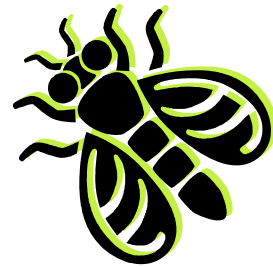


Adaptations of Insects

Student Booklet



Texas AgriLife Extension
Part of the Texas A&M University System



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Preface

Insects have amazing adaptations that make each type unique and diverse. Insects are adapted for life in every environment imaginable. With the exception of deep in volcanoes, insects can be found everywhere. Insect adaptations include mouthparts, the ability to fly, leg types, and body shapes. Imagine if all insects looked exactly the same, ate exactly the same food, and lived in exactly the same habitats. It would be impossible because insects would compete too much and would not be able to survive.

In this booklet are a variety of exercises designed to help you learn about adaptations by using insects as examples.



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Glossary Terms

Adaptation

Adapted

Camouflaged

Environment

Lesson 1: Insect Adaptations

Reading Exercise

Insects are **adapted** their **environment** in many ways. An **adaptation** is an adjustment to the environment so that an animal can fit in better and have a better chance of living. Animals with heavy fur coats are adapted for cold environments. Animals that have webbed feet are adapted for living in the water. Insects can also be adapted to their environment.

Here are some adaptations insects can have:

Insects can be **camouflaged**. Insects that look like their environment won't be seen by predators such as birds and lizards. Some insects look like sticks, leaves, and thorns. This type of adaptation helps insect survive by blending in with their surroundings so they aren't eaten or so that prey doesn't see them hiding.

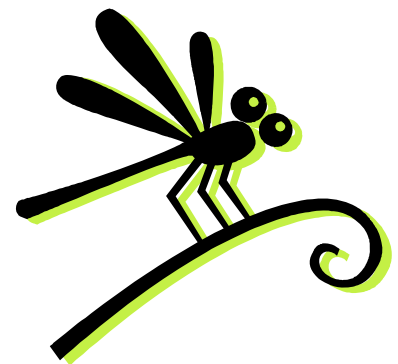


Stink Bugs are the same color green as the leaves they like to eat.

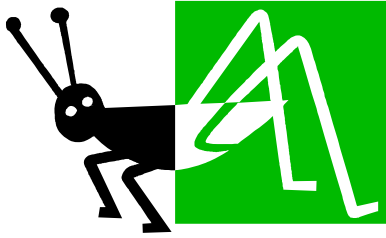


Walking sticks look just like sticks or leaves.

Insect antennae can be adapted to their environment. Insects with large eyes do not need extra help seeing and have short antennae. Insects with long antennae probably have very little eyes. Think about an insect that lives in dark places, what will their eyes and antennae look like? They will probably have small eyes because their world is dark, and eyes aren't helpful. They will also probably have long antennae to help them get around in the dark.



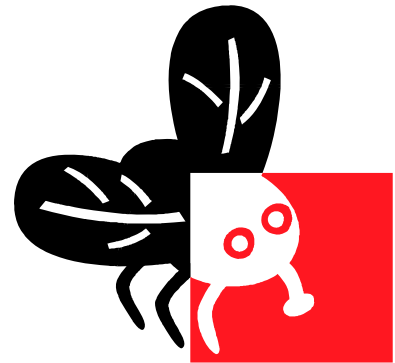
Dragonflies have very large eyes and very small antennae.



Insects can have adapted feet and legs. There are many different types of insect legs such as jumping, digging, running, and swimming. These adaptations help them survive in the environment that they live in.

Grasshoppers have long, strong hind legs that help them jump. This adaptation helps them get away from predators, and jump over tall grasses.

Insects can also have adapted mouthparts. This helps them eat their favorite foods better. There are chewing, sucking, lapping, and sponging mouthparts.



House flies have sponging mouthparts to slurp up food.

Wrap Up Questions:

What is an adaptation?

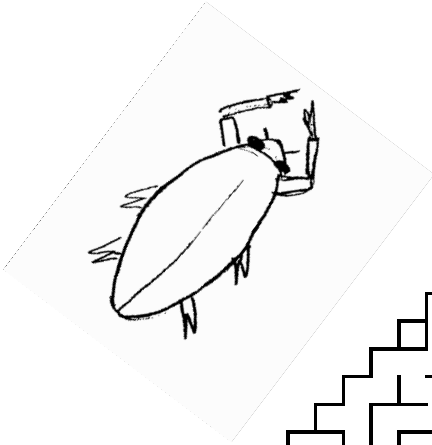
What are some ways insects can be adapted to their environment?

What would an insect's antennae and eyes look like if it only lived in dark caves?

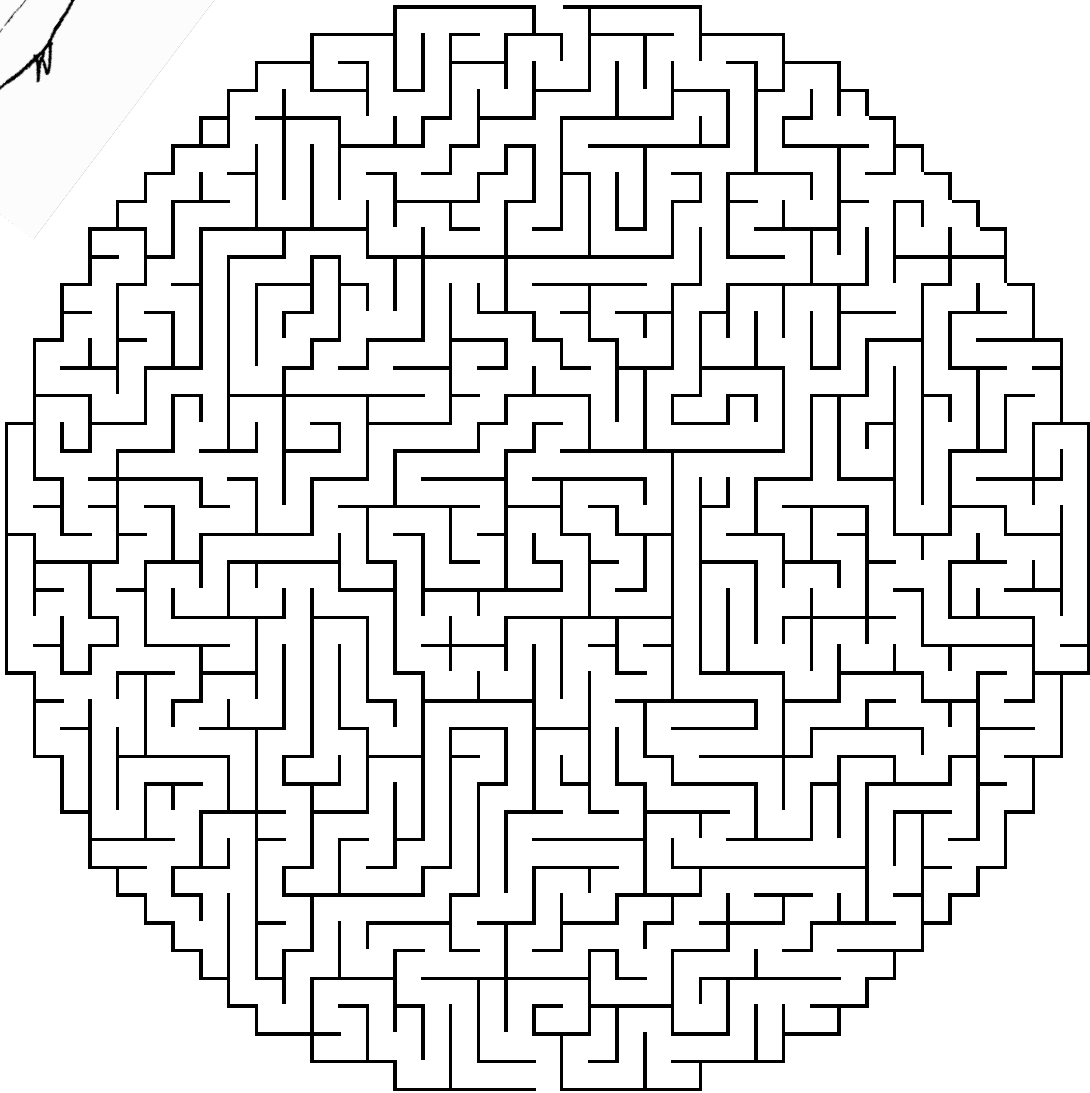
What type of adaptation would an insect that lived in trees have?

