

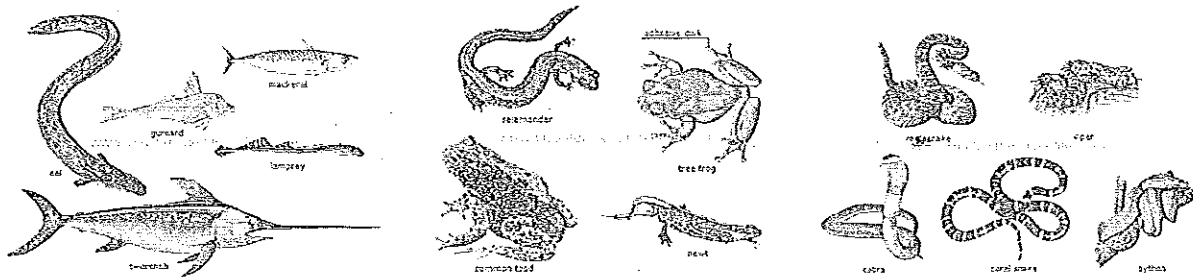
KEY

# CHAPTER 11

## FISHES

## AMPHIBIANS

## REPTILES



## Chapter 11 Objectives

### *Section 1: What is a Vertebrate?*

1. Name the characteristics chordates share
2. Describe the main characteristics shared by all chordates
3. Explain how vertebrates differ in the way they control body temperature

### *Section 2: Fishes*

1. Name the main characteristics of fishes
2. Name the major groups of fishes and describe how they differ

### *Section 3: Amphibians*

1. Describe amphibian characteristics
2. Examine how adult amphibians are adapted for life on land

### *Section 4: Reptiles*

1. Identify adaptations that allow reptiles to live on land
2. Contrast the characteristics of each of the three main groups of reptiles
3. Describe one adaptation that helped dinosaurs survive before they became extinct

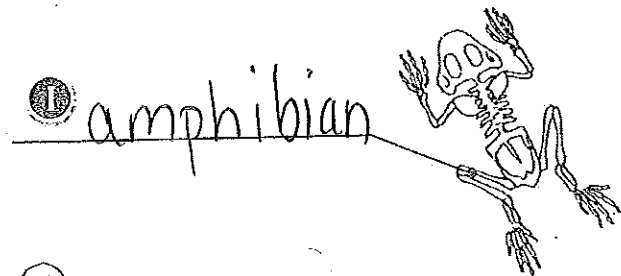
### *Section 5: Vertebrate History in Rocks*

1. Identify the kind of rock in which fossils are frequently found
2. Describe what scientists can learn from studying fossils

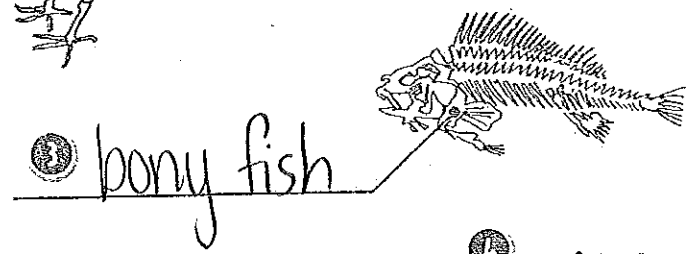
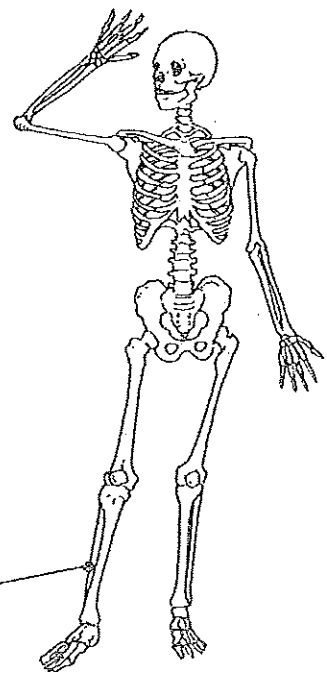
# The Vertebrate Animals

The phylum Chordata includes those animals that are vertebrates. These bilateral animals have a backbone made of either cartilage or bone. Their brains are protected inside a chamber of skull bones. There are seven main classes of living vertebrates. Use the terms in the word box to label them.

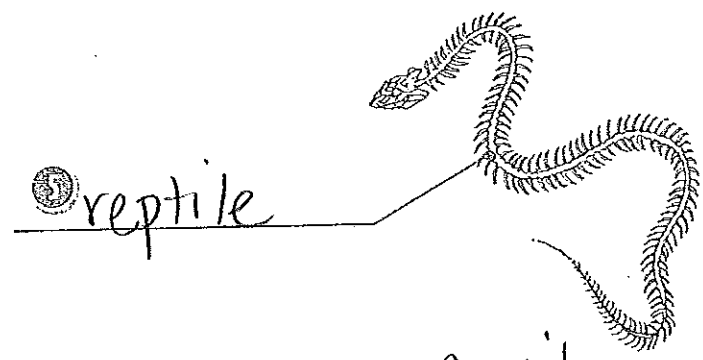
bony fish	amphibian	bird
reptile	mammal	cartilage fish
jawless fish		



2 bird



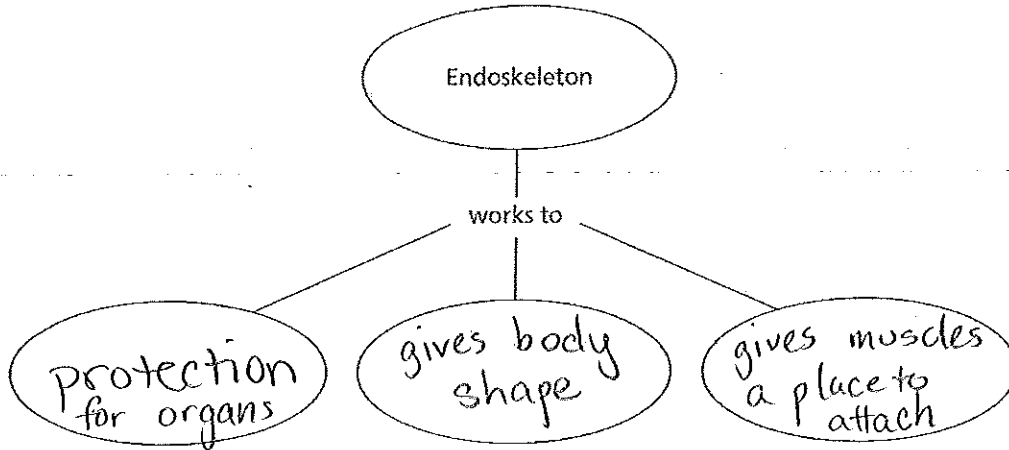
4 mammal



6 These do not have bones: cartilage fish jawless fish

## WHAT IS A VERTEBRATE?

Directions: Fill in the following concept map



Directions: Answer the following questions

1. What are three characteristics shared by all chordates?

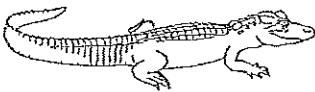
notochords  
Nerve cord in back  
pouches in throat area

2. What is a vertebrate? animal with a backbone

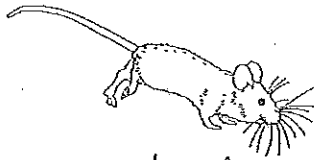
3. What is the difference between an ectotherm and an endotherm?

ectotherm - animal whose body does not produce much internal heat  
endotherm - animal whose body regulate its own temperature by  
controlling the internal heat it produces

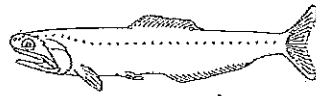
Directions: Decide whether the following organisms are ectotherms or endotherms.



