see wings ant, grasshopper, lady bug	..... *go to step 3* ..... *go to step 2*

   - **Look at the insects in the "can't see wings" pile. There should be three cards. Where does step 1b instruct us to go?** *(Go to step 2.)* **Look at the choices in step 2.**

2. a) has exoskeleton covering wings b) doesn't have exoskeleton covering wings as it has no wings to cover	..... *go to step 4* ..... ***ant***

Say:
   - **Insects have no bones. Their hard outer covering is their skeleton. The prefix exo- means outside. Some insects have a hard covering over their wings. This covering is a part of their exoskeleton. Examine the cards closely. Which of the three will complete line 2b?** *(The ant is the only insect pictured with no wings.) Instruct students to write the word "ant" beside the dots on line 2b.* **Where does step 2a instruct us to go?** *(It instructs us to go to step 4.)* **Go to step 4.**

4. a) has rounded wing covers b) doesn't have rounded wing covers	..... *lady bug* ..... *grasshopper*

Say:
   - **Look at the choices in step 4, and look at your cards. Which insect has rounded pieces of exoskeleton covering their wings?** *(The lady bug is the only insect pictured with rounded wing coverings.) Instruct students to write the word "lady bug" beside the dots*

on line 4a. **Which insect fits the criteria for 4b?** *(The grasshopper is the only insect pictured without rounded wing coverings from the step 2 sort.) Instruct students to write the word "grasshopper" beside the dots on line 4b.*

- **Go back to step 1, and retrace how you got the ant, grasshopper, and lady bug identified by the characteristics of their wings.** *Lead students through the steps again before continuing with the rest of the insects.*

- **Now, go back to the remaining cards left from the sort you made in step 1. You should have five cards remaining.** *(butterfly, damselfly, fly, dragonfly, and moth)*

- **Where does step 1a instruct us to go?** *(It instructs us to go to step 3.)* **Go to step 3.**

3. a) holds wings straight out to sides dragonfly b) doesn't hold wings out to sides butterfly, fly, damselfly, moth	..... *dragonfly* ..... *go to step 5*

Say:

- **Look at your cards and the choices. Which insect fits the description in step 3a?** *(The dragonfly holds its wings straight to to the side.)* **Dragonflies are unable to fold their wings in any direction. They are always out to their side. It is one way to tell a dragonfly and a damselfly apart when they are at rest.** *Instruct students to write the word "dragonfly" beside the dots on line 3a.*

- **Where does step 3b instruct us to go?** *(It instructs us to go to step 5.)* **Go to step 5.**

5. a) folds wings together over back butterfly, damselfly b) doesn't fold wings together over back fly, moth	..... *go to step 6* ..... *go to step 7*

Say:

- **Look at the cards you have left. Sort them into the two groups described in step #5. Look at step 5a. Where does it instruct us to go?** *(It instructs us to go to step 6.)* **Go to step 6.**

6. a) wings are transparent damselfly b) wings are not transparent butterfly	..... *damselfly* ..... *butterfly*

Say:

- **Look at your cards and the choices. Which insect fits the description in step 6a?** *(The damselfly has transparent wings.) Instruct students to write the word "damselfly" beside the dots on line 6a.* **Look at step 6b. Which insect from this sort fits the description?** *(The only card left from the sort for step 5a is the butterfly.) Instruct students to write the word "dragonfly" beside the dots on line 6b.*

- **Look back at step 5b. What cards do you have left?** *(The fly and the moth are left.)* **Where does step 5b instruct us to go?** *(It instructs us to go to step 7.)* **Go to step 7.**

- **Read the choices for step 7, and place the name of each insect on the correct line next to the dots.**

7. a) wings lay in a flat triangular shape moth b) wings do not lay in a flat triangular shape fly	..... *moth* ..... *fly*

Ask the following questions to check for student understanding and clarification.

