7

Science Standard
7.4.g.

Teacher's Masters

California Education and the Environment Initiative

Extinction: Past and Present

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency
California Natural Resources Agency
Office of the Secretary of Education
California State Board of Education
California Department of Education
California Integrated Waste Management Board

Key Leadership for the Education and Environment Initiative:

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Andrea Lewis, Assistant Secretary for Education and Quality Programs, California Environmental Protection Agency
Mark Leary, Executive Director, California Integrated Waste Management Board
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Key Partners:

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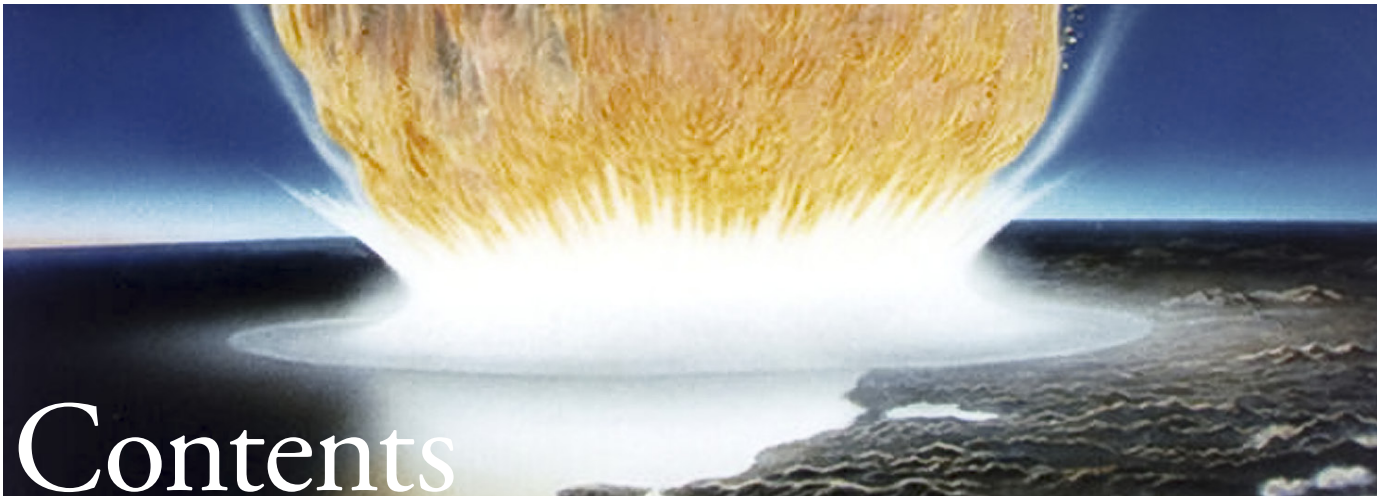

Contents

Lesson 1 La Brea Tar Pits: A Case Study of Extinction

None required for this lesson.

Lesson 2 Change in Geologic Time

None required for this lesson.

Lesson 3 Extinction: Rates and Possible Causes

None required for this lesson.

Lesson 4 Digging Up the Past

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Lesson 5 Extinction: in the Present

None required for this lesson.