4. ectotherm

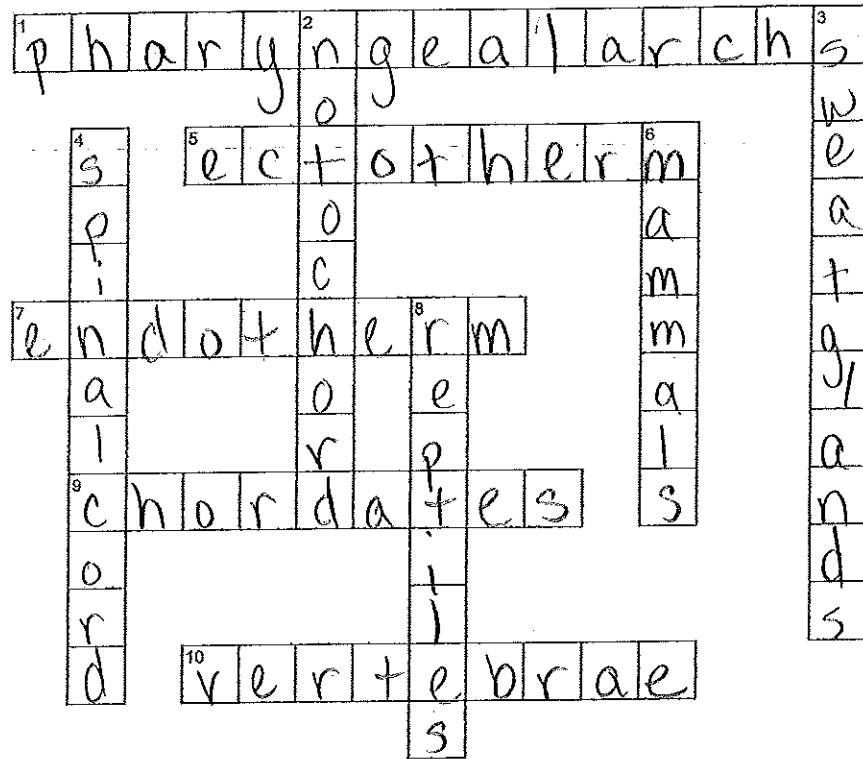


5. endotherm



6. ectotherm

# WHAT IS A VERTEBRATE?



## ACROSS

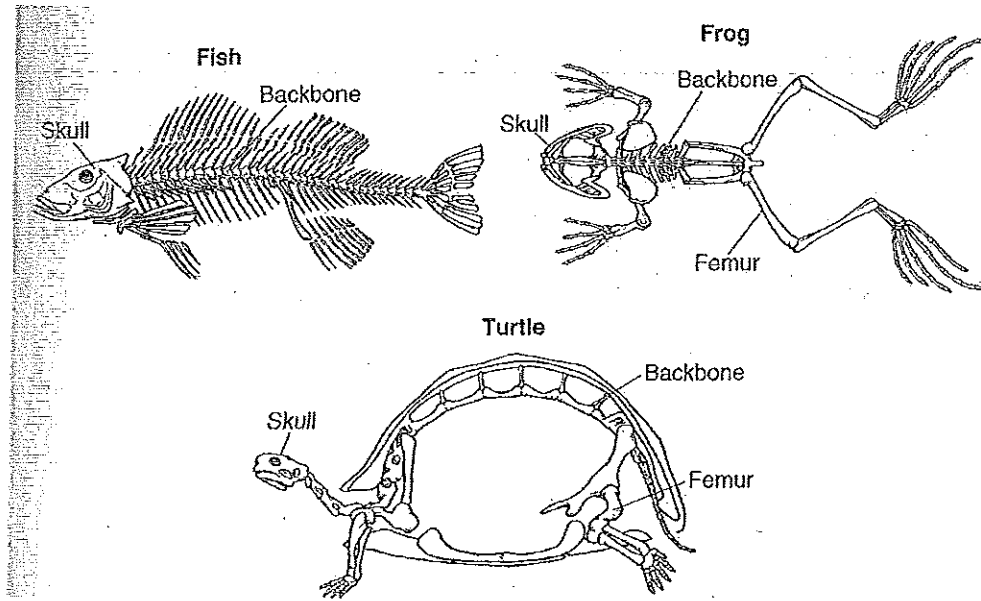
- 1 also known as gill slits, which are found in the throat area of chordates
- 5 an animal whose body does not produce much internal heat
- 7 An animal whose body controls and regulates its temperature by controlling the internal heat it produces
- 9 organisms that have a notochord, a nerve cord, and slits in their throat area at some point in their lives
- 10 small bones that make up the backbone

## DOWN

- 2 flexible rod that supports a chordate's back
- 3 adaptations found in animals that are able to regulate their own body temperature
- 4 the thick column of nerve tissue that links the brain to most of the nerves
- 6 Phylum of organisms that are considered to be endotherms
- 8 Phylum of organisms that are considered to be ectotherms

## SIMILAR BUT DIFFERENT

One of the characteristics that separate vertebrates from invertebrates is the presence of a backbone and an endoskeleton. All vertebrates have an internal skeleton, but all vertebrate skeletons are not the same. Just as bodies of vertebrates vary in size and shape, so do the vertebrate endoskeletons. Study the three diagrams of vertebrate skeletons below, and then answer the following questions.



1. Look at the hind legs of the turtle and the frog. Contrast the structures of the bone called the femur in both animals. Which animal's leg bones probably need to support a greater weight? How is this difference reflected in the bones' structures?

↳ turtle

↳ two bones in the lower leg of the turtle

2. One function of an endoskeleton is to support the body against the downward pull of gravity. Which animal skeleton pictured above would have to support the least amount of weight? Explain your answer.

fish because it is in water and water will support it some

3. Do you think the turtle backbone allows as much movement as the backbone of a fish? Why or why not?

No the fish has to swing its tail back and forth to swim

4. What bony body parts enable frogs and turtles to move on land? Can you see an adaptation for life in the water in the skeleton of the frog?

long toes and fingers to give more surface area for swimming, legs allow them to move on land

## LAB: SOAKING UP THOSE RAYS

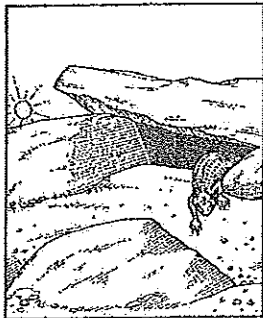
**PROBLEM:** How do some lizards control their body temperature in the extreme heat of a desert?

**MATERIALS:**

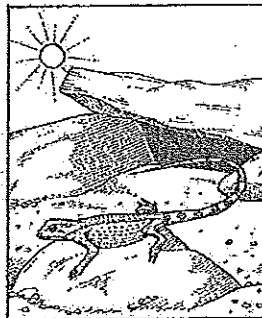
Paper  
Pencil

**PROCEDURE:**

1. The data below are collected by scientists studying how lizards control their body temperature. Examine the data.
2. Fill in the data table on the next page as you work through the procedure.
3. Organize the data in the diagrams by filling in the table, putting the appropriate information in each column. Begin by writing a brief description of each type of lizard behavior.
4. Complete the data table using the information in the diagrams.



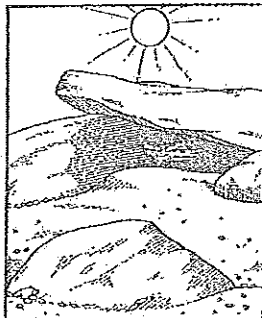
6 A.M.–7 A.M.  
*Emerging from burrow*  
Air temperature 20°C  
Ground temperature 28°C  
Body temperature 25°C



7 A.M.–9 A.M.  
*Basking (lying on ground in sun)*  
Air temperature 27°C  
Ground temperature 29°C  
Body temperature 32.6°C



9 A.M.–12 NOON  
*Active (moving about)*  
Air temperature 27°C  
Ground temperature 30.8°C  
Body temperature 36.6°C



12 NOON–2:30 P.M.  
*Retreat to burrow*  
Air temperature 40.3°C  
Ground temperature 53.8°C  
Body temperature 39.5°C



2:30 P.M.–6 P.M.  
*Stiling (belly off ground)*  
Air temperature 34.2°C  
Ground temperature 47.4°C  
Body temperature 39.5°C



6 P.M.–9 P.M.  
*Retreat to burrow*  
Air temperature 25°C  
Ground temperature 26°C  
Body temperature 25°C

DATA TABLE					
Activity	Description of Activity	Time of Day	Air Temperature (°C)	Ground Temperature (°C)	Body Temperature (°C)
1. Emerging	move out into sun	6am - 7am	20	28	25
2. Basking	laying in sun	7am - 9am	27	29	32.6
3. Active	Moving around	9am - 12pm	27	30	36.6
4. Retreat	layin in shade	12 pm - 2:30 pm	40	53.8	39.5
5. Stilling	staying still with belly off ground	2:30 pm - 6pm	34.2	47.4	39.5
6. Retreat	going into burrow	6pm - 9pm	25	26	25

ANALYSIS:

- Describe how the lizard's body temperature changed between 6am and 9pm.  
got warmer in the middle of day but then cooled again as temperatures cooled
- What are three sources of heat that caused the lizard's body temperature to rise during the day?  
air and ground
- During the hottest part of the day, what were the air and ground temperatures? Why do you think the lizard's temperature remained below 40°C?  
40 + 53.8 it went into the shade
- Predict what the lizard's body temperature would have been from 9pm and 6am. Explain your prediction.  
25 the sun went down so no external heat was available



5. Predict what would happen to your own body temperature if you spend a brief period outdoors in the desert at noon. Predict what your temperature would be if you spent time in a burrow at 7pm. Explain your predictions.

Would change much in either place b/c our bodies have adaptation to keep a constant temp.

6. Based on what you learned from the data, explain why it is misleading to say that an ectotherm is a "cold-blooded" animal.

