A Teacher's Guide to **Fur, Feathers, and Scales**
Grades 3–6

Description: Why do animals have fur, feathers, or scales? Learn about the importance of animal coverings and discover some of the differences between mammals, birds, and reptiles.

Outcomes: Students will understand that animals need different coverings to help them to survive in different environments. Students will compare and contrast the fur, feathers, and scales of mammals, birds, and reptiles.

Suggested Activities Before Your Outreach:

Vocabulary

Mammal
Reptile
Bird
Taxonomy
Biodiversity
Warm-blooded
Cold-blooded

- Create a K-W-L chart about the different classifications of animals and fill in what the students already know about birds, mammals, reptiles, etc. and what they want to know. Leave the "What We Learned…" column blank and have students fill in new information after the outreach or discovery lesson. Discuss the words "mammal," "bird," and "reptile."
- Try a biodiversity activity. Give each student a sheet of paper with the instructions to draw the animal you describe. Then, give the students the features of a group of animals. For example, ask them to draw an animal with hair or an animal with feathers. Ask them to draw a warm-blooded animal or one without teeth. For general information on characteristics of animals, check out the Animal Diversity Web from the University of Michigan Museum of Zoology at http://animaldiversity.ummz.umich.edu. Then, have each student share their drawing. Even though each animal shares a characteristic, do all the animals look exactly the same? Would all these animals live in the same place? Discuss the many different types of animals on this planet.

Suggested Activities After Your Outreach:

Classroom Activities:

- Discuss the lesson with your students. What new ideas or information did they learn? Was anything confusing? What did they like best? Fill in the final column of the K-W-L chart.
- Learn all about the feathery inhabitants of our planet in a "Bird-Brained Internet Quest." Allow your students to explore the world of birds using classroom resources. See the attached **Fur, Feathers, and Scales Activity: Internet Quest**.
- Create the attached **Animal Classification Flip Boxes**. Play this game in small groups. (Each student may play independently or students may play in teams.) One player rolls both flip boxes. One box displays a classification of animals and the other gives the players directions. The players must then follow the directions on the second die and name either a defense or habitat of, a fact about, or an example of an animal from the classification rolled on the first die. If the team can successfully respond, they receive one point and must pass the flip boxes to the next team/player. The next team must try the same thing, and play continues. If a group

cannot correctly respond, they may pass. The other team then has a chance to steal the point by following the directions on the dice. If the second team cannot, the flip boxes are rolled again and play resumes with neither team collecting any points. The first group to receive 15 points wins. Another fun version is students vs. the teacher. The rules are the same, but the whole class pools its animal knowledge to try to stump the teacher!

Homework Assignments:

- For a challenging assignment about classification of animals, try the attached **Fur, Feathers, and Scales Activity: Taxonomy Scramble**.

Interdisciplinary Activities:

- As a class, discuss how body coverings help different animals to survive. What factors lead to a successful covering? Talk about when and where being warm-blooded or cold-blooded might be helpful or harmful to an animal. Create an animal that is well adapted to a particular habitat. Discuss as a class how different animals survive in different environments. Choose a habitat and create an animal with adaptations (like body coverings and body temperature regulation) that allow it to successfully meet all its needs in that habitat. Write a description of the animal highlighting its adaptations and draw an illustration. Write a story about a typical day in the life of your animal.

Writing/Drawing Prompts:

- Think about global climate change. Which classifications of animals do you think will be most affected by a change in the overall climate of the planet?
- Why is biodiversity important?

Class Project Ideas:

- Write a children's book on animal coverings. Students may choose to work on these projects alone or in small groups. Each individual or group should choose a classification: mammal, bird, reptile, amphibian, fish, etc. Give students examples of books that illustrate nonfiction for young students. There is a list of great examples that you can browse by age level from the National Science Teachers Association at http://www.nsta.org/recommends. Set educational goals for each book. For example, you may want the young readers of the books to learn that all birds hatch from eggs or that lizards are not amphibians or that mammals can be big or small. Create the books and peer edit. Finally, choose a day for a read-aloud session with a younger class. Did you meet your educational goals?