Lesson 6 Holocene Extinction Event

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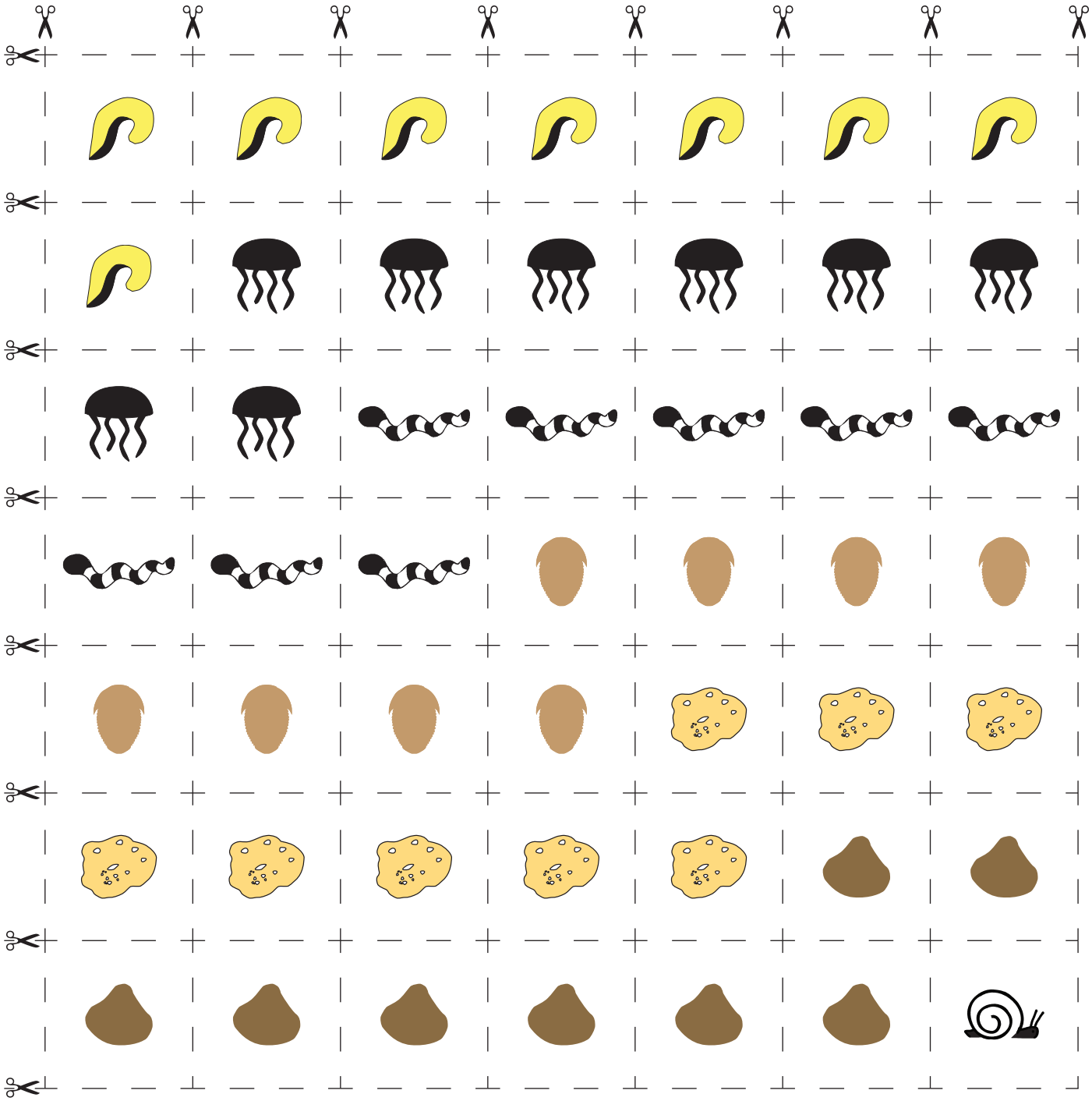