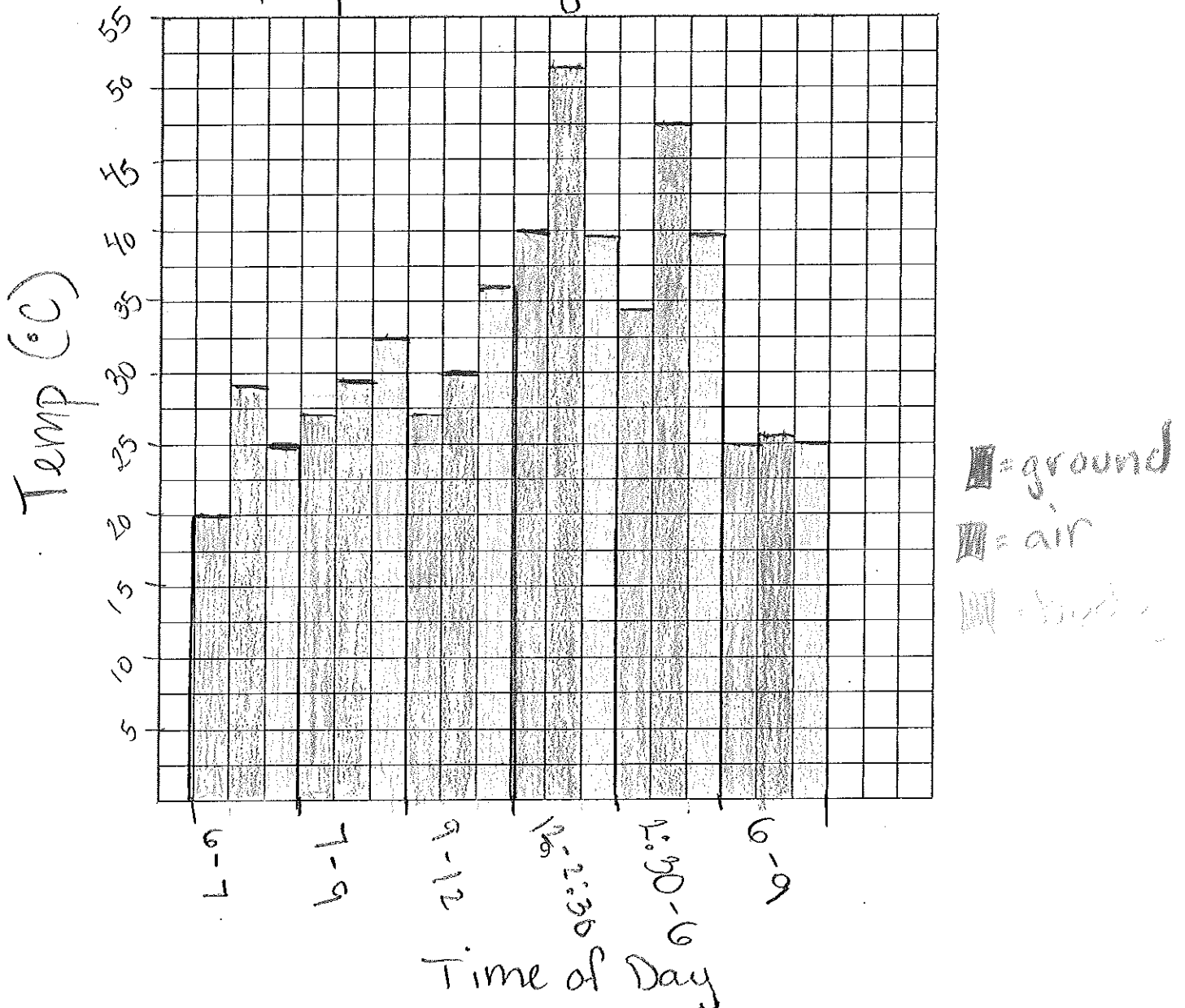
the animal (blood) is as hot as its surroundings which can be hot

7. Why is it helpful to organize data in a data table before you try to interpret the data?

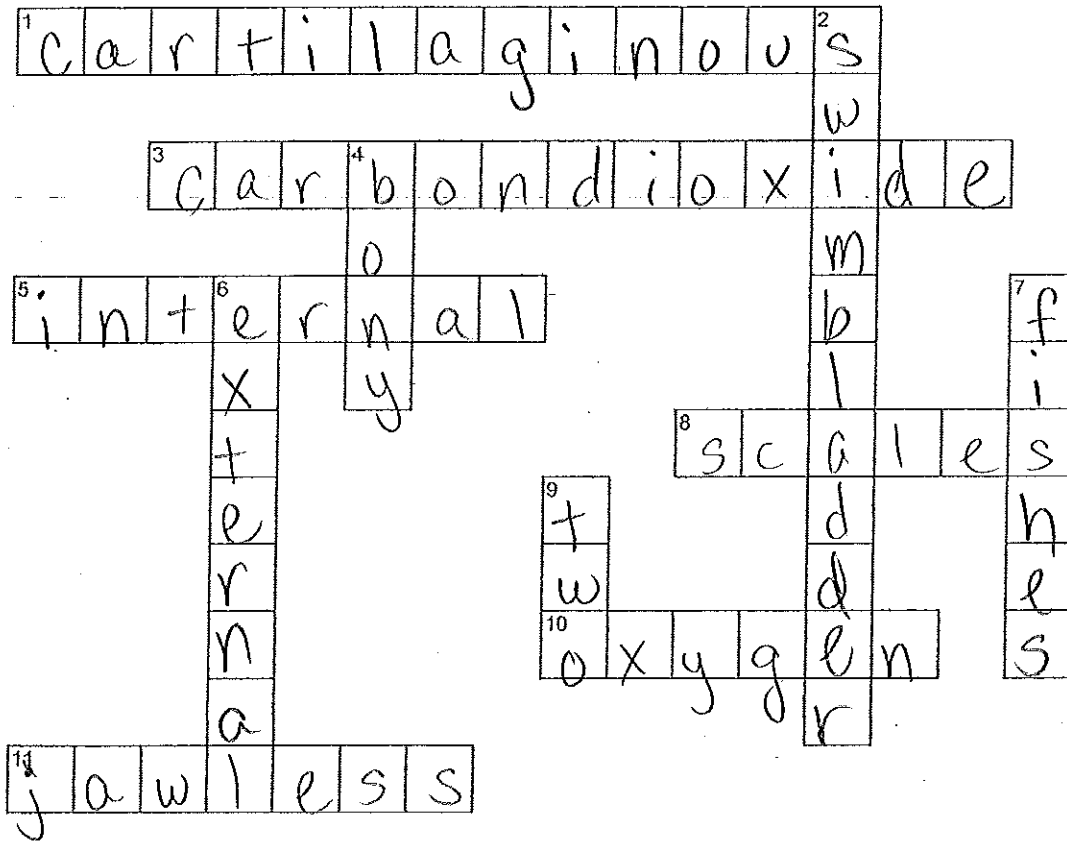
to see trends

8. Make a bar graph of the temperature of the data. Explain what the shows you. How does this graph help you interpret the data about how lizards control their body temperature in the extreme heat of a desert?

at the temps at different times, to visually the temps as they increase



# FISHES



## ACROSS

- 1 type of fishes that include sharks, rays, and skates
- 3 gas that diffuses out of blood vessels of gills
- 5 type of fertilization demonstrated by sharks and guppies
- 8 outer layer of fish is covered with these
- 10 gas that diffuses into blood vessels of gills
- 11 type of fishes with no jaws and scales

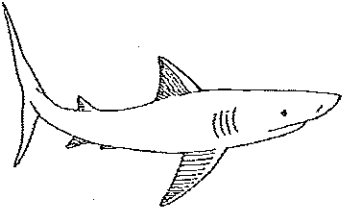

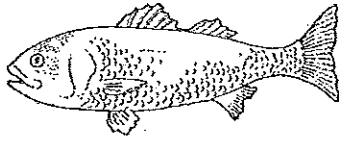
## DOWN

- 2 internal, gas filled sac that helps stabilize fish at different depths
- 4 type of fishes with a skeleton made of hard bones
- 6 type of fertilization when eggs and sperm join outside of the fishes body
- 7 Phylum name for aquatic vertebrates with fins
- 9 number of heart chambers in the circulatory system of a fish

# Characteristics of Fish

All fish can be divided into three groups: the cartilage fish, the jawless fish, and the bony fish. All are cold-blooded and breathe with gills. Other characteristics distinguish one group from the other. Use the terms in the word box to complete the chart.

skate	shark	stingray
trout	flexible skeletons	moray eel
sucker-shaped mouths	sea-horse	hagfish
lamprey	no paired fins	paired fins
lobed- or ray-finned	jawless	5-7 gill slits per side
gill covers	scaled bodies	