Resources for Students

- *Reptile* (DK Eyewitness Books), Colin McCarthy
- Mammal (DK Eyewitness Books), Steve Parker
- *Bird* (DK Eyewitness Books), David Burnie
- Examine infrared images of cold-blooded and warm-blooded animals. Click on the Infrared Zoo under Infrared Light Lessons at CoolCosmos.com: http://coolcosmos.ipac.caltech.edu/
- Check out Dragonfly TV for a look at how two kids just like you investigate the grooming habits of one furry mammal, the otter: http://pbskids.org/dragonflytv/show/otters.html
- Test your knowledge of how animals use their coverings to help them survive cold winters at eNature.com: http://www.enature.com/ Search for the Winter Wildlife Quiz.

Additional Resources for Educators

- For a searchable database of information on animals with all different kinds of coverings, check out the University of Michigan Museum of Zoology's "Animal Diversity Web" at http://animaldiversity.ummz.umich.edu. You can even search general information on the classes of animals.
- For information on scaly animals, search the reptile database at http://www.reptile-database.org
- *Janice Van Cleave's Animals: Mind-Boggling Experiments You Can Turn into Science Fair Projects*, Janice Van Cleave (general animal resource)
- *How Nature Works (How It Works)*, David Burnie (general animal resource)
- *A Dictionary of Nature: 2,000 Key Words Arranged Thematically*, David Burnie (general animal resource)
- *Last Child in the Woods*, Richard Louv. This is a wonderful book for any educator who wants to bring nature back into the classroom.

Pennsylvania Academic Standards in Environment and Ecology

- 4.1

Pennsylvania Academic Standards in Science and Technology

- 3.1.A, 3.1.C

New Jersey Core Curriculum Content Standards

- 5.1, 5.3

Fur, Feathers, and Scales Activity: Internet Quest

Give each student a copy of the attached Bird-Brained Internet Quest. Allow them to explore classroom resources to find the answers. Encourage them to use all available resources (books, magazines, Internet resources, etc.) There are a few distinctive resources listed in the Additional Resources for Educators section of this guide.

Answer Sheet:

1. What does warm-blooded mean? Warm-blooded means that the animal's internal body temperature is basically constant. If it's cold or hot outside, the animal stays the same temperature inside.

2. Name an animal that lays eggs but is not a bird. Answers vary. Ex.: frog, platypus
Name one characteristic of that animal that proves it is not a bird.
Answers vary. Ex.: Shells of frogs aren't hard, and the platypus has hair.

3. Name a bird that has feathers that help to camouflage. Answers vary. Ex.: Great-horned owl
Where in the world does that bird live? Answers vary. Great-horned owls live in many habitats, from the Arctic tundra to temperate forests to tropical rainforests, deserts, the Andes mountains, suburbs, and cities all across North, Central, and South America.

4. Name a bird with brightly colored feathers. Answers vary. Ex.: Blue and Gold Macaw
Where in the world does that bird live? Answers vary. Ex.: Blue and Gold Macaws live in northern South America lowland forests, preferring humid primary forest areas.

5. Our bones are not hollow like some bird bones. What is inside our bones? Our bones have several very dense layers. We have an outer layer called the periosteum. Under that we have a layer of compact bone and, finally, many of our bones have jelly-like marrow at the center. Many bird bones instead have an inside layer that, while strong, is basically hollow with supports.

6. Name a bird that does not fly. Answers vary. Ex.: penguin
Where in the world does that bird live? Answers vary. Ex.: Different species of penguins live in many areas in the Southern Hemisphere, including Antarctica, the Galapagos Islands, and South Africa.

7. Which bird is the fastest flyer? Peregrine Falcon
What does that bird eat? Peregrine falcons are carnivores eating almost exclusively birds, including game birds, shorebirds, doves/pigeons, ducks, and songbirds; occasionally they eat mammals or insects. Most prey are 1 pound or less, but birds the size of geese (3–13 pounds) have been killed by this amazing predator. They have been clocked at more than 200 mph during a dive!