Activity 1: Maze

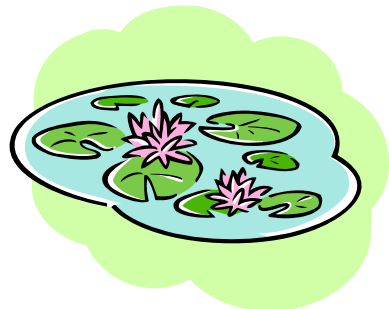
Wendel the Whirligig Beetle is adapted for living in the water. He has long hind legs for swimming and short front legs for grabbing food. Help Wendel find his way back to his pond.



Start



End



Lesson 2: Insect Mouthpart Adaptations

Questions to Ask Before Reading the Passage:

- Do insects have more than one type of mouth?
- What types of mouthparts do insects have?
- How do their mouthparts help them eat and survive?

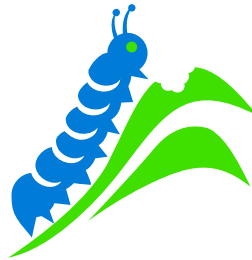
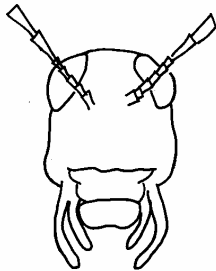
Glossary Terms

Diverse
Unique

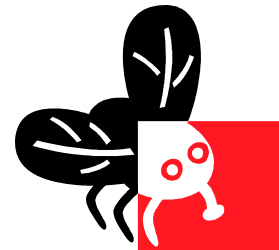
Reading Exercise:

Insects have many different types of mouthparts. Their mouthparts are adapted to help them eat their favorite foods. If all insects had the same mouthparts they would all eat the same things. Different mouthparts make insects **unique** and **diverse**. Each type of mouthpart has the same parts; they are just adapted to do different things!

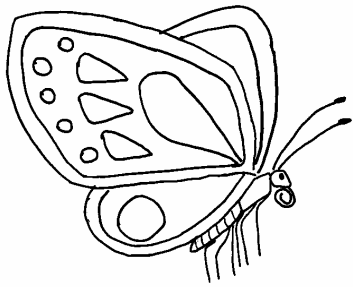
The most basic type of mouthpart an insect can have are called chewing mouthparts. Chewing mouthparts are found on insects that eat plants and sometimes other animals. Insects chew their food opposite of us. We chew up and down, and insects chew side to side! Cockroaches, grasshoppers, crickets, beetles, and caterpillars all have chewing mouthparts. You can tell if you have a chewing insect on your plants because you will have little holes eaten in the leaves!



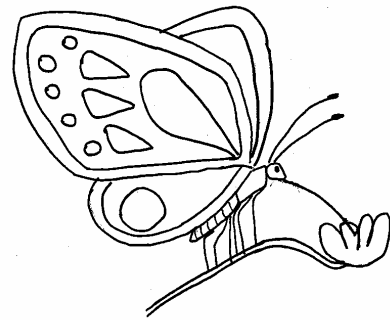
Some insects have sponging mouthparts. Their mouthparts are adapted to sponge up food. Houseflies have sponging mouthparts. They have nothing to chew, so they have to spit up on their food to dissolve it before they can sponge it up. So when a fly lands on your sandwich, don't eat that piece – it has fly throw up!



Insects that like to drink nectar from plants have lapping mouthparts. These mouthparts help them drink the sweet nectar from flowers. Lapping mouthparts have the same pieces that chewing mouthparts have, they are just put together differently. Lapping mouthparts are long, like a flexible straw, and can be stuck deep into flowers. Butterflies have lapping mouthparts. Butterfly mouthparts are so long that they keep them rolled up under their head until they are ready to eat.

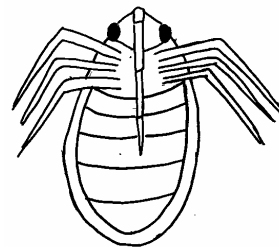
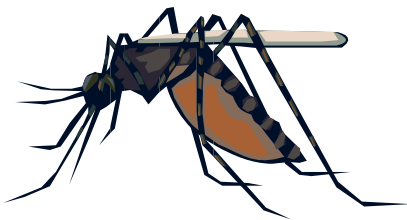


Butterfly with mouthparts rolled up under its head.



Butterfly with mouthparts extended, feeding on flower nectar.

Other insects have sucking mouthparts. Sucking mouthparts have the same parts as chewing mouthparts, they are just adapted for sucking the juices of plants or blood. Sucking mouthparts are made like a sword or straw. Insects stick their mouth into a plant and suck all the juices. Other insects stick their mouthparts into animals or other insects and suck blood. Mosquitoes have sucking mouthparts. Stink bugs also have sucking mouthparts. Mosquitoes suck blood, and stink bugs suck plant juice.



Wrap up Questions:

What are the different types of insect mouthparts?

Do the different type of insect mouthparts all have the same parts?

Name some insects with chewing mouthparts, lapping, sponging and sucking.

Activity 2: Insect Masks

Choose the insect mouthparts you would like to have: butterfly lapping mouthparts, or the chewing mouthparts of a cricket or grasshopper. Cut out the pieces of the mouth and paste them to complete your mask. Color the mask in whatever color you like.

Masks available online at:

<http://www.pbs.org/wnet/nature/alienempire/index.html>

PBS Alien Empire Educational Website

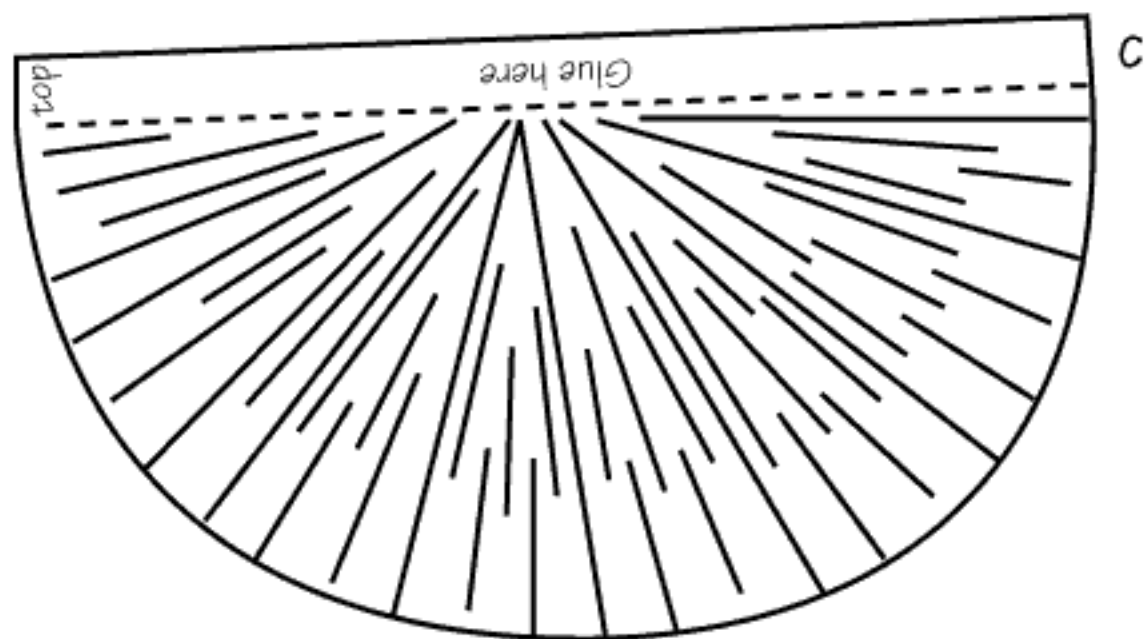
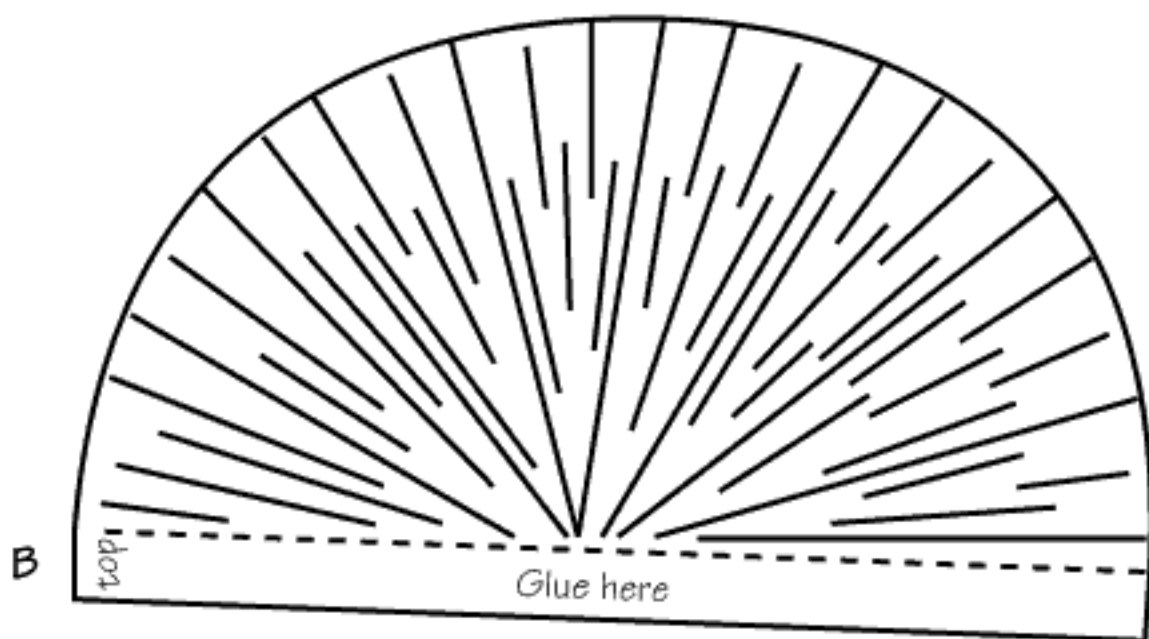