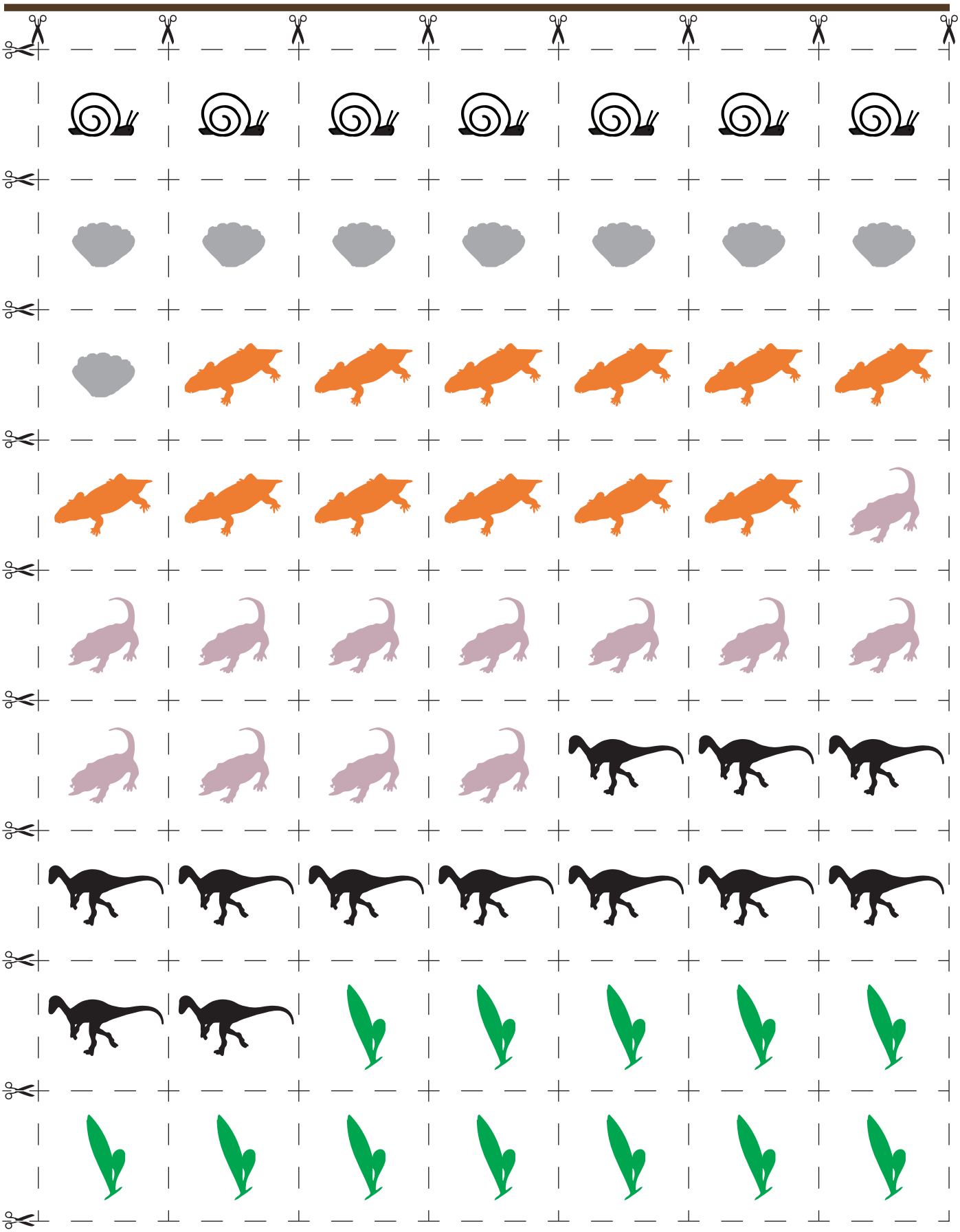
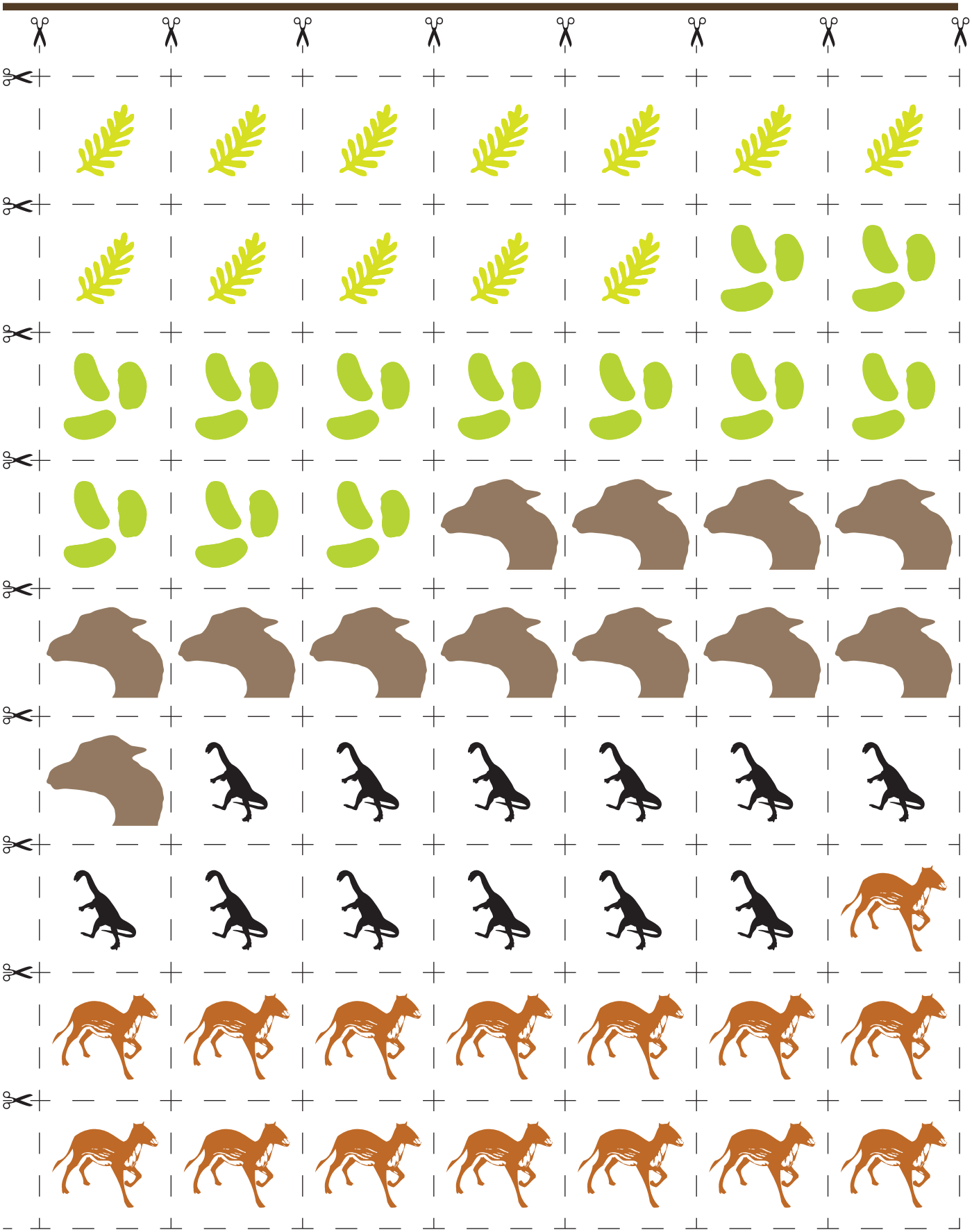
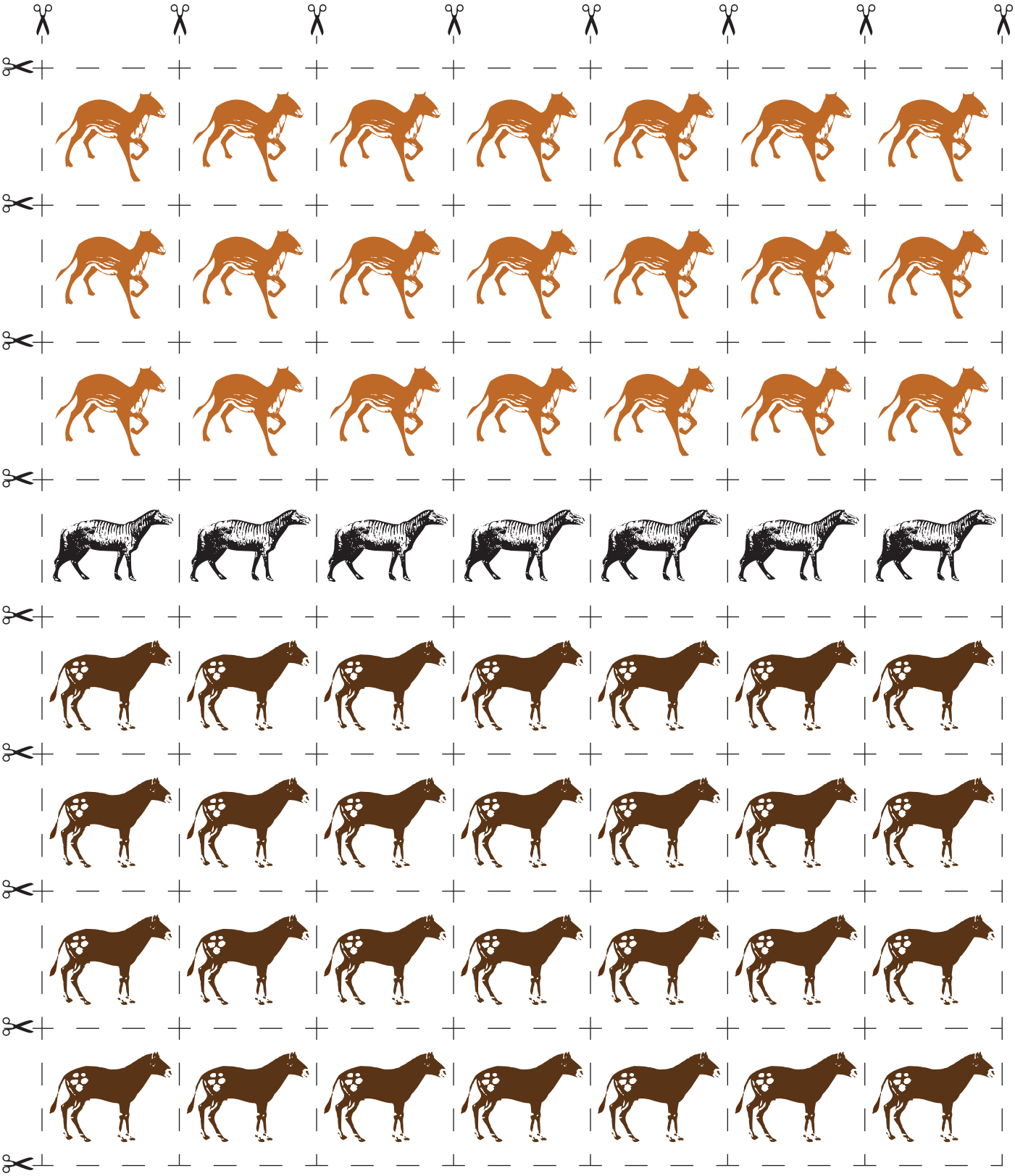
Teacher Instructions: Cut out the fossils below for use in making core samples (See: **How to Make Core Samples** [Teacher's Edition, pages 92–93].) These four sheets contain enough fossils to make core samples for 18 pairs of students.