8. Name a bird that does not build a nest for its eggs. Answers vary. Ex.: Emperor Penguin, Whip-poor-will
Where does that bird lay its eggs? Answers vary. Ex.: Emperor Penguins carry their eggs on their feet. Whip-poor-wills lay their eggs right on the ground**.**

9. How might imitating other animals help a parrot to survive in the wild? Imitating other animals in the wild helps some parrots stay safe. If they can sound like different animals, hopefully they can

confuse a predator and not get eaten!

THE ACADEMY
OF NATURAL SCIENCES
of DREXEL UNIVERSITY

Bird-Brained Internet Quest

Name: _____ Date: _____

What are birds?

Birds are animals that have feathers and wings, lay hard-shelled eggs, and are warm blooded.

1. What does warm-blooded mean?

_____

_____

2. Name an animal that lays eggs but is not a bird. _____

Name one characteristic of that animal that proves it is not a bird.

_____

_____

Why do birds have feathers?

Birds have feathers for many different reasons. Some birds use their feathers to fly while others use their feathers like a raincoat to keep them dry in the water. Some birds use brown and black feathers to camouflage and stay safe. Others might use bright red, yellow, green, and blue feathers to attract a mate.

3. Name a bird that has feathers that help to camouflage. _____

Where in the world does that bird live? _____

4. Name a bird with brightly colored feathers. _____

Where in the world does that bird live? _____

How do birds fly?

Birds' bodies make it possible for birds to fly. Their ability to fly is affected by everything from the shape of their wings and the way their lungs pull oxygen while they're flying to their hollow, light bones. Some birds spend more time catching the breeze and gliding through the air like the eagle or the vulture. Others flap their wings more often—some of the smallest hummingbirds which can beat their wings between 70 to 80 times a second! Some birds even fly without making any noise. Owls can sneak up on their food because they can fly silently.

5. Our bones are not hollow like some bird bones. What is inside our bones?

_____

Continued on back!

Do all birds fly?

No. Even though all birds have wings covered in feathers, not all birds fly. Some birds run and others swim.

6. Name a bird that does not fly. _____

Where in the world does that bird live? _____

How fast are birds?

Birds can fly at many different speeds, for different lengths of time, and at different heights. Some birds are very fast—the fastest bird in the air can reach speeds of nearly 200 mph! Really speedy penguins can swim about 10 mph, and ostriches can run about 40 mph. Some birds are more amazing when they're not moving forward at all. Hummingbirds can actually hover, or stay in the air while flapping their wings without moving forward.

7. Which bird is the fastest flyer? _____

What does that bird eat? _____

Why do birds build nests? How do they build nests?

Birds use nests when they lay their eggs and take care of their young. Some birds, like the cardinal, will use sticks, leaves and grasses to make their nests in bushes and trees. Other birds like the duck will build their nests on the ground using their own feathers. Some birds don't build a nest at all, and others will use nests built by other birds.

8. Name a bird that does not build a nest for its eggs. _____

Where does that bird lay its eggs? _____

Why do birds sing?

Birds sing to talk to each other. Some birds sing to attract a mate while others sing to warn other birds of a predator. Moluccan cockatoos scream very loudly at the beginning and the end of the day. Scientists think they call so loudly to make sure the whole flock is safe and sound. Some birds can "talk" too. Parrots and crows can imitate other animals. In the rainforest, parrots can make noises like other birds and bats, but when parrots are in people's homes, they learn to imitate human speech!