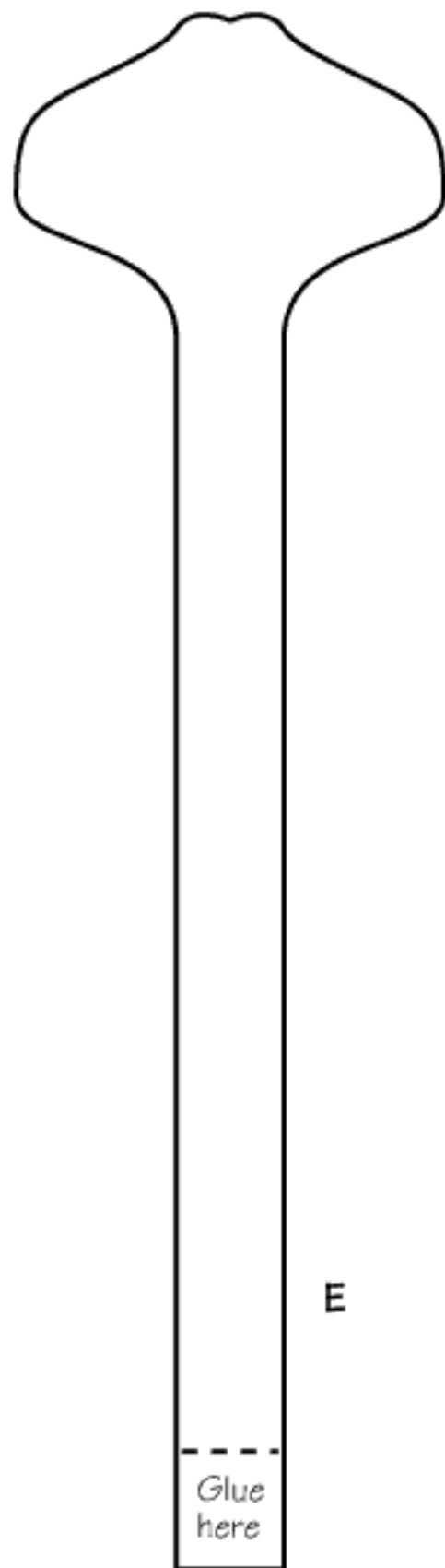
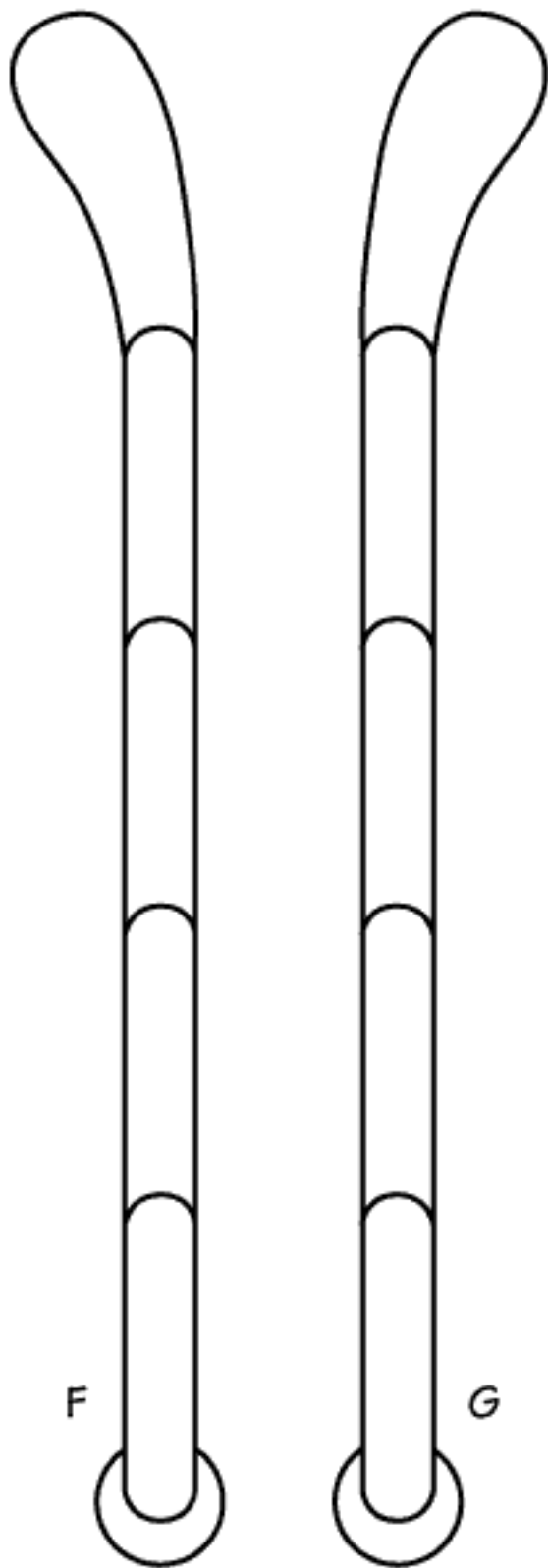
A