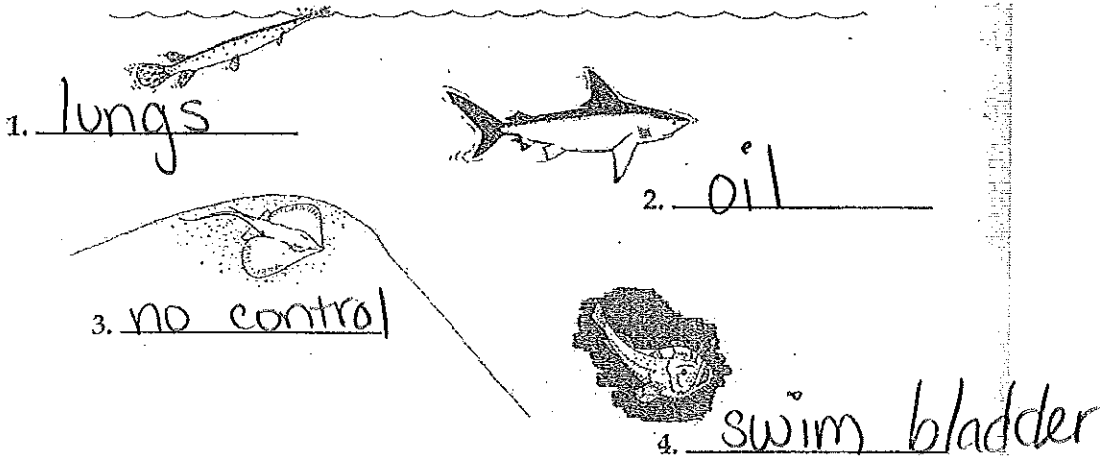
Cartilage Fish	Jawless Fish	Bony Fish
		
<p>Characteristics:</p> <p>5-7 gill slits <sup>side</sup> per</p> <p>lobed- or ray-finned</p> <p>flexible skeletons</p>	<p>Characteristics:</p> <p>jawless</p> <p>sucker-shaped <sup>mouth</sup></p> <p>no paired fins</p>	<p>Characteristics:</p> <p>gill covers</p> <p>scaled bodies</p> <p>paired fins</p>
<p>Examples:</p> <p>shark</p> <p>sting ray</p> <p>skates</p>	<p>Examples:</p> <p>lamprey</p> <p>hag fish</p>	<p>Examples:</p> <p>trout</p> <p>sea horse</p> <p>moray eel</p>

## DEPTH ADJUSTMENT BY FISHES

You have learned that bony fishes use their swim bladders to adjust their position in the water. Some fish have other methods to adjust or maintain their position, and still others have no method at all. Here is a summary:

- **No control:** the earliest fishes had zero control over their position. Instead, they rested on the bottom and had to swim actively to rise off of it. Some modern fishes, such as skates and rays, continue to live this way.
- **Oil:** The livers of many cartilaginous fishes make and store large amounts of oil. Because oil floats in water, its presence in the fish's tissues makes it easier for the fish to swim without sinking. Such fishes have very large livers.
- **Lungs:** Some fishes have lungs that are used to supplement oxygen the fishes obtain from their gills. These lungs are connected to the esophagus. The esophagus is the tube that connects a fish's mouth to its stomach. The fishes get air by swimming to the surface and swallowing air. In addition to supplying oxygen, the air helps the fishes maintain their position.
- **Swim Bladder:** The swim bladder differs from lungs in that it is not connected to the esophagus. The fish inflates its swim bladder with gases removed from its bloodstream.

**Directions:** Write the method for maintaining position that each fish might use in the blank next to the number.



Fish live in many habitats. Questions 5-7 concern three of these habitats: (1) ponds that are low in oxygen; (2) near the surface of the ocean; and (3) thousands of meters deep in the ocean. Based on this information, answer the questions.

5. In which of these habitats would a lung not be a very useful way to adjust depth? Explain.

#3 thousands of meter deep to far to

6. In which of these habitats would a lung be a very useful adaptation? Explain.

#2 near the surface of the ocean so can come up for air

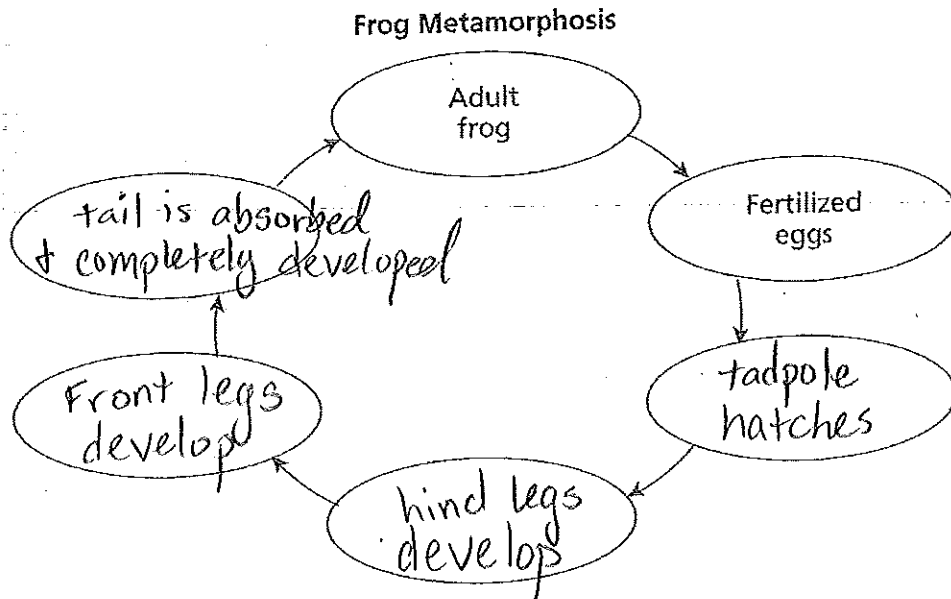
7. In which of these habitats do you think it would be most important to maintain position? Explain.

#1 ponds w/ low oxygen,

up for air easily

## AMPHIBIANS

Directions: Fill in the diagram with the frog's stages in the life cycle.



Directions: Complete the flow chart to show the steps in the metamorphosis of a frog.

### FROG METAMORPHOSIS

Fertilized eggs hatch and a legless tadpole swims out.

First, hind legs develop.

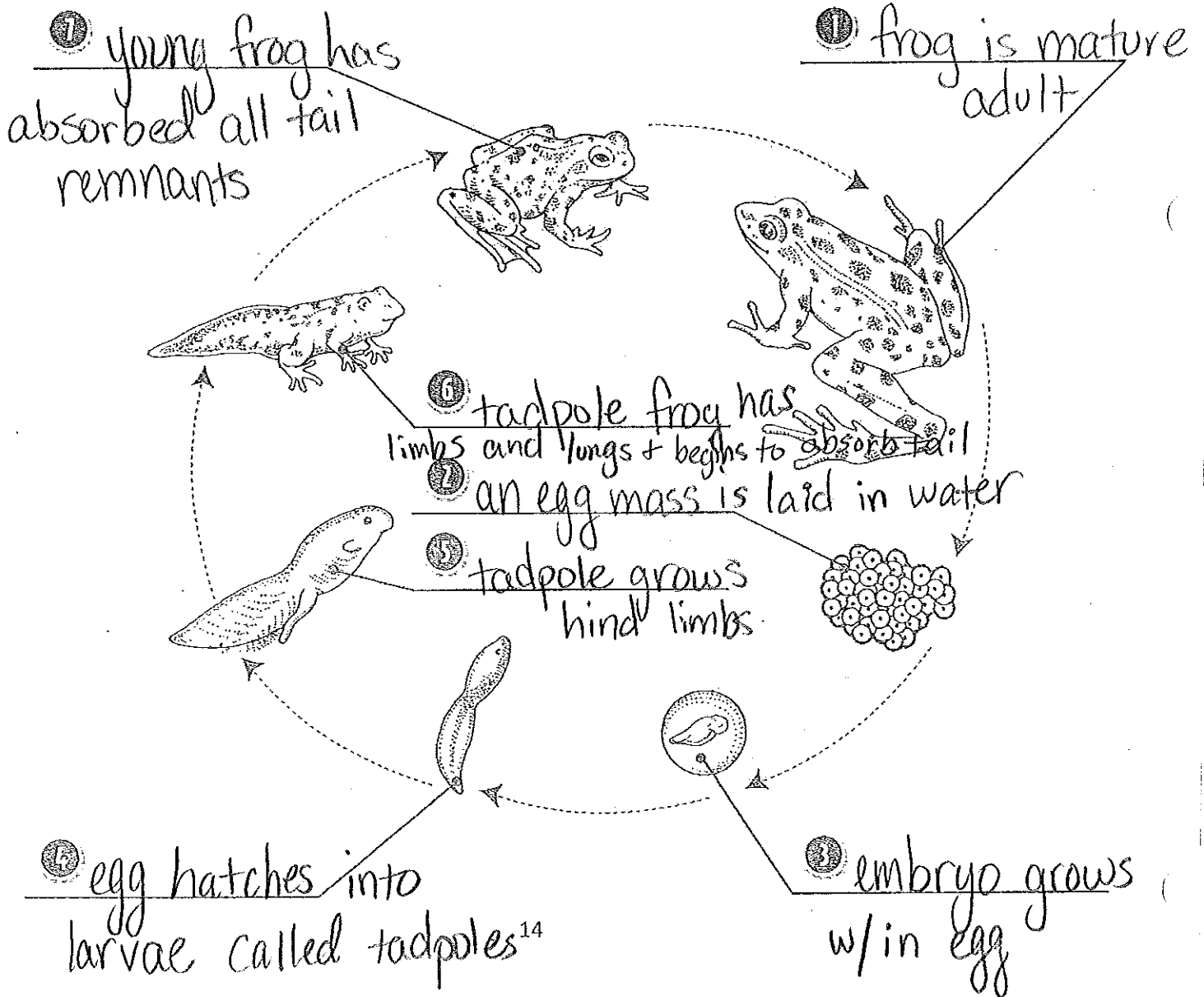
Then the tadpole develops front legs.