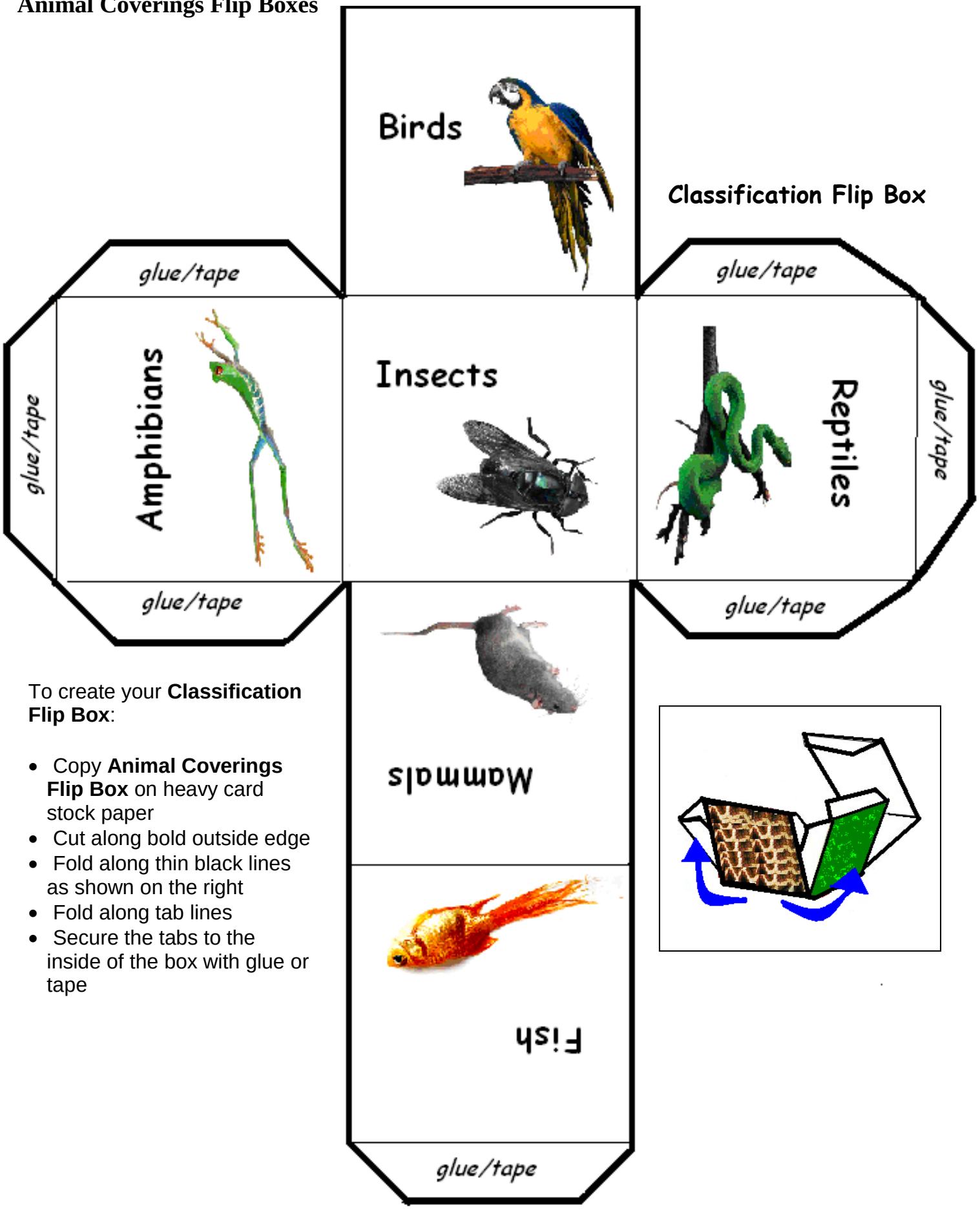
9. How might imitating other animals help a parrot to survive in the wild?

_____

_____

Fur, Feathers, and Scales Activity:
Animal Coverings Flip Boxes

THE ACADEMY
OF NATURAL SCIENCES
of DREXEL UNIVERSITY



To create your **Classification Flip Box**:

- Copy **Animal Coverings Flip Box** on heavy card stock paper
- Cut along bold outside edge
- Fold along thin black lines as shown on the right
- Fold along tab lines
- Secure the tabs to the inside of the box with glue or tape

THE ACADEMY
OF NATURAL SCIENCES
of DREXEL UNIVERSITY

Classification Flip Box 2

Name a predator that fits into this classification...

PREDATOR

glue/tape

glue/tape

Name a habitat of an animal that fits into this classification...

HABITAT

glue/tape

glue/tape

Name a fact about this classification of animals...

FACT

Name a prey animal that fits into this classification...

PREY

glue/tape

glue/tape

FACT

Name a fact about this classification of animals...