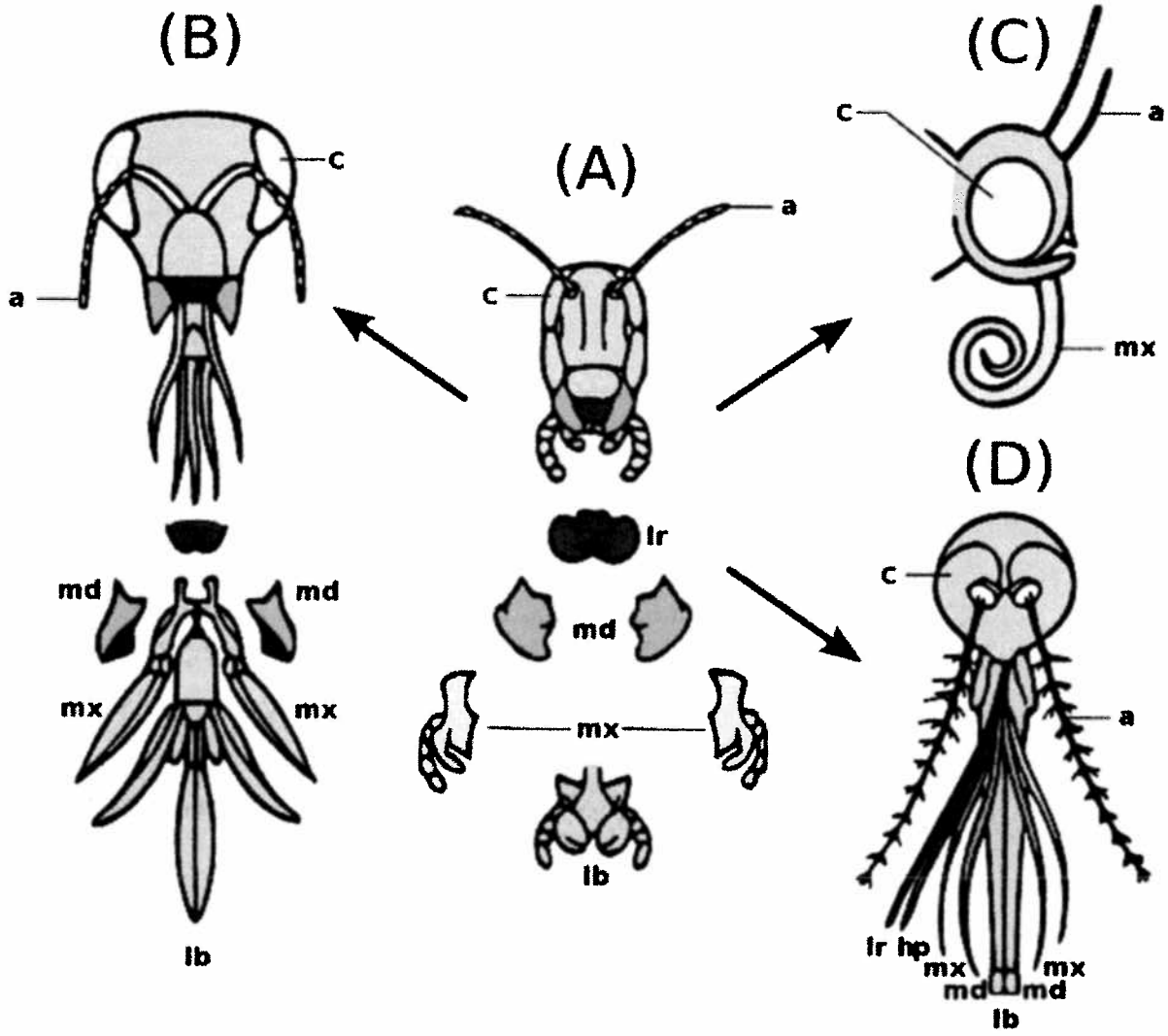
- **What did you notice about the choices for each step?** Answers may vary *but lead students to the idea that one choice in a step describes a trait and the other choice is a "not" statement of that trait.*