Extinction Cards

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I am teosinte (tay-o-sin-tay), a plant that is related to corn. In Mexico, I grow next to cornfields, and sometimes I exchange genes with corn. These exchanges sometimes make types of corn that are more resistant to disease or pests. If I go extinct, new forms of corn will not develop naturally and there will be fewer corn types to grow for food.

I am a *Chincona* (chin-ko-nah) plant. A few hundred years ago, scientists made a drug called quinine from me. This drug was used to fight malaria. If other plants like me go extinct, scientists might not be able to find medicines for other diseases.

I am a mangrove tree. I grow in tropical coastal environments. I protect the coast from erosion, especially during storms and tsunamis. I also filter pollutants out of the water. In addition, I provide a home for many marine organisms. If I become extinct, flooding and erosion will become bigger problems in coastal areas. Water pollution will also increase. Many marine organisms that depend on me, or that eat animals that depend on me, will be at risk of extinction, too.

I am a Cavendish banana plant. I produce the kinds of bananas you usually find in grocery stores in the United States. If I become extinct, there will be no more bananas for food, at least none that look like me.

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I am a coral. I grow beneath the ocean and provide a habitat for many marine organisms. Many large fish rely on the small fish that live near me for food. If I go extinct, many other marine organisms will also be at risk of extinction. These fish are often an important source of food for humans.

I am a silkworm. I produce silk, which people use for clothing. If I go extinct, silk will no longer be available.

I am a honeybee. I pollinate many crops: almonds, apples, cherries, peaches, and watermelon are just a few. If I go extinct, crops around the world will decrease significantly. My honey, which many people enjoy, will also be gone.

I am a small fly called a midge. I am the only known pollinator of cacao trees, which make chocolate. If I go extinct, there will be no more chocolate in the world.

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I am a ladybug. I eat aphids, which can destroy crops, such as vegetables, grains, beans, and strawberries. If I go extinct, the population of aphids that eat these crops will increase.

I am a rat snake. I eat animals, such as rats and mice. These rodents eat grain supplies, damage buildings, and sometimes spread disease. If I go extinct, the rodent population will increase significantly.

I am a black-backed woodpecker. I eat insect larvae from beetles that eat trees. If I go extinct, these insects will consume trees used for timber. This loss could cost timber companies tens of millions of dollars and reduce the amount of wood available for building.

I am a red-tailed hawk. I eat rodents that destroy farmers' crops. If I go extinct, populations of rodents will increase on farms and farmers' crops will be eaten.

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I am a bluefin tuna. Many people enjoy hunting me for sport and eating me, especially in sushi. If I go extinct, there will be less food for humans to enjoy. I am also a top predator in the ocean. If I go extinct, food webs will be affected.

I am a little brown bat. I can eat 1,200 mosquitoes in just one hour. Mosquitoes not only bite people, but also can carry diseases. If I go extinct, the mosquito population will go up.

I am a dung beetle. I eat the droppings of animals. People have even brought me to cattle ranches to help get rid of large amounts of cow dung, which provides a habitat for flies. If I go extinct, animal droppings will increase, as will fly populations.

I am a vulture. I eat the remains of dead animals, some of which carry diseases. If I go extinct, dead animals will lie out to rot. Scavengers, such as rats, which carry diseases to humans, may take my place.