The tail is complete gone when the frog is a(n) adult.

# Life Cycle of an Amphibian

Most amphibians undergo metamorphosis. During this time, amphibian larvae slowly change from animals with tails and gills to animals better suited for life on land. Use the phrases in the word box to label the stages of amphibian metamorphosis.

young frog has absorbed all tail remnants  
 an egg mass is laid in water  
 tadpole frog has limbs and lungs and begins to absorb tail  
 embryo grows within egg  
 tadpole grows hind limbs  
 egg hatches into larvae called tadpoles  
 frog is mature adult



## Lesson 3.5

# Keeping an Eye on Frogs

**indicator species:** a species that is sensitive to changes in the environment and can serve as a warning when an ecosystem is in trouble.

**porous:** able to absorb liquids.

**invasive species:** a nonnative species whose introduction often causes changes to existing populations of plants and animals.

In the 1960s, the sharp decline of peregrine falcons served as a warning that something was wrong in the environment. It turned out that the use of harmful pesticides, particularly DDT, was causing the falcon eggs to be very fragile. In 1972, DDT was banned because of its potential to harm the environment, wildlife, and human beings.

Beetles, spotted owls, pileated woodpeckers, Atlantic puffins, lichens (a type of fungus), and fish are all common indicator species for their habitats.

*What can scientists learn from frogs about the state of the environment?*

Historically, coal miners brought a canary into the mines with them because canaries are more sensitive to toxic gases than human beings. If the bird showed signs of distress, the miner would immediately leave the mine. In nature, plants and animals that are extra sensitive to their environments play the same role. These **indicator species** can provide warning signals to scientists about the health of an ecosystem.

Frogs, a common indicator species, spend their lives on land and in the water, so they are exposed to problems in both environments. In addition, they have **porous** skin and eggs, which makes them very sensitive to changes in their environment. In 2004, the Global Amphibian Assessment (GAA) did a study of the nearly 6,000 species of amphibians in the world. The assessment revealed that there were declines in the populations of 43 percent of the species. In addition, about one-third of amphibian species were found to be in danger of extinction.

One way to evaluate the health of a species is by observing its breeding behavior. Amphibians breed at certain times of year, depending on cues they get from the environment. Changes in the climate, due to causes like global warming, can alter their breeding patterns. They can also be affected by other extremes in weather, such as droughts, flooding, and early frosts.

Loss of habitat is the single greatest threat to amphibians, followed by pollution, fires, and **invasive species**. However, there are still many unknowns about what is causing the population changes. It's not happening only in areas that experts categorize as high-risk. The GAA found that amphibians around the world—in wetlands, prairies, deserts, and forests—were in decline. Amphibians have been a part of the world's ecosystems since the Devonian Period more than 400 million years ago, and yet a combination of factors in today's world is seriously threatening them.

Researchers believe that a variety of causes are at work. They think that additive causes—the combined effects of two or more factors—may be to blame for the drop in numbers. It's the responsibility of human beings to pay attention to the warning signs that our global ecosystems are out of balance and to try determine what we can do to remedy the problems.



## KEEPING AN EYE ON FROGS

Directions: Answer the following questions about the story on the previous page.

Write true or false next to each statement below.

1. False The numbers of amphibians are declining only in high-risk areas of the world.
2. True Many amphibian species are threatened, but none have recently become extinct.
3. True The health of falcon populations in the 1960s indicated that pesticide use was harming the environment.
4. False Amphibians have been a part of life on Earth for only about 4 million years.
5. True Birds and fish are frequently used as indicator species.

Write your answers on the lines below.

6. Reread the last sentence of the selection. Do you agree with it? Why or why not?

Yes

7. Explain in detail why amphibians are useful as an indicator species.

They are exposed to problems in both water and land environments and have porous skin and legs so they are sensitive to changes

8. What can scientists learn by observing the breeding behavior of amphibians?

the use cues by the environment to breed

9. What does it mean to say that additive causes are responsible for the decline in the number of amphibians?

Combination effects of 2 or more factors may cause a decline



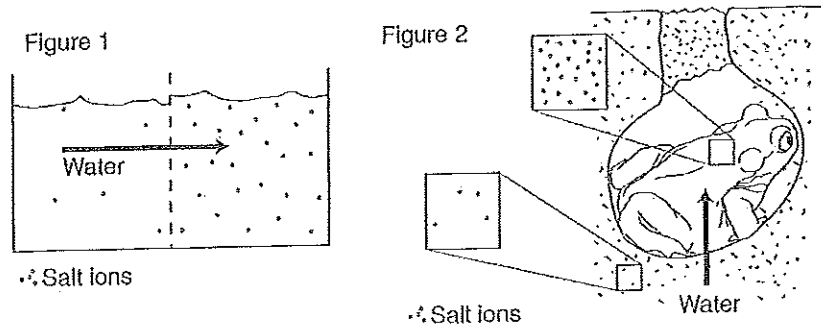
## AMPHIBIANS UNDERGROUND

All amphibians spend at least part of their lives in water. Their eggs are laid in water, and as adults amphibians are susceptible to drying out. Surprisingly, some amphibians live in deserts, where it hardly ever rains.

The spadefoot toad of western North America is a master dry-land amphibian. For about nine months out of the year, it lives underground, sealed at the bottom of a burrow up to a meter deep in a state similar to hibernation. During this time, the toad does not eat anything and its metabolism slows. When it finally rains, the toad digs its way to the surface, eats, and reproduces.

The spadefoot toad can survive underground by taking advantage of osmosis. To understand osmosis, look at Figure 1. Figure 1 shows a container of water, divided in half by a membrane. Water molecules can pass through the membrane, but the salt particles (ions) cannot. Osmosis causes the water to move from the side where the salt is less concentrated (ie., fewer salt ions) to the side where salt is more concentrated (more salt ions).

The spadefoot toad can absorb water from the surrounding soil through its skin by controlling the amount of salt ions in its blood. Normally, the kidneys remove these salts from the blood so that the concentration of salts in the blood is low. The salts are then expelled with the urine. However, while the spadefoot toad is underground, the action of its kidneys slows down, allowing the concentration of salt in the blood to increase to the point where small amounts of water move from the soil into the body of the toad.



Directions: Answer the following questions

1. What would have to happen for the movement of water molecules pictured in Figure 1 to stop?

the concentration of salt to water would have to be equal on both halves

2. What would happen if the salt were more highly concentrated in the surrounding soil than in the spadefoot?

The frog would dry out b/c the water would be pulled out by the salt

3. Remember that urine contains water and salt. What two disadvantages would occur if the spadefoot were to expel urine while underground?

The water would go to the urine

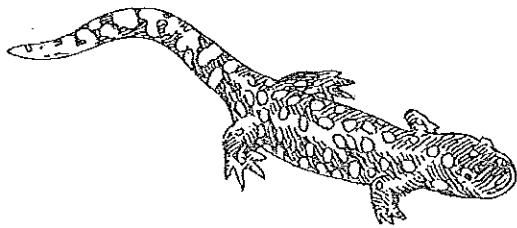
# Characteristics of Amphibians and Reptiles

Amphibians and reptiles are both cold-blooded vertebrates. However, while reptiles have lungs and live largely on land, the amphibians begin their lives in the water using gills and develop lungs as they grow. Use the phrases in the word box to complete the chart.

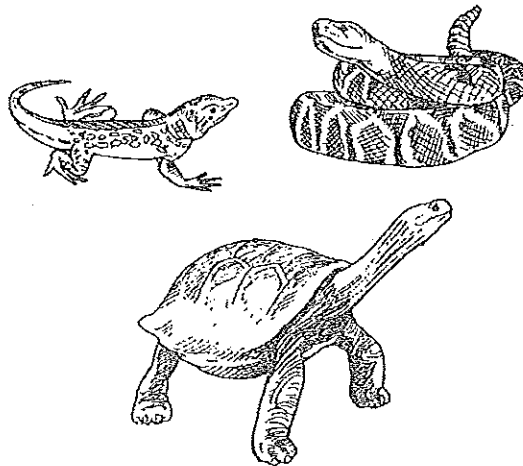
moist skin through which water can pass  
 tough, dry skin with horny scales  
 adults breathe with lungs; young with gills  
 most adults are carnivorous  
 most hatch from eggs laid on land

have three-chambered heart  
 have a cloaca  
 young and adults breathe with lungs  
 rarely have scales  
 eggs have a leathery shell

Amphibians



Reptiles



can pass  
 moist skin thru which water  
 adults breathe w/lungs; young w/gills  
 most adults are carnivorous  
 have 3-chambered heart  
 have a cloaca  
 rarely have scales

tough, dry skin w/horny scales  
 most hatch from eggs laid on land  
 have 3-chambered heart  
 have a cloaca  
 young & adults breathe w/lungs  
 eggs have a leathery shell

## Lesson 5.7

# Hiding in Plain Sight

**optical illusions:** differences in what the brain perceives to be true and what is actually true about a visual stimulus.