Glue here

Glue here

Glue here







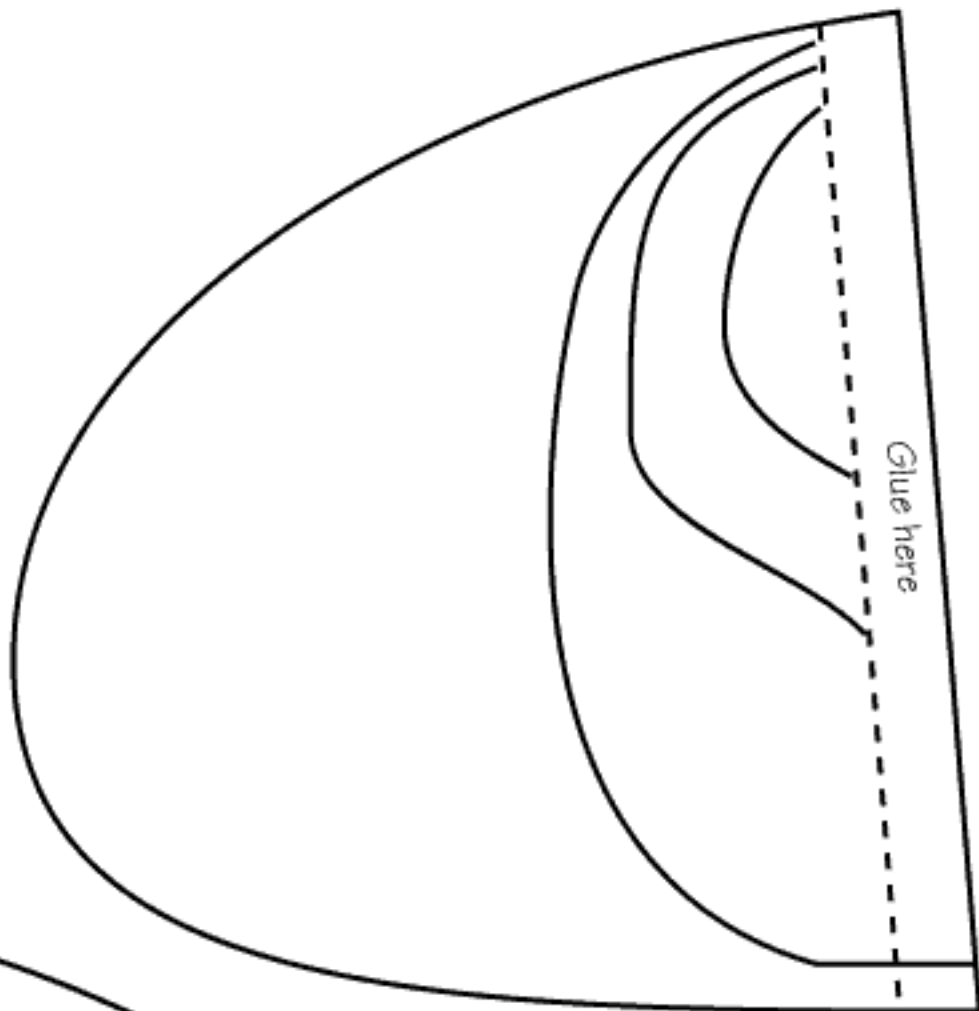
A

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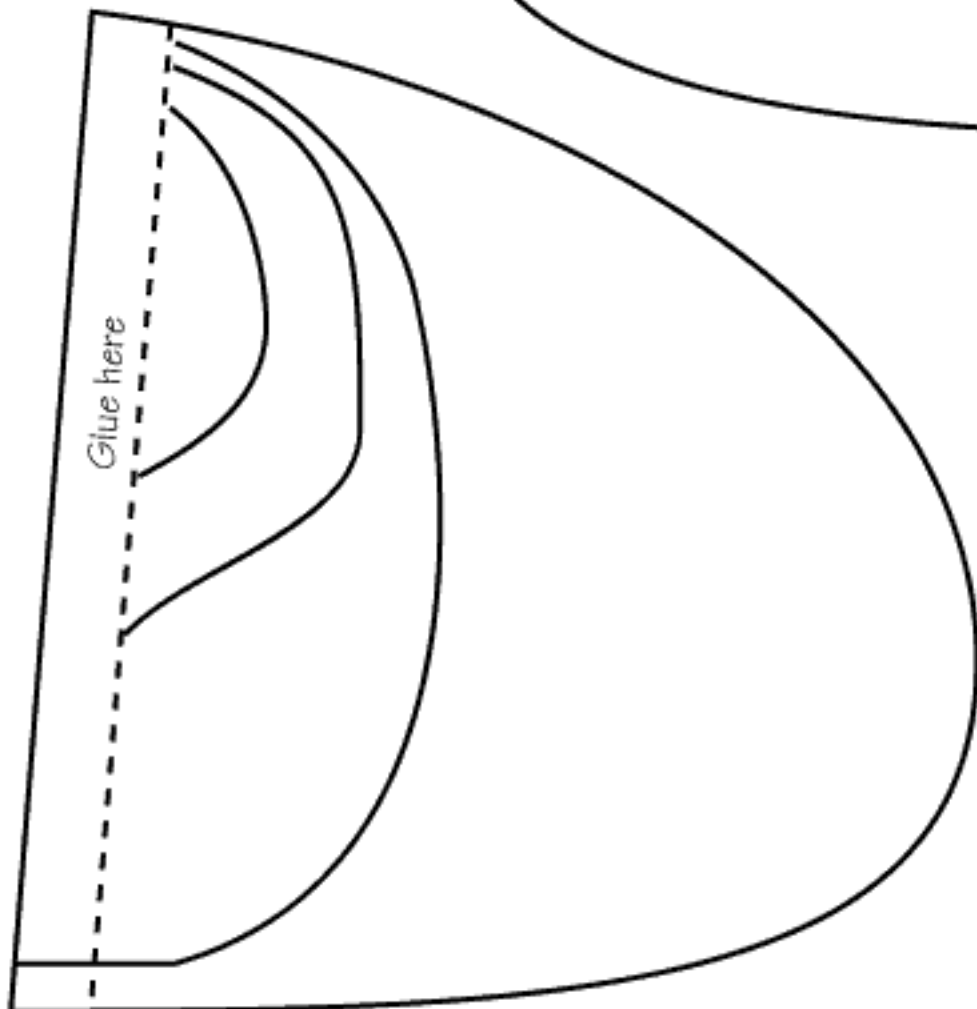
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B