- **Did you have to go in numerical order through the key.** *Only to a point. It is necessary to follow the numbering identified in the a or b choice in each step.*

- **How does a dichotomous key show relationships between organisms?** *The key focus on a physical characteristic that was inherited. By refining the sorting based on differences in that trait, the relationship between organisms becomes clearer. The dichotomous key allows us to compare and contrast groups of similar organisms.*

- **If these were live insects instead of cards, what are some characteristics, other than wings, that could be used to classify the insects?** Answers may vary as students may not have studied insects in detail. Some suggestions are: *mouth parts; leg structure, such as number of toes; hairs or spines on legs; antenna structure; eyes; patterns of veins in wings; body covering; etc.*

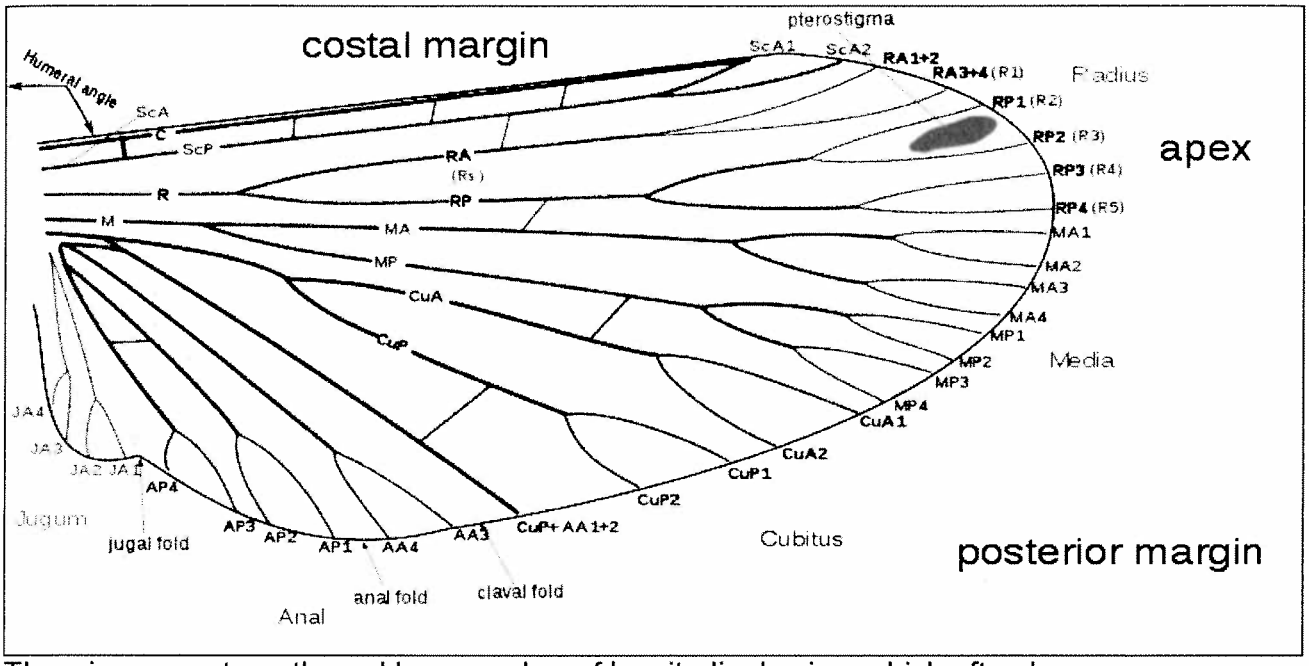
Insect Parts



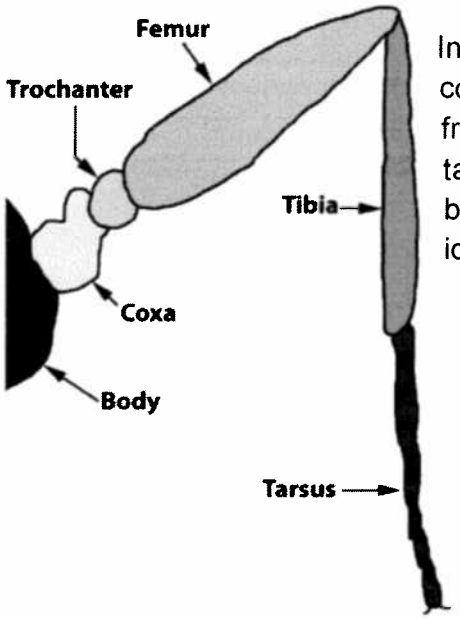
Legend: **a**, antennae; **c**, compound eye; **lb**, labium; **lr**, labrum; **md**, mandibles; **mx**, maxillae; **hp**, hypopharynx

The types of insect mouthparts:

a) chewing mouthparts of a grasshopper in the center
b) the lapping type of a bee
c) the siphoning type of a butterfly
d) the sucking type of a female mosquito

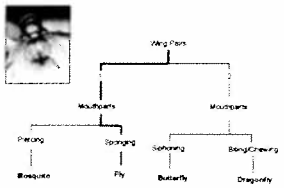


The wings are strengthened by a number of longitudinal veins, which often have cross-connections that form closed "cells" in the membrane. These patterns can be used for identification purposes.



Insects and their relatives are hexapods: having six legs connected to the thorax and each with five components. In order from the body, they are the coxa, trochanter, femur, tibia, and tarsus. Each is a single segment, except the tarsus which can be from three to seven segments and can be used for identification.

Identifying Organisms



In this presentation you will:

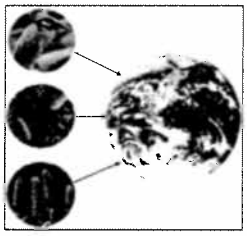
- identify and sort living things based on their similarities and differences

Next >

Introduction

Over 1.5 million species of organisms have been discovered on Earth.

It is estimated that many more species are yet to be discovered.



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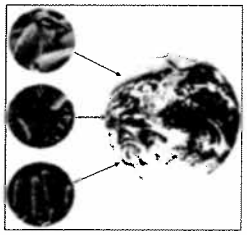
Introduction

For thousands of years, humans have been sorting and grouping these species to understand them better.

Grouping things based on their similarities and differences is called **classification**.

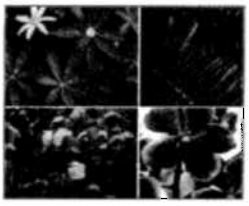


Next >

Sorting Living Things

The scientific community uses classification as a standardized system for identifying organisms.

Classification involves sorting things into groups depending on their internal and external structures.



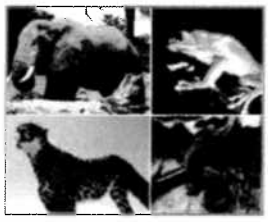
Next >

Sorting Living Things

Almost any organism in the living world can be sorted.

Trees, flowers, insects, birds, mammals...

...the list goes on and on.



Next >

Classification Systems

Classification systems are constantly being updated:

- as new species are discovered
- as new technologies allow similarities and differences between species to be viewed in new ways

Next >

Identifying Living Things

In practice, all living things, even of the same species, vary a little.

Suppose you found a leaf, and wanted to know what type of tree it came from.

There are tools that biologists can use to help them identify these things.

Next >

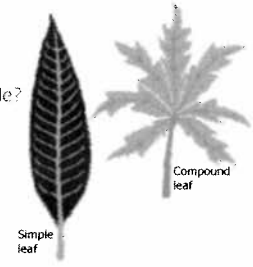
Sorting Leaves

Trees can often be identified by comparing the structure of their leaves:

- **Leaf Shape**

A single undivided blade?

Or divided into small 'leaflets' that meet at the leaf stalk?



Next >

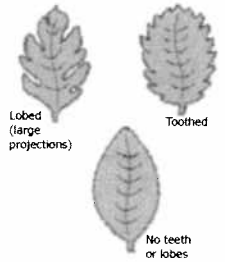
Sorting Leaves

- **Leaf Edge**

Does it have large projections (lobes)?