**pigment:** a chemical substance that determines color.

Human beings have learned about camouflage by observing nature and use these lessons especially in hunting and warfare.

Camouflage clothing employs color and pattern to conceal the wearer. Shades of green, brown, or tan are chosen to blend with the colors of the environment. Visually disruptive patterns are often used to hide the outline of the body and appear to the viewer to be a part of the surroundings.

### *How does camouflage work?*

One of the most common survival adaptations in nature is camouflage. This ability to hide from predator or prey is accomplished by blending into the environment using color and texture. Camouflage develops over time through natural selection. Remember the gypsy moths in London during the Industrial Revolution? Though both light- and dark-wing moths existed, the species evolved so that eventually most of the moths had darker-colored wings. This allowed them to better blend in with the bark of trees that had darkened from air pollution. Animals that are able to remain undetected survive longer and go on to produce offspring that also carry the physical traits necessary for disguising themselves.

Camouflage relies on **optical illusions**. When an animal blends into its surroundings, an observer's eye cannot distinguish the shape of the animal in order to communicate to the brain that something is there. An animal's camouflage is designed to fool its predators, but it may not always deceive human beings. For example, the bold, black-and-white pattern of zebra fur does not blend in with the grasslands zebras inhabit. However, lions are colorblind, and zebras travel in herds. Stripes make it harder for a lion to distinguish the individual zebras within the herd.

A similar result is achieved by fish that are countershaded. When an attack comes from above, the dark upper body is more difficult for the predator to see against the water. A predator from below would encounter the light underbelly that is obscured by the bright surface of the water.

Some birds and mammals change color seasonally. The arctic fox has a dark coat in the spring and summer to better blend in with the ground. To prepare for winter, it molts, and grows a new white coat to match the snow-covered ground. Other animals, like reptiles, amphibians, and fish, can alter their skin color. They have deeper-level pigment cells called *chromatophores*. Certain cuttlefish species can manipulate their chromatophores by controlling muscles that surround each one. The constricting muscles squeeze the pigment to the top so that it becomes visible. These cuttlefish can generate many colors and patterns to blend in with various surroundings. Chameleons are the most famous color-changers, but their ability is a reflex response to their mood and the time of day.



## HIDING IN PLAIN SIGHT

Directions: Answer the following questions about the story on the previous page

Write true or false next to each statement below.

1. false Human beings used camouflage as a means of protection long before animals ever did.
2. true The appearance of some animals varies by season so that they can blend into their changing surroundings.
3. true Color, texture, and shape can all play a role in camouflage.
4. false Molting allows an animal to change color when a predator is near.
5. true An animal that is countershaded may be different colors, depending on the side from which it is viewed.

Write your answers on the lines below.

6. Explain how camouflage can be used by both predator and prey.

Predator - so prey can't see them approaching  
prey - use as a defense against predators

7. How do optical illusions work?

brain can't perceive reality - "visual trick"

8. What role does natural selection play in the development of camouflage?

gives animals a better chance of survival

9. Human camouflage often includes the use of a visually disruptive pattern to confuse the viewer. Give an example not mentioned in the selection of an animal whose skin or fur contains a visually

disrupting pattern. leopard

10. What purpose do chromatophores serve?

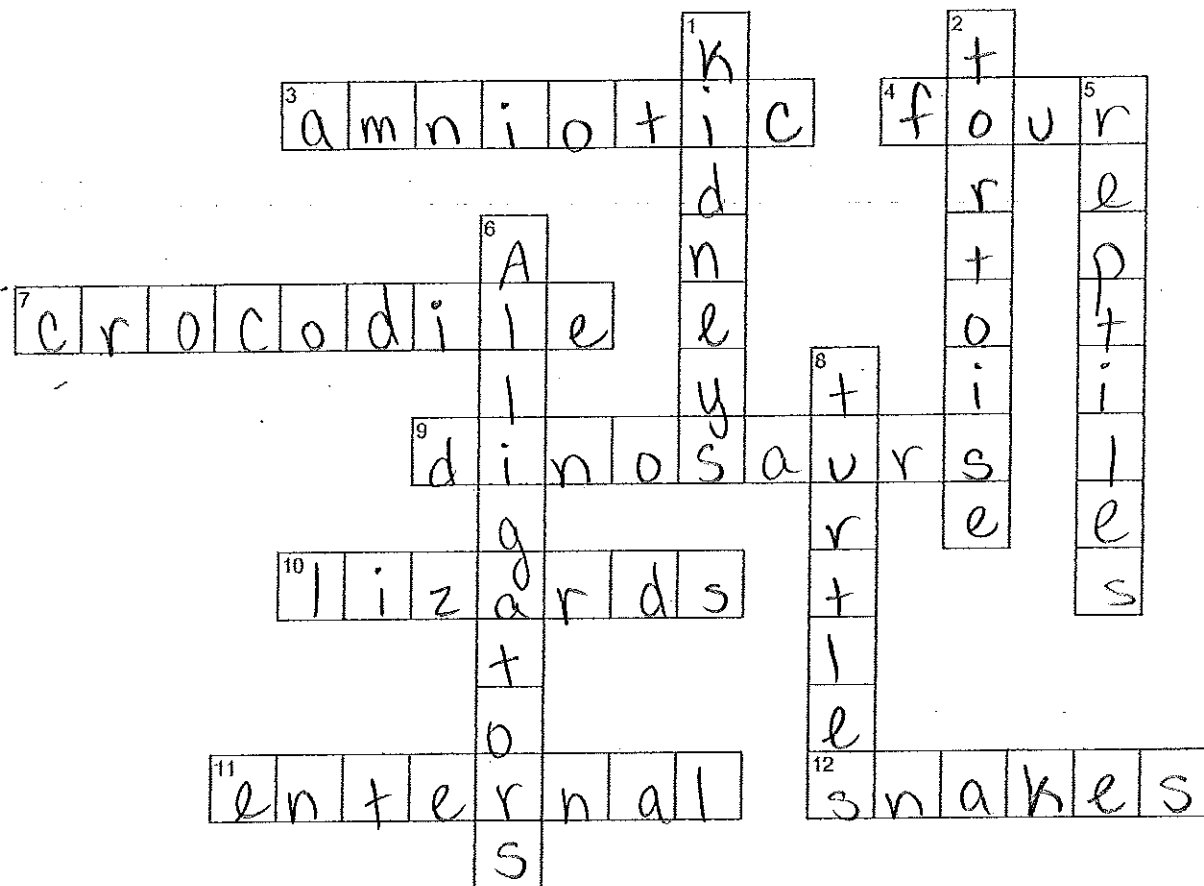
pigment cells that allow change in skin color