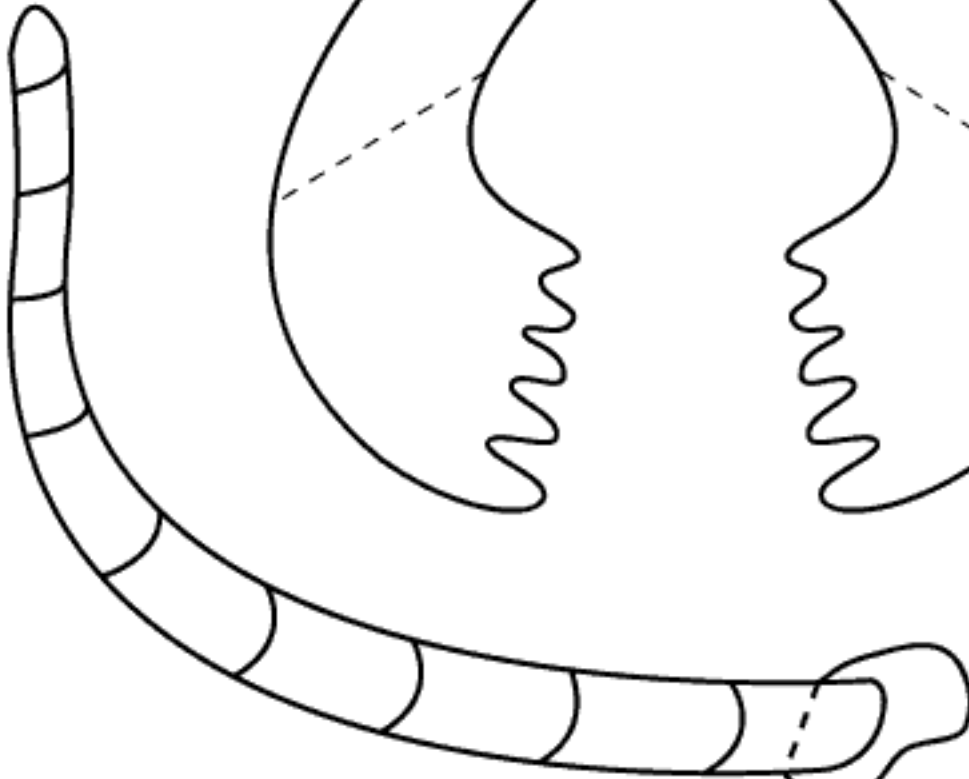
C



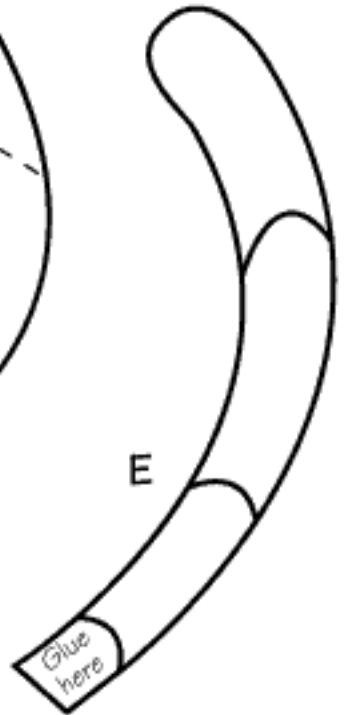


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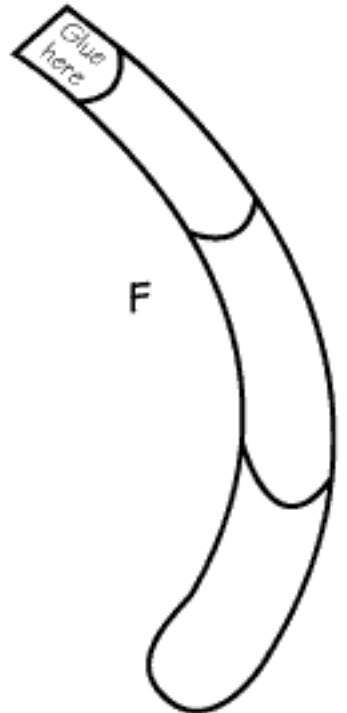
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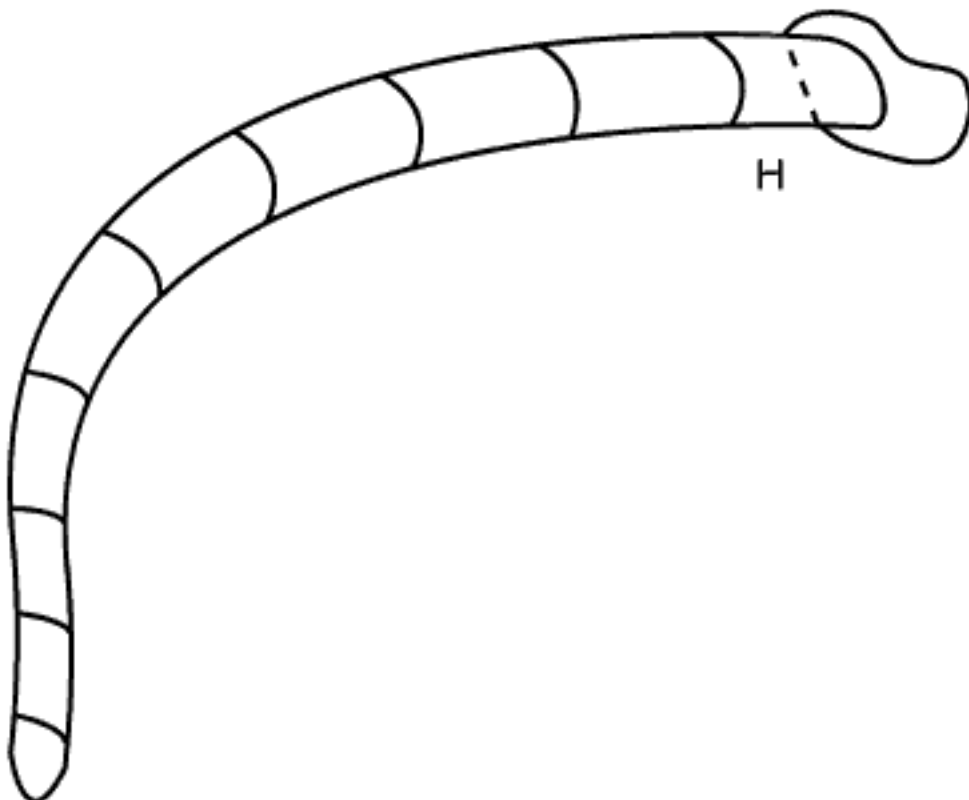
E



G



H



Cricket Mask
Page 3 of 3

Lesson 3: Insect Adaptations to Habitats

Glossary Terms

Aquatic
Host
Predators

Reading Exercise:

Insects live in many different habitats and environments. You can find insects living in nearly everywhere on Earth. Insects have six legs and they are adapted to help them move around their environment. There are many different types of legs that insects may have: running, walking, jumping, swimming, and digging.

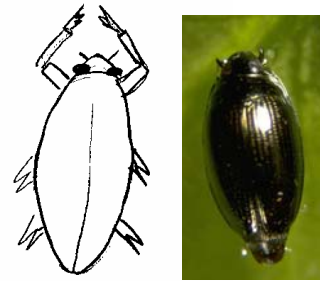
Insects that live in the water are called **aquatic**. Aquatic insects have legs adapted for swimming. Some aquatic insects have long legs that are used like oars to help the insect swim. Other insects have very short, fat legs that beat quickly for fast swimming. Some insects don't swim they walk on top of the water. These insects are very skinny and small and have long, thin legs that keep them on top of the water instead of falling through the water.



Giant Water Bugs have grasping front legs to catch prey. Their hind legs are long and strong for swimming. Their middle legs are small and help in swimming, but are not really needed because the hind legs do such a good job



Water Striders walk on water. Their legs are long and skinny. Their legs help balance out their weight so that they don't break through the water and drown



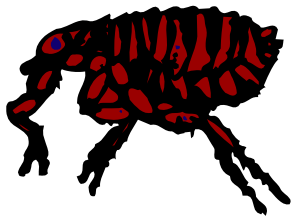
Whirligigs have long front legs that help them catch food. Their middle and hind legs are very short and fat, and beat very fast to help them swim quickly

Insects that need to run very fast usually have long, thin legs. Cockroaches have adapted long and thin legs to help them run away from **predators** quickly. If a cockroach is born with short legs, it will not be able to run fast, and you would have an easier time stepping on him!



Insects that need to jump high have long, strong hind legs. Grasshoppers and crickets live in fields with high grass. They need jumping legs to help them jump over the grass to get to food, shelter and water. Fleas also have very strong hind legs. If a flea was as big as you are, it would be able to jump up as high as one and a half football fields! Fleas are blood suckers and need a **host** for blood. Fleas are also very tiny and need strong hind legs so they can jump high to get on your dog for food!

Flea



Field Cricket

Some insects live underground. These insects have adapted legs for digging. Mole crickets live underground all the time and eat the roots of grasses. Mole crickets have adapted front legs for digging. Their front legs are shorter and are made like a shovel to help them make tunnels to travel in the soil.



Wrap Up Questions:

What are the different types of legs and insect can have?

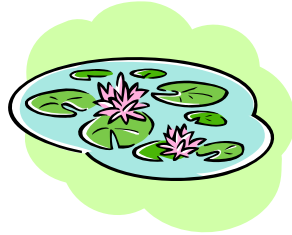
What type of legs would an insect have if it was an aquatic insect?

An insect with really strong grasping legs would use them do what?

Activity 3-1: Matching Legs to Habitats

Match the insect on the right to the habitat it would live in on the left.

Pond



Garden plants



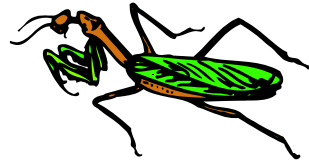
Grass field



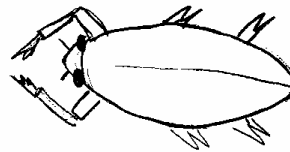
In Soil



Ground



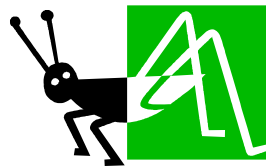
Strong grasping forelegs for catching insects on plants



Short and fat hind legs that beat quickly. Long forelegs for steering.



All six legs are long and thin.



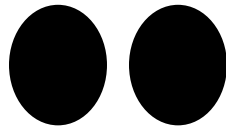
Long strong hind legs.



Short fore legs shaped like shovels.

Insect Eyes

(Do not have to cut out, can just draw onto insect.)



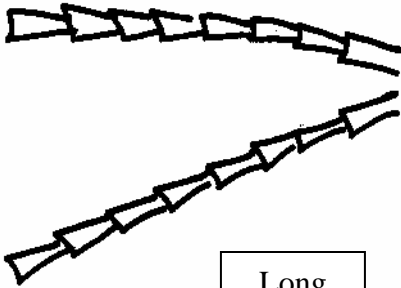
Large



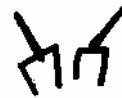
Small

Insect Antennae

(Do not have to cut out, can just draw on insect)

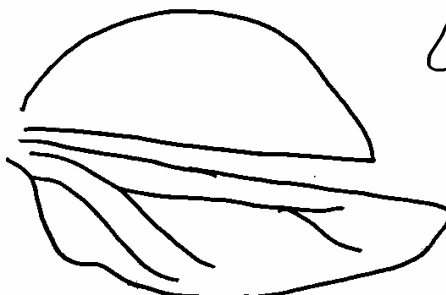
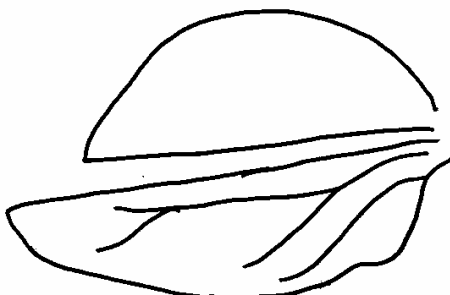
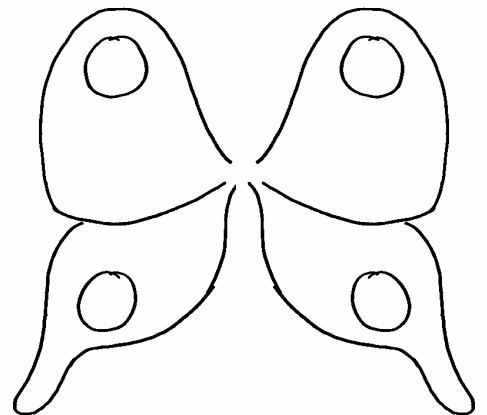