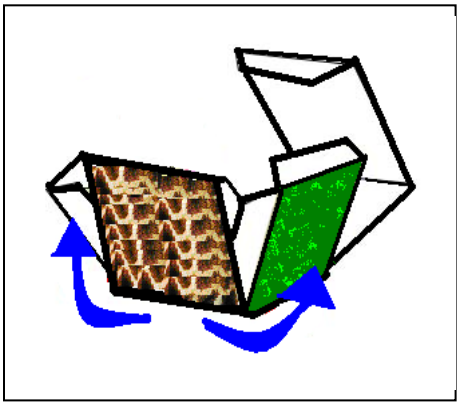
DEFENSE

Name a defense of an animal that fits into this classification...

glue/tape

To create your **Classification Flip Box**:

- Copy **Animal Coverings Flip Box** on heavy card stock paper
- Cut along bold outside edge
- Fold along thin black lines as shown on the right
- Fold along tab lines
- Secure the tabs to the inside of the box with glue or tape



Fur, Feathers, and Scales Activity: Taxonomy Scramble

Give each student a copy of the attached Taxonomy Scramble.
If necessary, allow them to explore classroom resources to find the answers. Information on taxonomy to share with your students can be found at The University of Michigan Museum of Zoology's Animal Diversity Web at http://animaldiversity.ummz.umich.edu.

Answer Sheet:

1. Animal 1 Common Name: Ostrich

2. Animal 2 Common Name: Tiger

3. Animal 3 Common Name: Bumble Bee

4. Animal 4 Common Name: Hermit Crab

5. Which of these animals are vertebrates (animals with a backbone)?
   Animal 1 (Ostrich) and Animal 2 (Tiger)
   How do you know? Which of the classifications (Kingdom, Phylum, Class, Order, Family, Genus, Species) help to figure it out?
   Both of the animals are in the Phylum Chordata which includes all animals with backbones.

6. Which animal is most closely related to Animal 3? Animal 4 (Hermit Crab)
   How do you know? Which of the classifications help to figure it out?
   All of the animals are in the same Kingdom (Animalia), but only the hermit crab shares the Phylum Arthropoda with the bumble bee.

7. Which animal is most closely related to you (*Homo sapiens*)? Animal 2 (Tiger)
   How do you know? Which of the classifications help to figure it out?
   Humans are in the same Kingdom (Animalia) as all four mystery animals, but we are most closely related to the tiger because we are in the same Kingdom, Phylum (Chordata), and Class (Mammalia).

Homo sapiens Taxonomy:
Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primates
Family: Hominidae
Genus: Homo
Species: *Homo sapiens*

THE ACADEMY
OF NATURAL SCIENCES
of DREXEL UNIVERSITY

Name: _____ Date: _____

Is a spider an animal? How closely related are dolphins and fish? Which animals have bones? These and many other questions about animals can be answered by looking at taxonomy. Taxonomy is most simply classification. There are many ways to classify animals.

One method of classification is placing individual animals in groups with animals with similar characteristics. These groups start really big with many animals and get smaller and more specific until the groups include only individual types of animals.

The kind of taxonomic system you will use for the following scrambles places animals into the following groups: Kingdom, Phylum, Class, Order, Family, Genus, and Species. Kingdom is the largest group, and species include only one type of animal.

Look at the taxonomic groups of the following animals. Unscramble the letters on "pawprint" spaces from the groups to find the common name of each animal.

1.

A	N	I	M	A	L	I	A

Kingdom

C	H	O	R	D	A	T	A

Phylum

A	V	E	S

Class

Hint:
Animals in Class Aves are "birds of a feather."

S	T	R	U	T	H	I	O	N	I	F	O	R	M	E	S

Order

S	T	R	U	T	H	I	O	N	I	D	A	E

Family

S	T	R	U	T	H	I	O

Genus

S	T	R	U	T	H	I	O

Species

C	A	M	E	L	U	S

Animal 1 Common Name: _____

2.

A	N	I	M	A	L	I	A

Kingdom

C	H	O	R	D	A	T	A

Phylum

M	A	M	M	A	L	I	A

Class

C	A	R	N	I	V	O	R	A

Order

F	E	L	I	D	A	E

Family

P	A	N	T	E	R	A

Genus

P	A	N	T	E	R	A

T	I	G	R	I	S

Species

Hint:
Animals in Order
Carnivora
never eat their
vegetables.