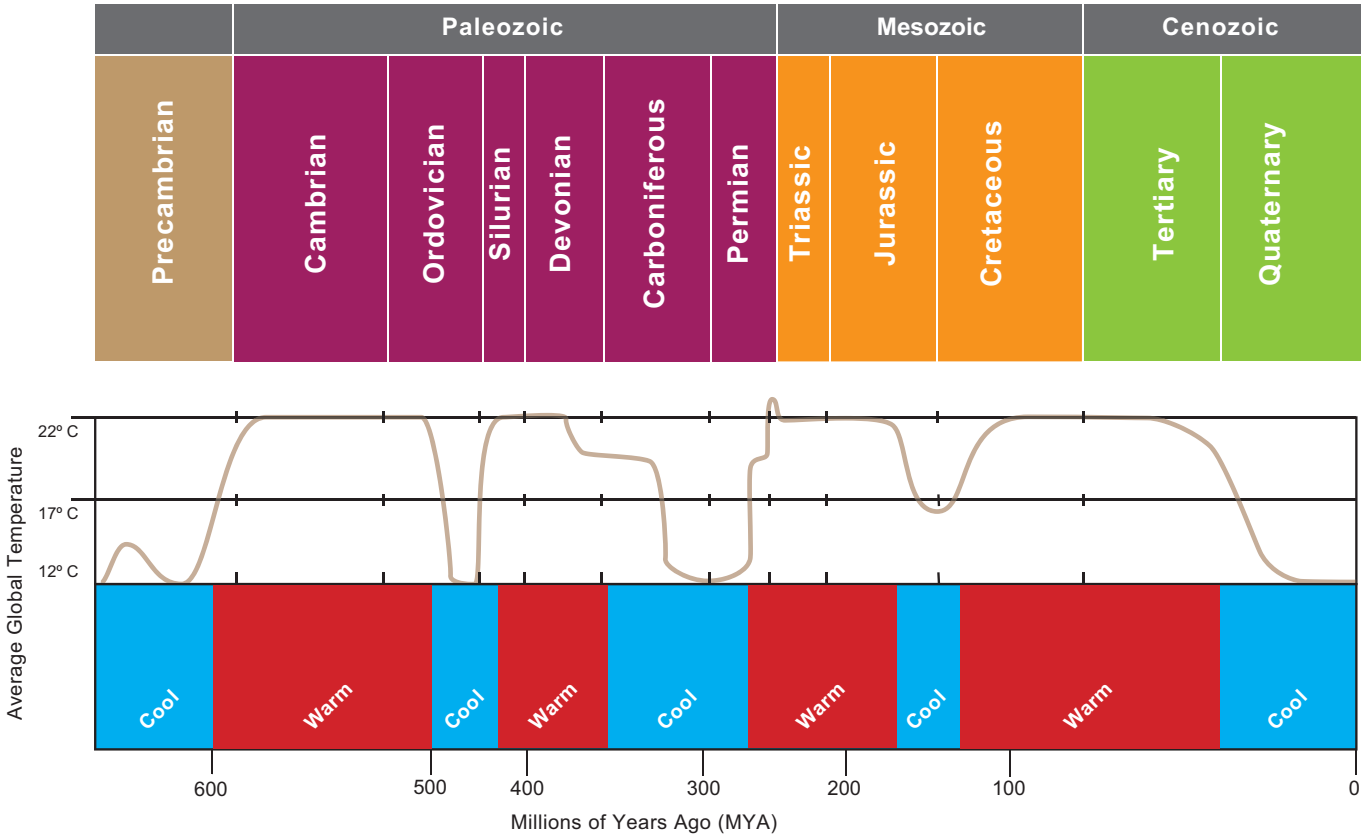
Name: _____

Instructions: Select the best answer and circle the correct letter. (2 points each)

1. Fossil evidence from the La Brea Tar Pits suggests that an extinction event occurred at the end of the Pleistocene. Which is true about that extinction event?
   - a. The megafauna of North America went extinct.
   - b. Glaciers covered California at that time.
   - c. Only the saber-toothed cat survived.
   - d. Scientists agree that humans were the cause of the extinction event.

2. Which of the following is the best example of gradual change in geologic time?
   - a. CO_2 in the atmosphere
   - b. an extinction event
   - c. movement of the continents
   - d. building of an ancient city

Data on Global Temperature



Source: C.R. Scotese. Paleomap Project

Name: _____

3. Based on the **Data on Global Temperature** graph on the previous page, which best describes Earth's temperature over the last 500 million years?
- a. Earth has been gradually getting cooler over time.
- b. Earth has been gradually getting warmer over time.
- c. Earth has been cool more often than it has been warm.
- d. Earth has been warm more often than it has been cool.

4. What could cause the kinds of mass extinctions seen on Earth in geologic time?
- a. lots of volcanic activity
- b. a large asteroid hitting Earth
- c. rapid warming or cooling of Earth
- d. all of the above

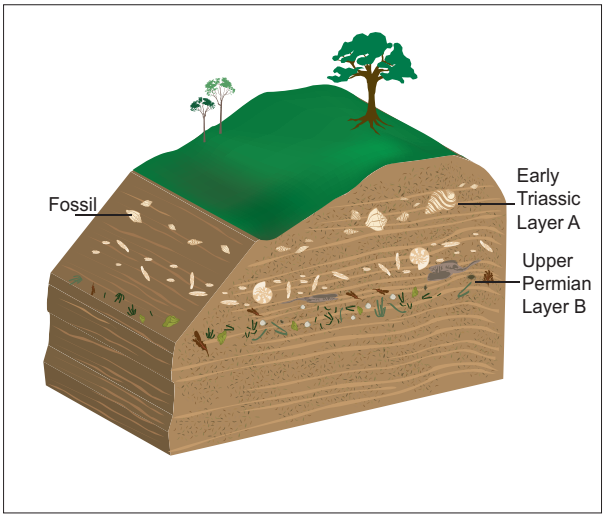
5. What is the background extinction rate of the past 500 million years?
- a. 0
- b. 10–100 species per year
- c. 10–100 species per day
- d. 90% of all species disappear in a short period of time