11. What uses does camouflage have for human beings?

used as disguise in hunting + warfare

12. How does a zebra's camouflage fool its predator?

# REPTILES



## ACROSS

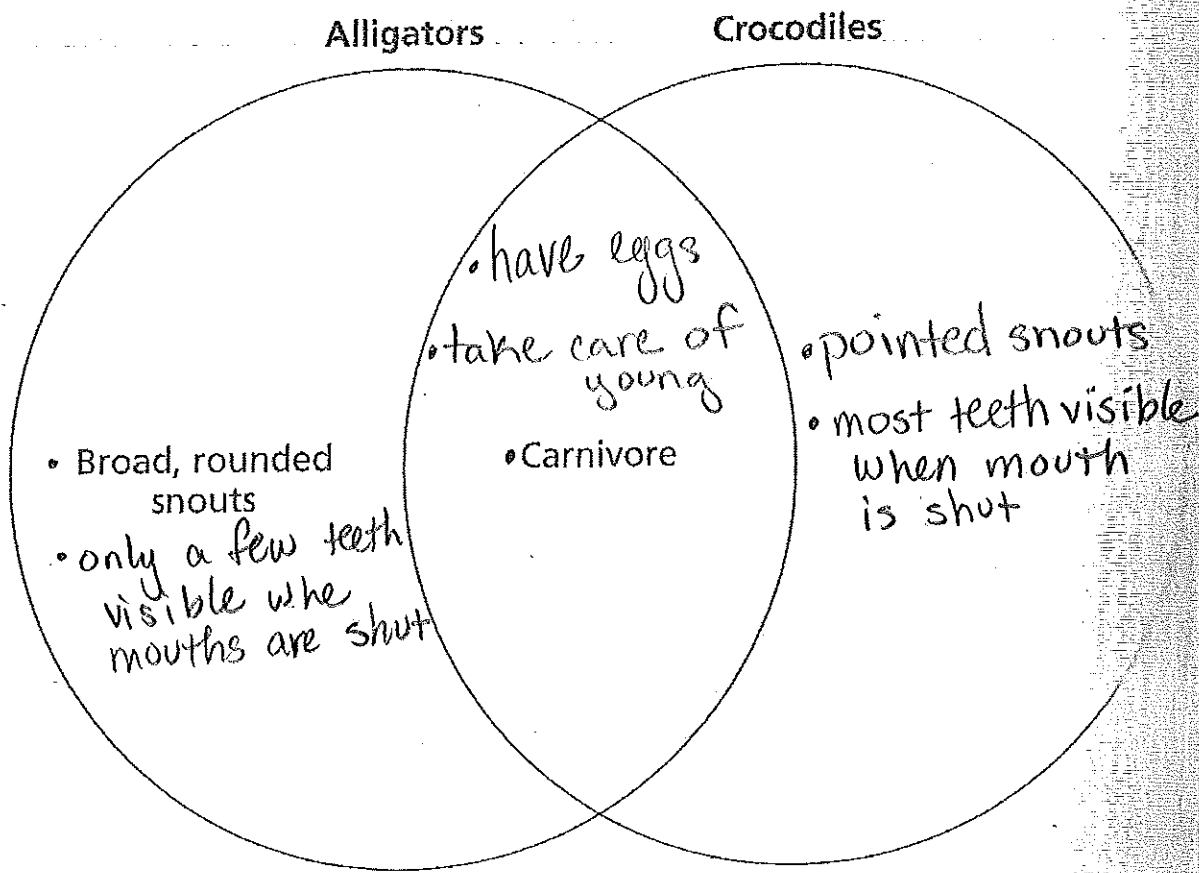
- 3 type of egg laid by reptiles
- 4 number of internal membranes in a reptile's egg
- 7 closest reptile relative to the alligator
- 9 another name for extinct reptiles
- 10 reptiles with 4 legs and claws on toes
- 11 type of fertilization exhibited by reptiles
- 12 reptiles with no legs, ears, or eyelids

## DOWN

- 1 organs that filter wastes
- 2 land version of a turtle
- 5 ectothermic vertebrates with lungs and scaly skin
- 6 largest living reptiles that take care of their young near the nests they have established
- 8 reptiles covered by a protective shell with ribs and a backbone

# ALLIGATOR VS. CROCODILE

Directions: Complete the Venn Diagram to show the similarities and differences between alligators and crocodiles



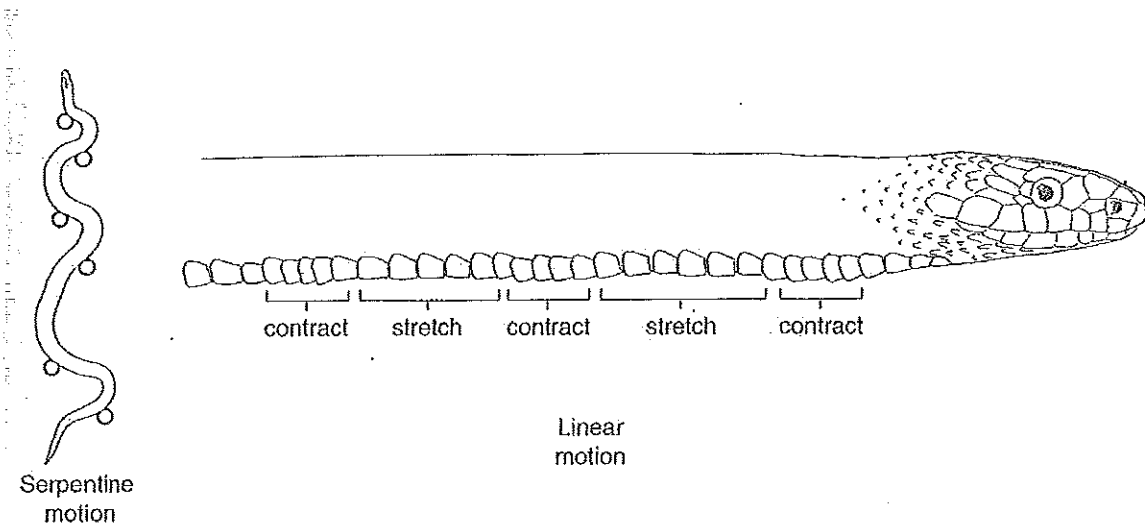
Directions: Fill in the blanks

1. Three adaptations that all reptiles have for conserving water are skin, kidneys, and eggs.
2. Snakes have specialized jaws.
3. All reptiles breathe with lungs.
4. Snakes look a lot like lizards, but snakes don't have legs.

## HOW SNAKES GET AROUND

Snakes can move in several different ways. There is no shape or texture of solid surface that snakes can't cross. Two types of snake movement are serpentine motion and linear motion.

- **Serpentine Motion:** This is a very common way in which snakes move, and the fastest. The snake bends its body into curves. The outside rear part of each curve presses against surrounding objects, pushing the snake forward. The snake's head can easily be seen to move from side to side.
- **Linear Motion:** The snake's body moves in a straight line, as if it were crawling. This is also called "caterpillar" motion. As the snake moves, small ripples of contracting muscles can be seen moving along its sides. At the same time, the broad belly scales grip against even tiny bumps or ridges on which the snake is crawling, in order to push the snake forward. A snake can't use linear motion on an extremely smooth or slippery surface, and it is only useful for moving slowly. A snake using linear motion is not easily seen.



Directions: Answer the following questions

1. Imagine that a small snake in a grassy yard sees you coming. Which type of motion would it probably use to move away quickly? Explain.

Serpentine motion, snake push off of grass quickly moving like a caterpillar would be slow

2. Which type of motion would a large snake probably use to sneak up on a motionless rabbit? Explain.

Serpentine motion → it is the fastest

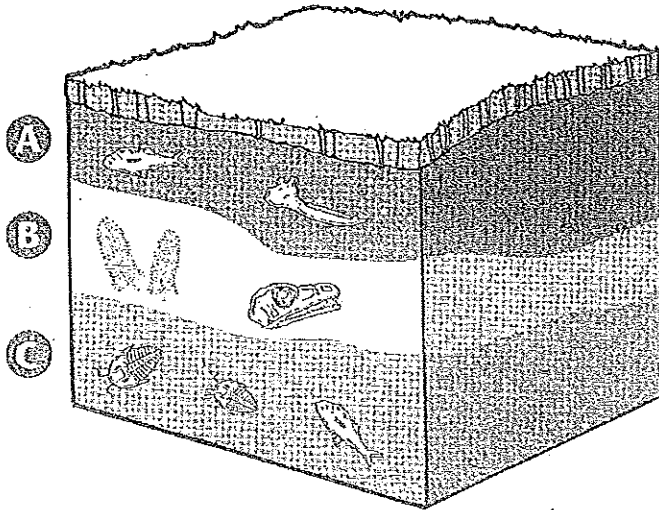
3. Which of the two kinds of motion would a snake have to use to move across deep water? Explain.

Linear motion to work like fins

## VERTEBRATE HISTORY IN ROCKS

Directions: Fill in the blanks

1. Fossils occur most frequently in sedimentary rock
2. What are two ways that sediment can build up?
  - a. wind
  - b. muddy water
3. Scientists who study extinct organisms, examine fossil structure, and make comparisons to present-day organisms are called Paleontologists.
4. What can scientists learn from studying fossils?  
they show animals from earlier in history
5. Which rock layer in the diagram below is the oldest and which is the youngest?
  - a. Oldest layer: C
  - b. Youngest Layer: A