Long

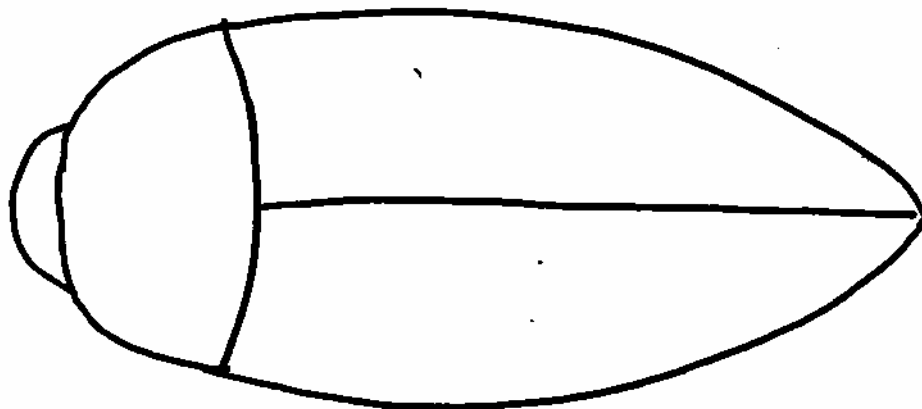
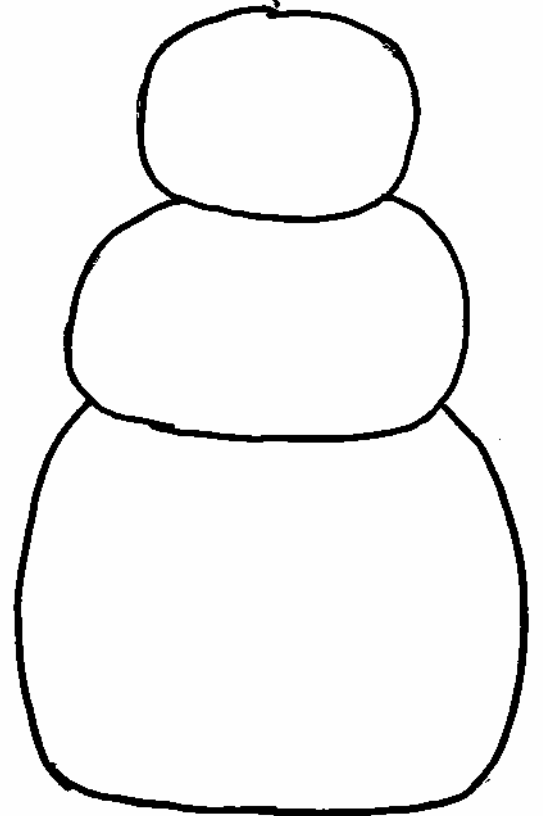
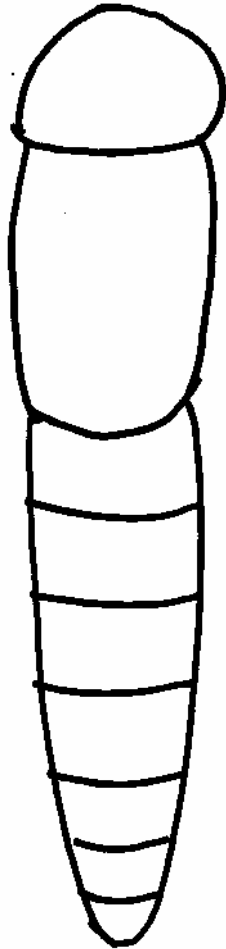
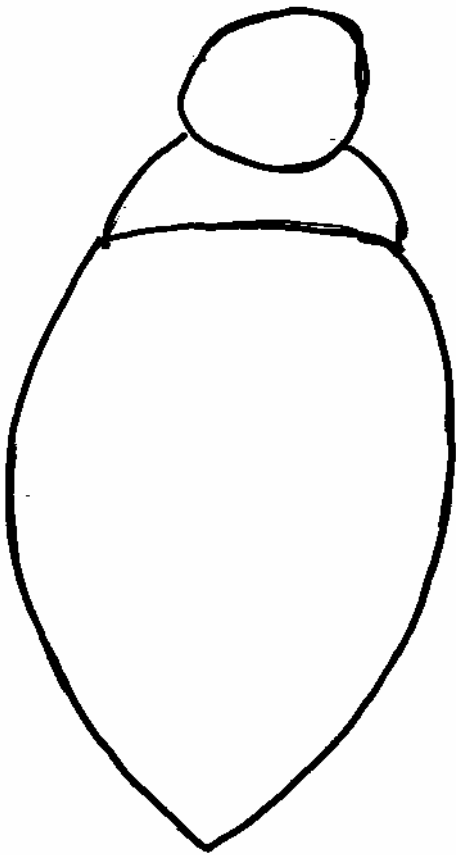


Short

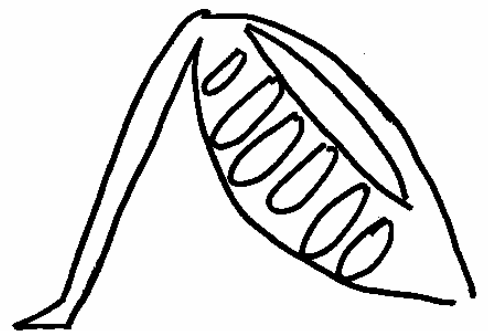
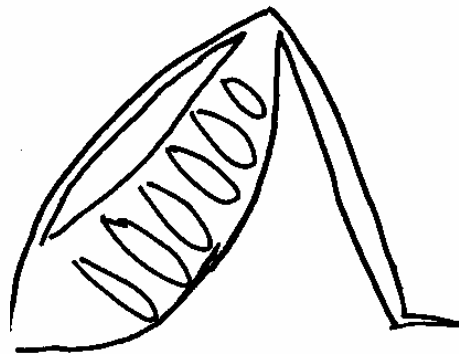
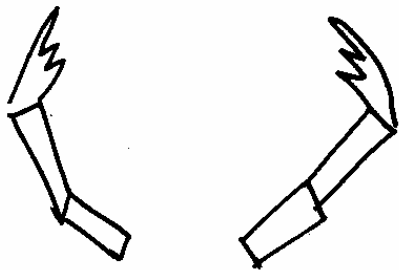
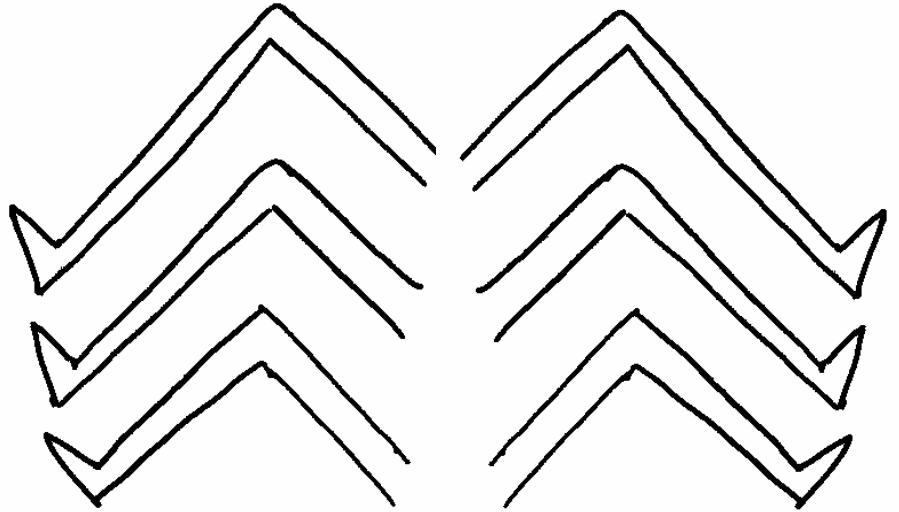
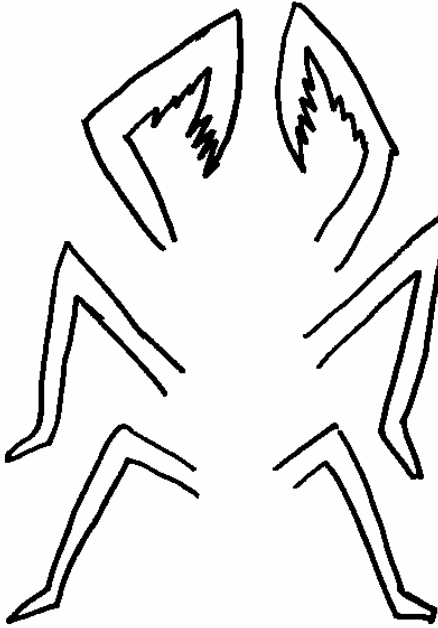
Insect Wings (not all insects have wings)



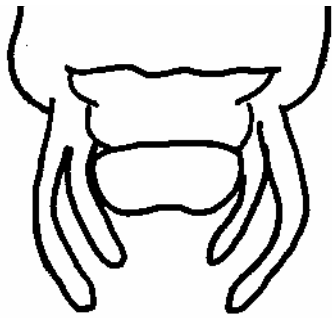
Insect Bodies



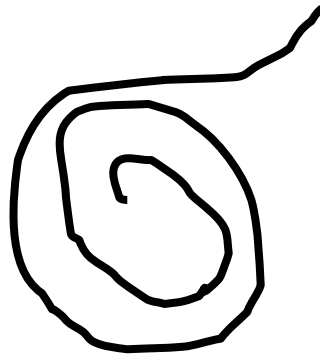
Insect Legs
(remember, insects have six legs)



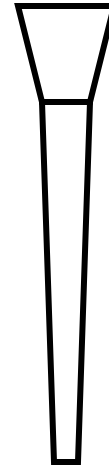
Insect Mouthparts



Chewing



Lapping



Piercing/Sucking

Lesson 4: Who Is Adapted to Their Environment?

