"The Deadly Dare" Helping Quadrant

Name_____
Per____

Part A: **Think About It (Independent)**

Thinking Questions:

1. Explain what happens to humans when they eat tetrodotoxin (TTX).
2. Why is TTX **adaptive** for the Newts? (I.E. how does it **help** them **survive?)**
3. What does the word "Detect" mean in paragraph 3?
4. What did scientists do to test whether or not garter snakes could detect poison?
5. Explain why more individual newts have higher poison levels now than in previous generations.

Annotate the Text

1. Highlight, or underline important information.
2. Write comments and questions about the text in the margin.
3. Use arrows to show how information connects through the passage
4. Circle words you don't understand, and try to define them at the bottom
5. Use symbols to mark the text

!	This is INTERESTING.
?	This is CONFUSING.
*	This is VERY important

Criteria for Success: A LEVEL 4 will do the all of the following

- Annotations (underlines and symbols) are found throughout the reading, equaling at least 1 per paragraph.
- Key words AND ideas are highlighted.
- At LEAST 2 additional questions/interactions with the text are written in the margins/empty spaces
- All prepped responses are written neatly & in complete sentences, are detailed and written in own words.
- All group responses are answered correctly using evidence from the text, or from prior learning

The Deadly Dare

In 1979, friends dared a 19-year-old boy in Oregon to swallow a living rough-skinned newt. The boy didn't realize how poisonous rough-skinned newts are. A lethal, fast-acting poison called tetrodotoxin (TTX) oozes from their skin. The boy swallowed the newt whole and started feeling weak a few minutes later. He described a numb feeling all over his body. His friends tried to take him to a hospital, but he refused. Just 20 minutes later, the boy was dead.

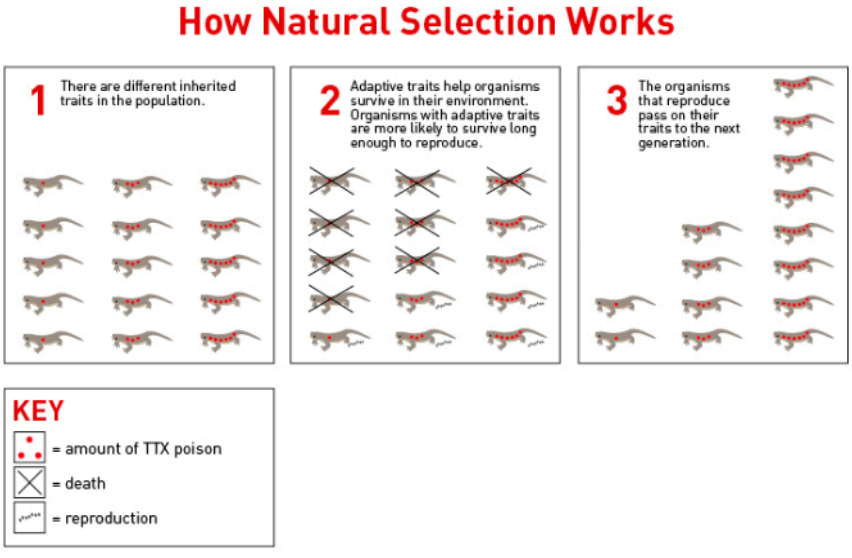
Of course, the newt the boy swallowed died, too. In that particular case, being poisonous didn't help that individual newt survive. If newts have to be eaten in order to defend themselves, being poisonous doesn't sound like a very good defense! How is being poisonous—having a high level of TTX poison—an **adaptive trait** for a rough-skinned newt?

Why Poison Is Adaptive

One reason TTX is **adaptive** is that it acts quickly. A predator that tries to eat a poisonous newt may become sick before it's able to kill the newt, allowing the newt to escape. In fact, TTX acts so quickly that sometimes predators die before finishing their meals. Scientists have observed rough-skinned newts crawling out of dead or paralyzed predators.

Even more important, predators can smell and taste TTX poison. The main **predator** of rough-skinned newts is the garter snake. Scientists have found evidence that garter snakes use their senses of smell and taste to tell whether a rough-skinned newt is too poisonous to eat. They have even observed garter snakes doing quick "taste tests"—licking rough-skinned newts before deciding whether to eat them.

Scientists have studied whether garter snakes are able to **detect** TTX poison in newts. Biologists have placed one newt and one garter snake together in a cage to see whether the snake would eat the newt. They have tried this test over and over again, using different snakes and different newts. Even though the newts are placed directly in front of the snakes, not every newt gets eaten! Biologists are able to consider the cause-and-effect relationship between high poison levels and survival in newts by examining a population of newts with **high variation.** The newts in the test range from having no poison to having very high levels of TTX in their bodies. In these tests, the snakes consistently eat the newts with the lowest levels of TTX, and do not eat the newts with high levels of TTX. *These results are **evidence** that garter snakes can detect TTX and that they prefer to eat rough-skinned newts with lower levels of TTX.* The more poisonous a rough-skinned newt is, the less likely it is to be eaten by a garter snake. That means high levels of TTX are an adaptive trait in rough-skinned newts that live near garter snakes.