Does it have teeth?

Is it without teeth and lobes?



Next >

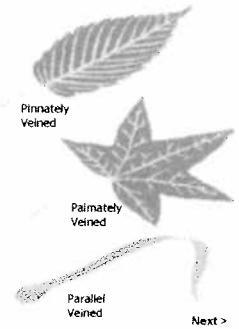
Sorting Leaves

- **Veins**

Are the leaf veins arranged along a center vein?

Do the leaf veins emerge from a single point?

Do the leaf veins run parallel to each other?



Next >

Sorting Leaves

Look at these pictures of four leaves.

Can you see similarities and differences between them?

A hand lens can help you to look at the structure of leaves.

Next >

Sorting Leaves

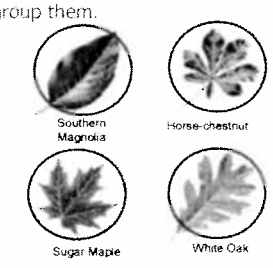
Now we can start to group them.

Which are simple leaves?

Which are compound leaves?

Which leaves have rounded lobes?

Which leaves have pointed lobes?



Next >

Sorting Insects

Insects can also be identified by their structures.

For example, the design of an insect's mouth can show how it feeds.

Next >

Sorting Insects

- **Piercing**
  Mosquitoes pierce food and then suck fluids out.

- **Sponging**
  Flies have a sponge-like end that absorbs liquid food.

Next >

Sorting Insects

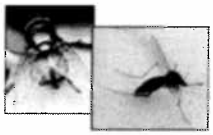
- **Siphoning**
  Butterflies and moths have a tube for sucking liquid food.

- **Biting or chewing**
  Dragonflies bite their food into tiny chunks.

Next >

Sorting Insects

The presence and number of pairs of wings can be used to identify insects too.

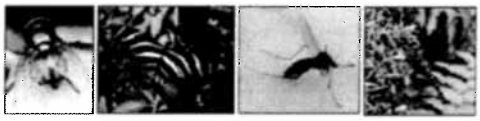


For example, flies and mosquitoes have just one pair of wings, while butterflies and dragonflies have two pairs.

Next >

Sorting Insects

By asking questions about these structures, we can start to separate one insect from another.



For example:

Does the insect have one or two pairs of wings?

Next >

Question 1

Look at this picture of an insect's mouth parts. What is the most likely feeding method of this particular insect?

A) Piercing

B) Sponging

C) Siphoning

D) Biting and chewing

Next >

Question 1

Look at this picture of an insect's mouth parts. What is the most likely feeding method of this particular insect?

A) Piercing

B) Sponging

C) Siphoning

✓ D) Biting and chewing

Next >

Classification in Practice

Dichotomous keys help identify things that are similar in appearance to each other.

Identification Key	
1a. Bean round	Garbanzo bean
1b. Bean elliptical or oblong	Go to step 2
2a. Bean white	White northern bean
2b. Bean has dark pigments	Go to step 3
3a. Bean even pigmentation	Go to step 4
3b. Bean mottled pigmentation	Pinto bean
4a. Bean black	Black bean
4b. Bean reddish-brown	Kidney bean

They work by providing a series of steps that ask specific questions about characteristics.

Next >

Classification in Practice

The name '**dichotomous**' comes from having two possible outcomes at each step.

Identification Key	
1a. Bean round	Garbanzo bean
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2a. Bean white	White northern bean
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3a. Bean even pigmentation	Go to step 4
3b. Bean mottled pigmentation	Pinto bean
4a. Bean black	Black bean
4b. Bean reddish-brown	Kidney bean

The outcome chosen at each step determines what the next step will be.

When the organism matches the step description, it has been identified.

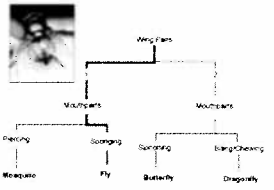
Next >

Using Keys

For example, this dichotomous key could be used to identify our insects.