Animal 2 Common Name: _____

3.

A	N	I	M	A	L	I	A

Kingdom

A	R	T	H	R	O	P	O	D	A

Phylum

I	N	S	E	C	T	A

Class

H	Y	M	E	N	O	P	T	E	R	A

Order

A	P	I	D	A	E

Family

B	O	M	B	U	S

Genus

B	O	M	B	U	S

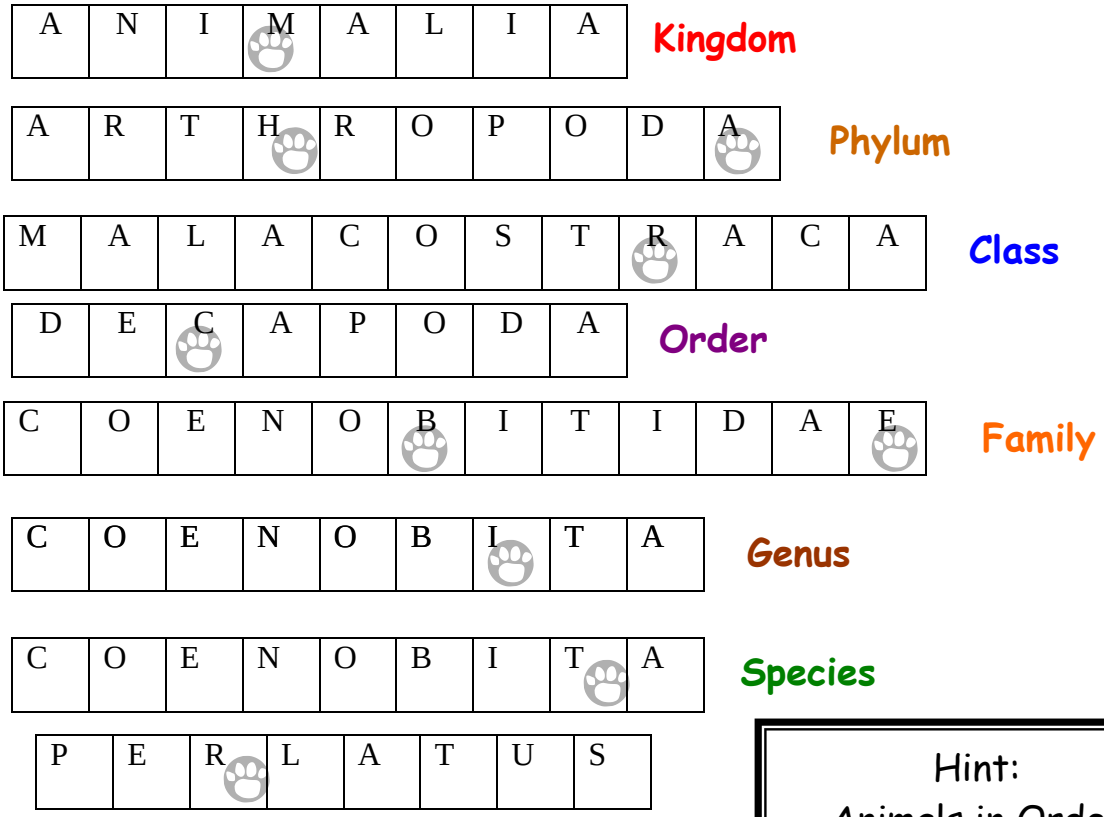
F	E	R	V	I	D	U	S

Species

Hint:
Animals in Order
Hymenoptera
fly without feathers.

Animal 3 Common Name: (2 words) _____

4.



Hint:
Animals in Order
Decapoda
scurry on 10 legs.

Animal 4 Common Name: (2 words) _____

_____

5. Which of these animals are vertebrates (animals with a backbone)?

_____

How do you know? Which of the classifications (Kingdom, Phylum, Class, Order, Family, Genus, Species) help to figure it out?

_____

6. Which animal is most closely related to Animal 3? _____

How do you know? Which of the classifications help to figure it out?

_____

7. Which animal is most closely related to you (*Homo sapiens*)? _____

How do you know? Which of the classifications help to figure it out?

_____