Glossary Terms

Mimic

Naiad

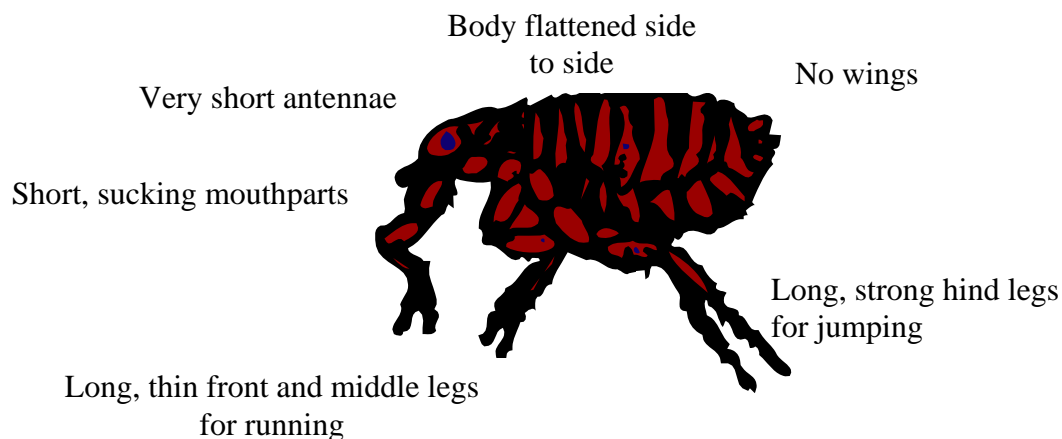
Predator

Reading Exercise:

We have talked about different ways insects may be adapted, such as having special legs and mouthparts. Many insects are completely adapted to their environment. Think of all the different kinds of insects in the world. They are all very different! They have to be different to survive in their special worlds.

Fleas are small insects that suck blood for food. Fleas have many adaptations to help them survive on other animals. An animal's body is a flea's habitat. Fleas have to be able to get onto an animal, so they have adapted long, strong hind legs to help them jump very high. Fleas also need ways to stay hidden once they are on the animal. They have adapted a body shape that is small and flattened side to side, just like a knife. This helps them run in between the hairs without getting caught. Fleas also have long, thin, front and middle legs for running quickly. To keep from getting stuck on hairs and fur, fleas do not have any wings and have very short antennae. They are very streamlined, just like an airplane! Fleas also have short sucking mouthparts to help drink blood. Your dog usually does not feel a flea biting them, because the mouthparts are so small.

Adaptations of a Flea

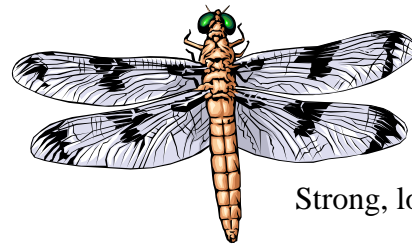
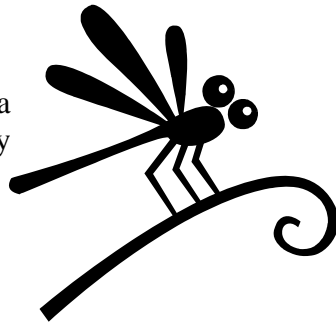


Dragonflies are insects that always live near water. They are **predators** and eat other insects. Dragonflies have adaptations as babies and adults. Dragonflies have to live near water because they lay their eggs in the water and their babies live in the water until they are ready to be adults. Dragonfly babies are called **naiads** (ny-ads). Naiads have adapted gills to help them live underwater. Dragonfly adults do not have gills because they do not need them in the air. Dragonfly adults have long, strong wings that beat fast to help them fly to catch food. They also have specially adapted legs that can catch food and hold it like a basket. Their legs are not needed for anything other than catching food because they use their wings to get around. Dragonflies have very large eyes and very small antennae. They need large eyes find their food!

Adaptations of a Dragonfly

Large eyes and short antennae

Grasping legs the make a basket for scooping prey



Strong, long wings

Dragonfly Naiad



Gills for breathing underwater

Dr. Bart Drees, Texas A&M
University

Butterflies are adapted for a life in the air and drinking nectar. Many butterflies are brightly colored to warn predators that they taste bad. Some butterflies **mimic** the colors of the bad tasting butterflies to trick predators. The Texas State Butterfly, the Monarch tastes bad to birds and lizards. Another butterfly called the Viceroy is adapted to mimic the Monarch so predators won't eat it!



Monarch Butterfly



Viceroy Butterfly

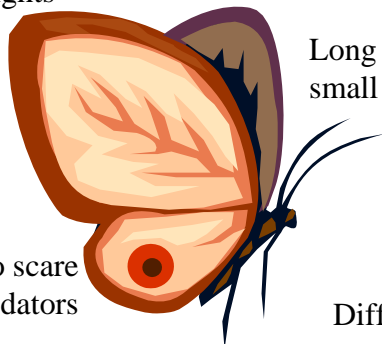
Butterfly wings are adapted for flying long distances. Their wings are very large, but they are not meant for flying very fast. Some butterflies have adapted spots on their wings to scare predators. When a predator sees the spots, they look like large eyes and make the predator think the butterfly is actually larger than it is!

Butterflies eat nectar from plants. They have adapted long mouthparts that can reach deep into flowers to drink nectar. Their mouthparts act like straws. Butterflies do not need large eyes to look for moving food, but they do need help to see predators. Instead of big eyes, butterflies have adapted long antennae and hairs on their body to feel for predators.

Butterfly adults and larvae eat different types of foods. This adaptation helps parents and children from fighting with each other for the same food! Butterfly adults eat nectar, and butterfly larvae chew on plants. They both have different mouthparts.

Adaptations of Butterflies

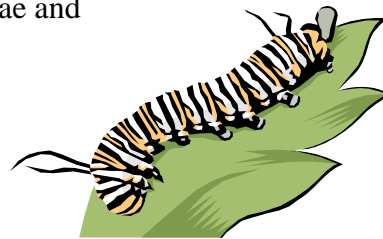
Four long wings
for long flights



Eye spots to scare
predators

Long antennae and
small eyes

Bright colors to warn
predators



Different mouthparts in adults and larvae

Wrap Up Questions:

Name three adaptations of fleas that help them survive.

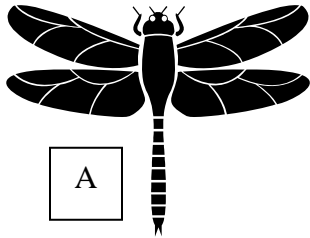
Name three adaptations of dragonflies that help them survive.

Name three adaptations of butterflies that help them survive.

What is a mimic?

Activity 4-1: Adaptation Matching Game

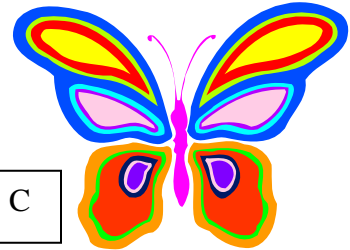
Match the following insects (A,B,C) to the adaptations they have that make them unique in the box on the left. Next, match the reason for the adaptation to the adaptation.



