Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project ID: \_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_\_\_

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_

Key:

Green text: Things to do, or general instructions to give, not word for word.

Bold red: Read this word for word. This is mostly text from the students’

packet.

Black text: This is in the student’s booklet, but do not read it to students.

I will read this page to you.

**Part A: Why did the color of the peppered moths change?**

****In the 1950s, the woods and forests in some parts of the US and England were dirty with black soot from factories. The soot covered everything from buildings to trees. The trees in these forests are naturally lighter in color, but the soot from the smoke stacks made them look very dark.

Gradually, from 1959 until today, air pollution laws have led to less air pollution. Because there is less soot produced by the factories, the trees have less soot on them. The old soot gets washed away over time by wind and rain, and the trees’ lighter natural color can again be seen.

There are moths called peppered moths that live on these trees.

They are called peppered moths because they have black speckles on their wings.

In 1959 and the early 1960s, most of the moths that lived in these woods were darker in color. But now, only a few of the moths are darker in color. Most of the moths are lighter in color.

**Problem:** **Why did these changes happen to the peppered moth?** Read the evidence below to help you develop a model of how these changes occurred.

**Evidence #1.** In 1959 and the early 1960s, about 90% of the peppered moths had darker colored wings. Now about 10% of the peppered moths have darker colored wings, and the rest have lighter colored wings.

**Evidence #2.** Scientists found that the dark color on the wings of peppered moths are not stains or dirt from soot or pollution. The color is in the wings. Darker wings are really darker in color, and lighter wings are really lighter.

**Evidence #3.** There is variation in wing color of the pepper moth population. Some moths are very light all over, some are very dark all over, and others are different shades of darker and lighter colors in between, as these pictures show:

****

1. Using this evidence, explain why you think peppered moths’ wings are lighter today but were darker in 1959. You don’t have to know for sure. Just write down your best ideas below. You may also use diagrams or pictures to help you.

|  |
| --- |
| You will have 10 mintues.  Give students 10 minutes. Announce the time remaining at 4 and 1 minutes. |

On this page, write your answer to this question:

**How good do you think your explanation is? Give at least four (4) reasons for your answer.**

You’ll have 7 minutes.

2. How good do you think your explanation is? Give at least **four** (4) reasons for your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. 35 million years ago, a large mammal called moeritherium lived on the earth. Moeritheriums are the ancestors of elephants.

Moeritheriums had small ears and a short snout (or nose). Modern African elephants have big ears and a long trunk. Write an explanation about either the ears or the trunk. (You don’t need to write about both.) Explain why the ears or trunk of a modern day elephant are different from the ears or snouts of moeritheriums. How did the change occur?

Give students 5minutes

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

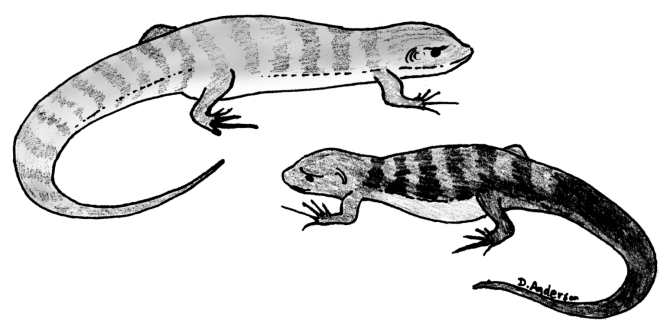
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



**PART B:**

**Canary Island Lizards**



The Canary Islands are a group of seven islands found to the west of Africa. Over time, the islands slowly became colonized with life, like plants, lizards, birds, etc. Scientists found three different species of lizards on the Canary Islands that are similar to one species found on the African continent. Because of this, scientists believe that the lizards traveled from Africa to the Canary Islands by floating on tree trunks that washed out to sea.

**Think like the scientists. Answer each of the questions below according to your current understanding of how animals change and adapt over time. Circle the best answer for each question.** Give students 9 mintues.

1. Lizards eat many kinds of insects and plants. Which answer must be true about the food available for lizards on the Canary Islands?

1. Finding food is not a problem since there is always a large amount of food available.
2. Since lizards can eat many kinds of foods, there is likely to be enough food for all of the lizards at all times.
3. Lizards can get by on very little food, so the amount of food available does not matter.
4. It is likely that sometimes there is enough food, but at other times there is not enough food for all of the lizards.

2. What do you think happens among the lizards of a certain species when there is a small amount of food available?

a. The lizards work together to find food and share what they find.

b. The lizards fight for the available food, and the strongest lizards kill the weaker ones.

c. Lizards go through genetic changes that would allow them to eat new types of food.

d. The lizards least successful in the competition for food are likely to starve and die off.

3. A successful population of lizards is made up of hundreds of individual lizards. On an island, all lizards in a particular lizard population are most likely to…

a. be almost identical, since there is a lot of interbreeding within populations.

b. be the same on the inside but have clear differences in their outside features.

c. be similar but have some important differences in their inside and outside features.

d. be the same on the outside but different in their inside features.

4. Which statement best describes how traits in lizards will be inherited by their offspring (children)?

1. When parent lizards learn to catch insects, their offspring can inherit their specific insect-catching skills.
2. When parent lizards develop stronger claws through repeatedly catching prey, their offspring can inherit their stronger-claw trait.
3. When parent lizards’ claws stay weak because easy food sources are available, their offspring inherit their weakened claws.
4. When a parent lizard is born with an extra finger on its claws, its offspring can inherit six-fingered claws.

5. Scientists say that an animal is “fit” when the animal can be very successful in its environment. Below are descriptions of four fictional female lizards. Which lizard is the “most fit”?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Lizard A | Lizard B | Lizard C | Lizard D |
| Body length | 20 cm | 12 cm | 10 cm | 15 cm |
| Offspring surviving to adulthood | 19 | 28 | 22 | 26 |
| Age at death | 4 years | 5 years | 4 years | 6 years |
| Other Comments | Lizard A is very healthy, strong, and clever | Lizard B has mated with many lizards | Lizard C is dark-colored and very quick | Lizard D has the largest territory of all the lizards |

a. Lizard A

b. Lizard B

c. Lizard C

d. Lizard D

6. Where did the variations in body size in the three species of lizards most likely come from?

1. The lizards needed to change in order to survive, so they developed helpful new traits.
2. The lizards wanted to become different in size, so new traits slowly appeared in the population.
3. There were random genetic changes and sexual reproduction combined traits from different lizards. Both these things created differences in size.
4. The island environment caused genetic changes in the lizards.

7. One species of lizard adapted into three species of lizards over time. What could cause this?

a. Groups of lizards faced different island environments. The lizards needed to become new species with different traits in order to survive.

b. Groups of lizards were separated from other groups because of their geography. Over time, random genetic changes were made in each of these lizard populations.

c. Even though there are minor differences, all lizards are alike. They are all still members of one lizard species.

d. In order to survive, different groups of lizards needed to adapt to the new islands. All of the organisms in each group slowly evolved to become a new lizard species.