6. Which best describes what we know about the extinctions in Earth's past?
- a. Extinction is a very rare event that has only happened twice.
- b. Extinction is a natural process that has occurred at a constant rate throughout time, except during an extinction event, when the rate becomes very high.
- c. Extinctions only occur in response to sudden and rapid changes to the environment and then the rate of extinction becomes very high.
- d. Extinctions have always occurred at the same background extinction rate.

7. Which of these changes could rapidly increase the extinction rate of many species?
- a. gradual cooling of Earth
- b. evolution of a new predator
- c. habitat destruction
- d. movement of the continents

Name: _____

8. What event is shown by the fossils in the core sample at the right?
   - a. a mass extinction
   - b. a gradual extinction
   - c. a rapid diversification
   - d. speciation



9. How do most scientists describe the current rate of extinction?
   - a. Extinction is not currently occurring on Earth.
   - b. Rates of extinction are declining.
   - c. Extinction is occurring at the normal rate.
   - d. Earth is currently experiencing an extinction event.

10. The acronym HIPPO stands for five different categories of human activities that affect rates of extinction. Which of the following is not one of the five categories?
    - a. habitat destruction
    - b. hunting
    - c. pollution
    - d. population growth

Instructions: Answer the following questions in the spaces provided. (5 points each)

11. Give one example of **rapid** change on the geologic timeline.

12. Give one example of **gradual** change on the geologic timeline.

Name: _____

13. Why do some extinctions occur so **rapidly**?

14. Give one example of a **mass extinction** in geologic time. What organisms went extinct and what do scientists think caused the extinction?

15. Describe how human activity can affect rates of extinction.

16. Describe how extinctions affect human society.

Name: _____

Follow the instructions below to complete the charts about extinction. Your charts will look at the relationships among: an extinction event in Earth's past, the Holocene Extinction Event, and the gradual extinction of a species over geologic time.

Instructions: Look at the phrases below. Which extinction or extinctions does the phrase describe? Put an X in each correct column (*Note: Xs may go in more than one column.*) (1 point per row)

	Extinction Event in Earth's Past	Holocene Extinction Event	Gradual Extinction of a Species Over Geologic Time
A background extinction rate of 10–100 species per year			
Greater than 20% of all species on Earth become extinct			
Occurs over a very short period of time			
Occurs over a long period of time			

Instructions: Changes in ecosystems often lead to extinctions or changes in extinction rates. To which extinction or extinctions do these changes apply? Put an X in each correct column (*Note: Xs may go in more than one column.*) (1 point per row)

	Extinction Event in Earth's Past	Holocene Extinction Event	Gradual Extinction of a Species Over Geologic Time
Collision of a large asteroid with Earth			
Evolution of a new predator			
Evolution of a new competitor			
Large amount of volcanic activity			
Movement of the continents			
Rapid change in atmospheric carbon dioxide			
Rapid climate change			

Name: _____

Instructions: Think of an example of each of these extinctions. Read the prompt on the left and fill in your answer in the appropriate column on the right. (1 point per cell)

	Extinction Event in Earth's Past	Holocene Extinction Event	Gradual Extinction of a Species Over Geologic Time
Give the name of a species that became extinct or is at risk of becoming extinct.			
What may have influenced (or is influencing) the extinction of this species?			
What changes that happened to other species may have influenced (or are influencing) this extinction?			

Name: _____

Instructions: Think about the five categories of human activities that can increase rates of extinction. List them in the column on the left. In the right-hand column, give an example of how that category has increased rates of extinction. (1 point per box)

Categories of Human Activities	Example of How These Increase Rates of Extinction

Instructions: Answer the following questions in the spaces provided. (2 points each)

1. How does extinction naturally occur?

2. Can humans affect rates of extinction? If yes, identify examples of how humans can cause such changes.

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