A



B



C

| Insect A, B, or C | Reason (#) |
|---|---|
| <input type="checkbox"/> & <input type="checkbox"/> Very short antennae | <input type="checkbox"/> & <input type="checkbox"/> |
| <input type="checkbox"/> Very long antennae | <input type="checkbox"/> |
| <input type="checkbox"/> Body flattened side to side | <input type="checkbox"/> |
| <input type="checkbox"/> Grasping legs like a basket | <input type="checkbox"/> |
| <input type="checkbox"/> No wings | <input type="checkbox"/> |
| <input type="checkbox"/> Long, strong wings | <input type="checkbox"/> |
| <input type="checkbox"/> Naiads have gills | <input type="checkbox"/> |
| <input type="checkbox"/> Very large eyes | <input type="checkbox"/> |
| <input type="checkbox"/> Four large wings | <input type="checkbox"/> |
| <input type="checkbox"/> Long, strong hind legs | <input type="checkbox"/> |
| <input type="checkbox"/> Small eyes | <input type="checkbox"/> |
| <input type="checkbox"/> Different mouthparts as adults and larvae | <input type="checkbox"/> |
| <input type="checkbox"/> Short sucking mouthparts | <input type="checkbox"/> |
| <input type="checkbox"/> Eye spots on wings | <input type="checkbox"/> |
| <input type="checkbox"/> Long, thin front and middle legs | <input type="checkbox"/> |
| <input type="checkbox"/> Bright colors | <input type="checkbox"/> |
| <input type="checkbox"/> Very long, straw-like mouthparts | <input type="checkbox"/> |

| Reason For Adaptations |
|--|
| 1- Don't need long antennae because have large eyes |
| 2- So that adults and larvae don't fight for food |
| 3- To help feel for predators |
| 4- To breathe underwater |
| 5- To help get deep into flowers for nectar |
| 6- To jump high to get on food |
| 7- Don't need large eyes because have long antennae |
| 8- To help fit between hairs |
| 9- To grab and scoop food during flight |
| 10- Would get in the way when running between hairs |
| 11- To fly quickly to grab food |
| 12- To see well to spot food |
| 13- To scare predators |
| 14- To warn predators that they taste bad |
| 15- For fast running |
| 16- To help drink blood without being felt |
| 17- Antennae would get in the way when running through fur |
| 18- To fly long distances |

Activity 4-2: Adaptation Word Search

N S E L J X L R Y W U C Q C H D I I I C N G I G E
 C O T G N I P P A L Y Q Z I A A C Y V F K M D N N
 U I I R L N Z O I B S O D M E I U O C M B U M I V
 G D T T A A Y S M X M O T I L A C K Y T L F T W I
 Z H J A A P G G N I Y L F M F N Y L A S X S V E R
 F E I T U T H E I E N C B T Z L F N E N S L E H O
 J D J D O Q P T P E H E K C F N T Y C C S W R C N
 X C A E N U A A U I H K E R O E E I T Q U J F S M
 G Z Q H N O E Y D O V Y E G N A P O B X J G B A E
 W I L L K X Q H Q A M T A N W V S R F W Q X O Q N
 C S C L N V O Y T K T R A A O A O C G C H K B Q T
 Z L U A G S A J E U D E H Q D Z N E O S D A Y V V
 W I N G S Y P B B B R G T J A U R J T I S M G R K
 M C R W C W C V R T L Y G O U Z L G K Y M Y C Z N
 W L P U T C I Z G J K K M N H P L T H J Q T J R K
 P N E C F V B D E A N D I E L L R V R K T Y N M A
 Q B F V Q L N D I Q H B A C G H J I Z U Y U J V K
 W A S J N O T F L S W W W A T V Z X R P E B B V M
 K K G L P A U D N S A E A L X Q E J T K Z R J W E
 Q L E X T O J X T J B M D R A Y R J D I L U J P Y
 V V L I S E R Y R T W X G Q T N F U E R M P I O Z
 X D B G P I C W V Z L G T D J S S B J P L O R L Q
 Y A V I K P F I C N Q Q P C U W G L I C D Y Z D J
 H L F E K H X S D J I U B F W B V N L W J L H P N
 B O V G Y R C P G R A S P I N G G T H U G S Q C N

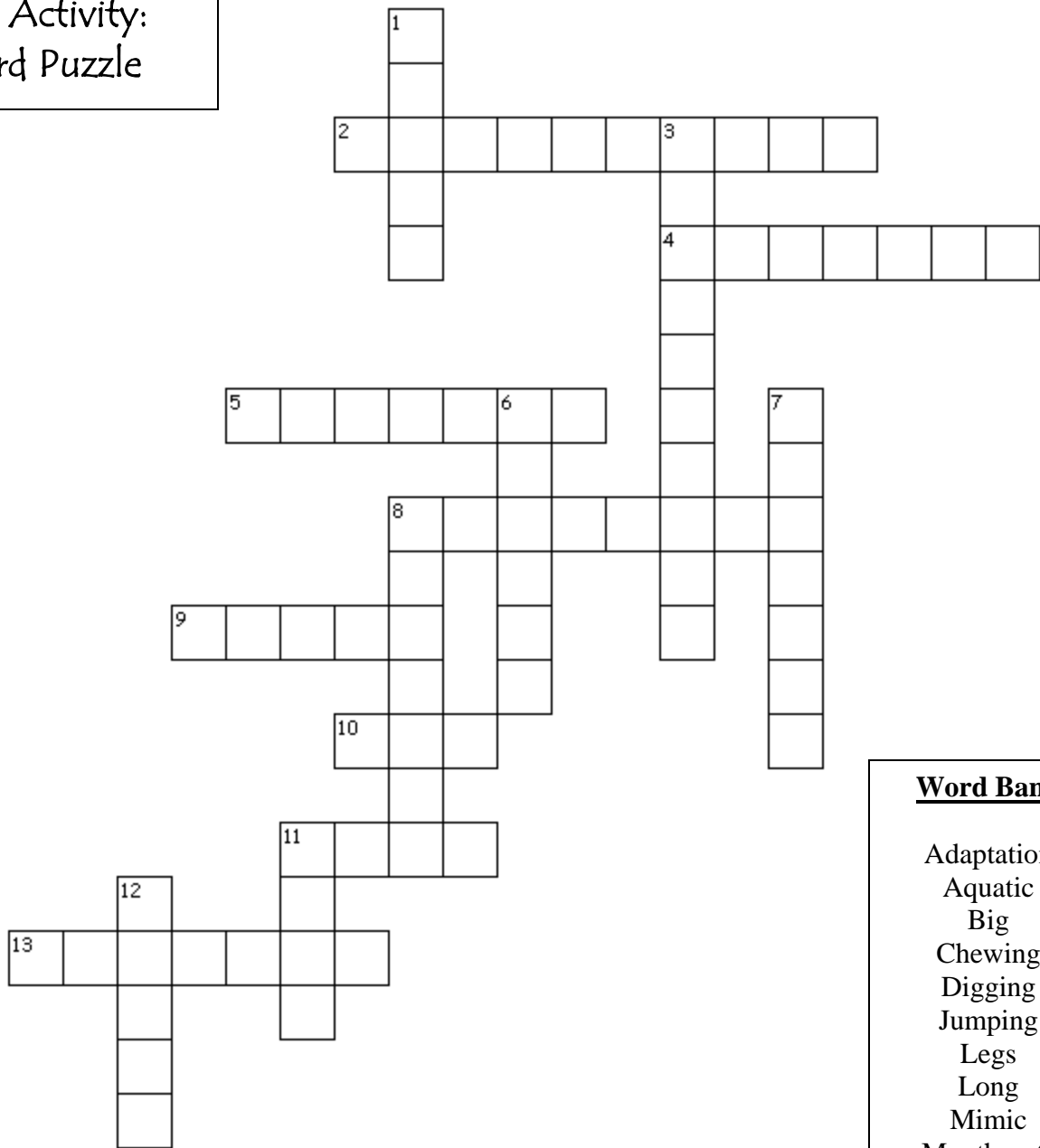
Word Search

ADAPTATION
 ADULT
 ANTENNAE
 AQUATIC
 BUTTERFLY
 CHEWING
 DRAGONFLY

ENVIRONMENT
 EYES
 FLEA
 FLYING
 GRASPING
 HABITAT
 JUMPING

LAPPING
 LEGS
 MIMIC
 MOUTHPARTS
 NAIAD
 STRAW
 WINGS

Wrap Up Activity: Crossword Puzzle



Word Bank

Adaptation
Aquatic
Big
Chewing
Digging
Jumping
Legs
Long
Mimic
Mouthparts
Naiads
Short
Small
Swimming
Sucking

Across

2. Insects have different _____ to help them eat their favorite foods
4. Insects that are _____ live in water and have swimming legs
5. Insects with _____ mouthparts can make holes in your plants when they eat
8. Aquatic insects have _____ legs
9. Look like something else
10. Insects with _____ eyes usually have short antennae
11. Insects have different types of _____ to help them move around in their environment
13. Insects with long strong back legs use them for _____.

Down

1. Insects with _____ antennae usually have big eyes
3. To change your body or behavior to fit into your environment
6. Immatures that live in water
7. _____ legs are used by mole crickets to move around underground
8. _____ mouthparts are used to drink blood or juice from plants
11. Insects with _____ antennae usually have small eyes
12. Insects with _____ eyes usually have long antennae

Glossary

Adaptation/Adapted (Lesson 1, 2, 3, 4) – adjustments an insect makes in its behavior or body to help it survive in its environment

Aquatic (Lesson 3) – living in water

Camouflage (Lesson 1) – disguises to help blend into the environment

Diverse (Lesson 2) – varieties or differences

Environment (Lesson 1) – surroundings or habitat

Host (Lesson 3) – a living animal where a parasite can live or get food from.

Mimic (Lesson 4) – to copy or look like something else

Naiad (Lesson 4) – the immature form of an aquatic insect

Predator (Lesson 3, 4) – An animal that eats other animals. A carnivore.

Unique (Lesson 2) – different, not like anything else

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