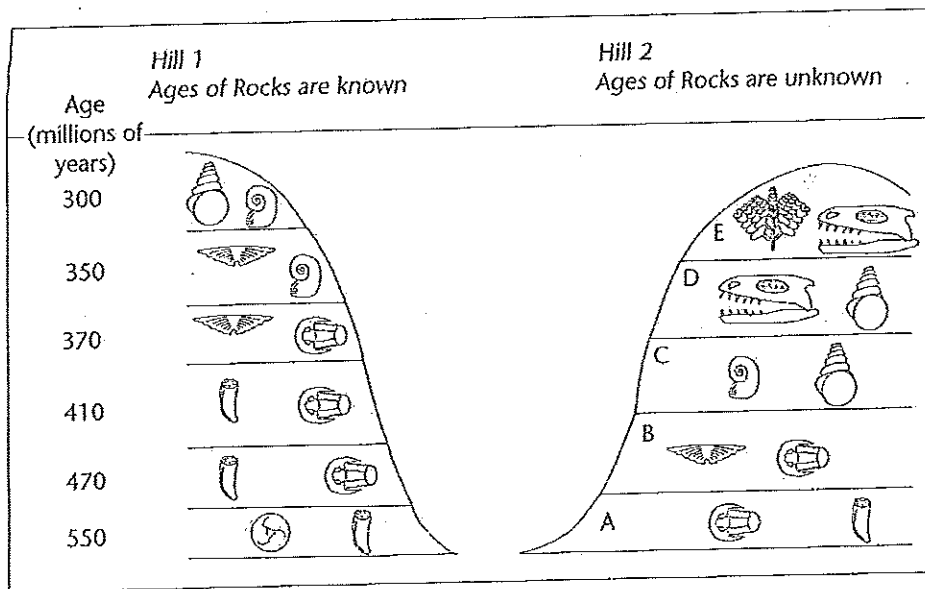




## TELLING TIME WITH FOSSILS

Geologists (scientists who study rocks) use fossils to determine the age of the sedimentary rocks in which the fossils are found. Each layer of rock will contain fossils of organisms that lived at that time. As time passes, some species die out, other species survive, and some new species of animals appear. While a later of rock contains many organisms similar to those in the later above it and below it, a layer may also contain fossils not found in the layer above. Or it may contain other fossils not found in the layer below. So, each layer of rock has a set of fossils that is somewhat different from other layers. Geologists recognize that the set of all the different fossils contained in a rock layer is like a fingerprint, identifying the time when the sediments forming that layer were deposited. Thus, geologists can determine the age of a rock layer and also tell that rocks in different parts of the world are the same age if they contain the same fossil "fingerprint".

The diagram below shows the different layers of rock and the types of fossils found in them.



Directions: Answer the following questions

1. Look at Hill 1. Many kinds of fossils are found in more than one layer, but do any two layers have all the same kinds of fossils? If so, which are they?

4, Yes, 410 + 470 million years ago

2. Which layer in Hill 1 is most similar to Layer B in Hill 2?

370

3. Compare fossil fingerprints of the layers in Hill 2 with those in Hill 1. About how old are layers B and C, based on their fossils?

B ~ 370      C ~ 300

4. Assuming the layers of rock are in their original positions, is layer D older or younger than layer C?

D is younger

## REVIEW: KEY TERMS

Directions: Fill in the blanks with the proper term and find the words in the word search.

1. An animal whose body controls its own temperature
2. The hardened remains of a living thing that existed long ago
3. An animal that has a notochord, nerve cord, and slits in the throat area
4. A flexible rod that supports an animal's back
5. The specific environment in which an animal lives
6. A bone found in the backbone
7. A vertebrate that lives in water and has fins

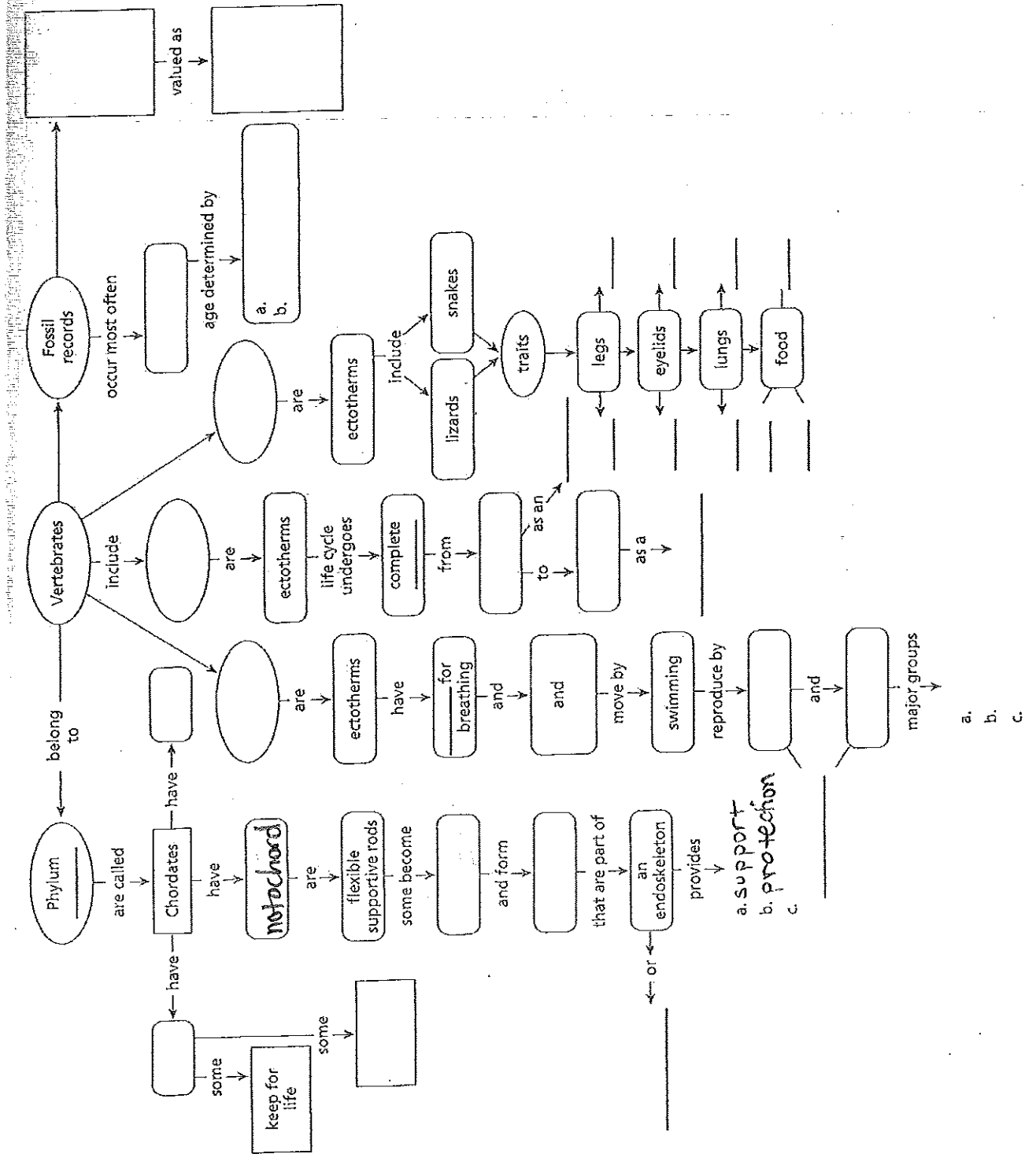
endotherm  
fossils  
chordate  
notochord  
habitat  
vertebra  
fish

```

g i d v e r t e b r a n k r
e f g w r i s u a h m o f c
v o t h a b i t a t y t r h
h s v r b h a u e l w o s o
l s p f d a t r i u m o y r
n c f e s a j l i h c d
a l i s y u r i n e d o j a
q u r h m p k g w s r r b t
e n d o t h e r m w o d a e
    
```

REVIEW: CONCEPT MAP

Directions: Fill in the concept map



## PROJECT: ZOO POSTER

You are the new Education Coordinator at the zoo. Your first project is to design a poster to teach visitors about the characteristics of fish, amphibians, and reptiles.

**PROBLEM:** How can you design a poster to teach zoo visitors about the characteristics of fishes, amphibians, and reptiles?

### DEVISE A PLAN:

1. Think about what you know about the characteristics of each animal and how you want to show these characteristics. What will most help a zoo visitor identify and understand each kind of animal? Make a list of at least four or five characteristics for each animal that you want to include on your poster.
2. Make a quick sketch of your design. Decide how you will present the information you plan to include on your poster. Experiment with different layouts of the information to get the most effective display.
3. Create your poster. When you are satisfied with your design, complete your poster.
4. Look at your poster. Will zoo visitors be able to tell how fishes, amphibians, and reptiles are similar? Will they be able to tell how the animals are different?
5. Is there a way you could include more information or display information more effectively?

### Grading Rubric:

	Planning	Communicating	Concept Understanding
4	Plan is clearly a very useful preparatory step for making the poster	Poster is organized and neat and effectively uses both pictures and words, and includes descriptions, lists, and compare/contrast tables.	Poster shows more than four characteristics for each main animal group. Student communicates exemplary knowledge of the similarities and differences between animal groups, including characteristics that are internal or can't be drawn
3	Plan is a useful preparatory step for making the poster	Poster is fairly well organized and neat and makes effective use of pictures and words, and includes descriptions and lists, but lacks compare/contrast tables	Poster shows four characteristics for each main group animal group. Student communicates adequate knowledge of the similarities and differences between animal groups, including characteristics that are internal or can't be drawn
2	Plan is a somewhat useful step for making the poster	Poster is somewhat organized and makes fair use of pictures and words but lacks compare/contrast tables	Poster shows three characteristics for each main animal group. Student communicates some knowledge of the similarities and differences between the animal groups, but little on characteristics that are internal or can't be drawn
1	Plan is a barely useful step for making the poster	Poster is disorganized and messy. Use of pictures and words is ineffective	Poster shows two characteristics for each main animal group. Student communicated little knowledge of the similarities and differences between the animal groups, including characteristics that are internal or can't be drawn