The key can be shown as a:

- diagram
- table

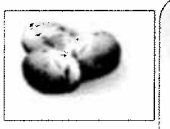


Identification Key	
1a. 2 pairs of wings	Go to step 2
2a. Piercing mouthparts	Mosquito
3a. Sponging mouthparts	Butterfly
3b. Biting/Chewing mouthparts	Dragonfly

Next >

Dichotomous Keys: Tables

By looking at the structure of these beans, we can see how the table key is used to identify them.



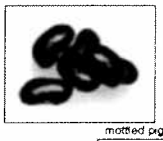
Identification Key	
1a. Bean is round	Garbanzo bean
2a. Bean is white	White northern bean
3a. Bean has even pigmentation	Go to step 4
4a. Bean is black	Black bean
4b. Bean is reddish-brown	Kidney bean

The key allows us to identify the bean as a pinto bean.

Next >

Dichotomous Keys: Diagram

By looking at the characteristics of these beans, we can see how the diagram is used to identify them.



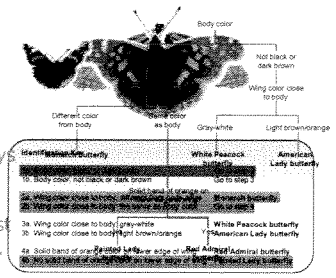
The diagram identifies the bean as a kidney bean.

Next >

Using Keys

When using a key in the form of a chart, it is important to follow the instructions.

Dichotomous keys can be used to sort and classify anything, not just living organisms.



Next >

Question 2

Here is a classification chart showing different species of butterflies. Using the information in the chart, what species is butterfly **Z**?

A) American Lady

B) Monarch

C) Painted Lady

D) Red Admiral

Identification Key	
1a. Body color: black or dark brown	Go to step 2
1b. Body color: not black or dark brown	Go to step 3
2a. Wing color close to body: different to body color	**Monarch**
2b. Wing color close to body: the same as body color	Go to step 4
3a. Wing color close to body: gray-white	**White Peacock**
3b. Wing color close to body: light brown/orange	**American Lady**
4a. Solid band of orange color on lower edge of wing	**Red Admiral**
4b. No solid band of orange color on lower edge of wing	**Painted Lady**

Next >

Question 2

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4b. No solid band of orange color on lower edge of wing	**Painted Lady**

Next >

Question 3

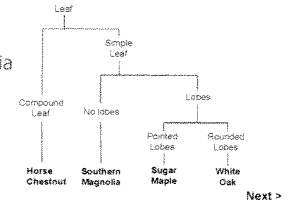
What type of tree does leaf **W** come from? Use the key to find out.

A) Horse Chestnut

B) Sugar Maple

C) Southern Magnolia

D) White Oak



Next >

Question 3

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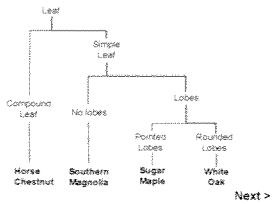
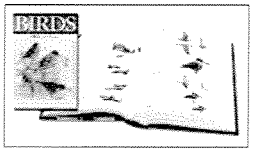


Next >

Field Guides

Field guides can also help to identify organisms.

They are often used to aid research and investigation.

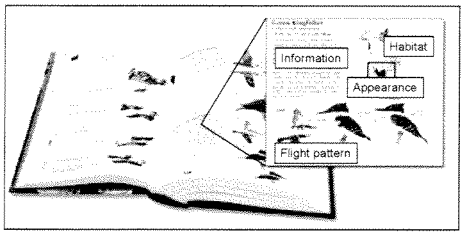


They give information about the habitat, appearance, and behavior of each organism.