How Adaptive Traits Spread

If snakes are in its environment, a poisonous newt is less likely to die from being eaten than a newt that isn't poisonous. The newts that don't get eaten have a better chance of living longer, and that's important because it means more chances to **reproduce**. Organisms have to **reproduce** in order to pass on their **genes**, which are the instructions for making the **protein molecules** that determine **traits**: *if they don't reproduce, **their traits die with them**. In the newt population, newts that are more poisonous are more likely to survive long enough to reproduce and pass down their genes, and therefore the trait of being poisonous, to the next generation. As a result, there will be more and more highly poisonous rough-skinned newt individuals in each generation.* This will cause the **distribution** of traits in the population to change over many generations, because more individuals in the population will now have the poisonous trait than in the previous generation. Scientists call this process **natural selection**. This process does not only happen in rough-skinned newts. It has been observed in populations of different species all over the world.

Part B: **Share What You Learned (Groups of 4, but first prepare your own responses before you share with your partners)**

Directions:
As a group, share your answers out loud to each other.
THEN, re-write your answers so that they reflect what is MOST correct (like a 50-50 quiz answer :), make sure to include text evidence to support your responses)

1. Having tetrodotoxin (TTX) ooze from a newt's skin is considered adaptive because...

This is supported in the text in paragraph _____ where it states "

2. In newt populations where there is high amounts of poison-level variation, newts with **high / low** levels of poison are **more / less** likely to pass on their traits because....

This is supported in the text in paragraph _____ where it states "

3. After many generations, it is likely that there will be **more / less / the same amount of** individuals with a high poison-level trait because...

This is supported in the text in paragraph _____ where it states "

GROUP QUESTION YOU MAY NOT LEAVE UNTIL THIS IS DONE

1. **Label** each trait level (1-10) on the histograms below as *more likely* to survive with a **+s,** and *less likely* to survive with a **-s**

2. **Predict** how the poison-level trait distribution will change after 50 generations by **drawing** new bars on the Gen 50 histogram (higher bars = more individuals with that trait, lower bars = less individuals with that trait.

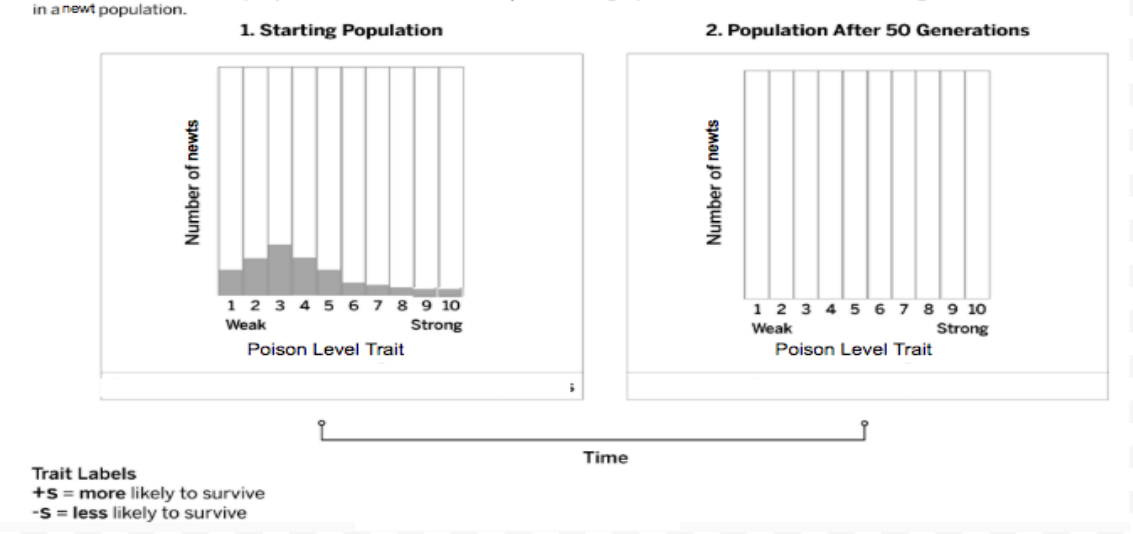
3. **Explain** your reasoning for how you shaded in your histogram to reflect the change in trait distribution.

To get a 4...

- **correctly label** each trait level as more or less likely to survive using the symbols
- **correctly draw** how the traits would be distributed in gen. 50
- use the words **adaptive trait, natural selection, reproduce, survive, distribution, change, cause, effect, individuals** in your explanation

Poison Level Explanation

Goal: Create a model to help explain to someone how adaptive traits get passed down and how that can change the distribution of traits in a newt population.



Explanation:
We changed the trait distribution in generation 50 to show that_____
_____
_
We did this because_____