Next >

Field Guides

They typically provide details and descriptions like this one:



Next >

Summary

In this presentation you have seen:

- how organisms can be grouped based on similarities and differences

End >

Plant Advanced Organizer

Tropism: Plant movement (behavior) triggered by stimuli

Geotropism

Phototropism

Plant Structures

Roots

Stems

Leaves

Flowers

Seeds

Include the following for each of the plant structures listed:

Function:
Variations:
Adaptations:

Verbal Visual Vocabulary Cards

Physiology	Phototropism	Geotropism	External Features
The scientific study of an organism's vital functions, including growth and development	Movement or growth in response to lights or colors of light	A plant whose roots grow down into the soil as a response to gravity	The outward appearance of a distinct part that can be seen, such as the roots, stem, leaf, or flower of a plant

Function	Adaptation	Variation	Behavior
The physiological activity of a part (the specific role a part has in the system)	The process of changing in response to something, such as an environmental condition	Marked difference or deviation from the normal or recognized form, function, or structure	The actions and mannerisms made by organisms in response to their environment. It is sometimes a response to various stimuli.

Structure	Camouflage	Migration	Hibernation
The arrangement of and relationship between the parts of something; made up of a number of parts that are held or put together in a particular way	A method of concealment that allows an otherwise visible animal to remain unnoticed by blending with its environment	The relatively long-distance movement of individuals, usually on a seasonal basis	Hibernation is a state of inactivity and decreased metabolism in animals, characterized by lower body temperature, slower breathing, and/or lower metabolic rate. Hibernation during summer months is known as aestivation.

Animal Advanced Organizer

Migration

Camouflage

Structure:

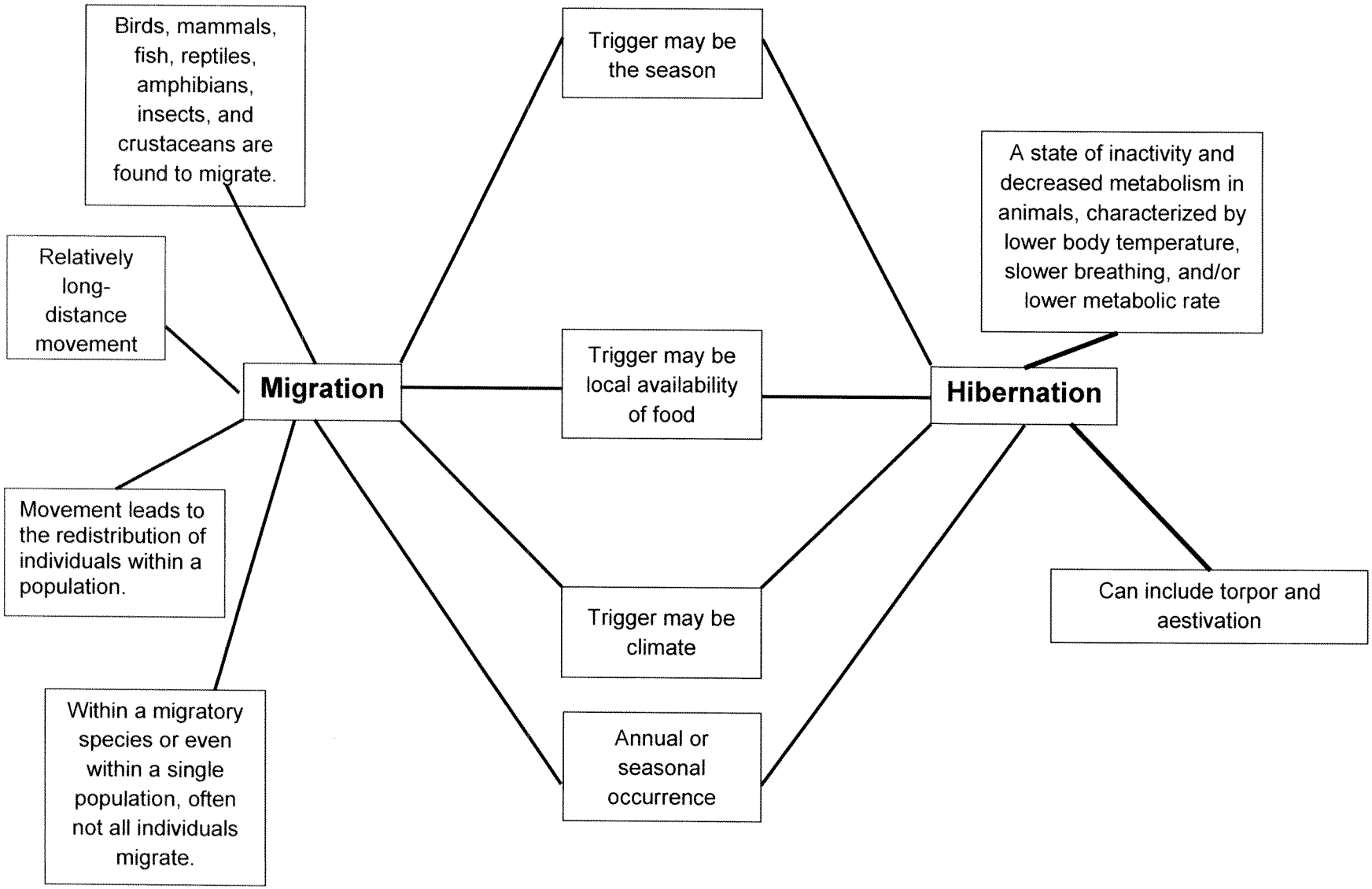
Function:

Hibernation

Appendages

Mouth Structures

Migration and Hibernation SAMPLE



Migration, Hibernation, Dormancy, Phototropism, and Geotropism

Migration

salmon

dolphin

Mexican free-tailed bats

monarch butterflies

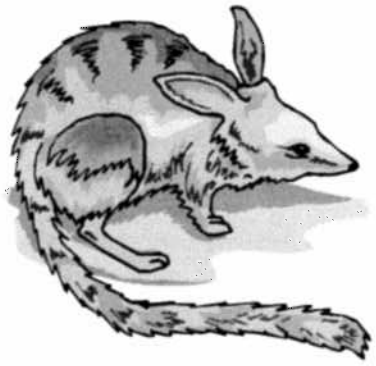
whale

arctic tern

Hibernation

brown bear

hedgehog



kangaroo rat

squirrel

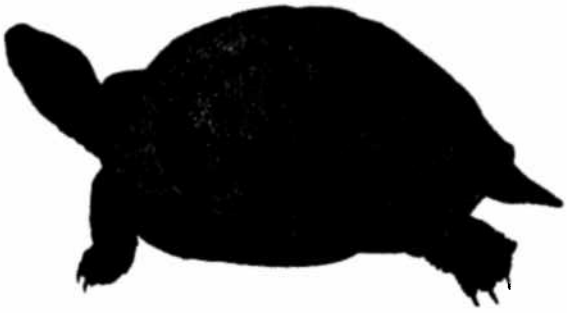
Dormancy

snake

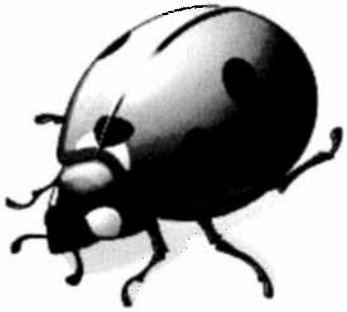
frog

skunk

badger

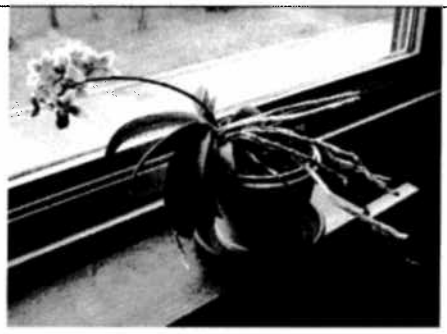


turtle



ladybug

Phototropism



http://commons.wikimedia.org/wiki/User:Tangopaso

Geotropism