Name: _____ **Date:** _____

Section: _____

Aquarium Simulator Activity

The Mystery of the Murky Aquarium

Phase 1: ENGAGE (5 minutes)

Getting Started: Open peebedu.com and navigate to Aquarium Simulator

Read the introduction popup to learn about the nitrogen cycle.

The Problem: Your friend just got a new aquarium and added 10 goldfish right away. After a week, the water turned brown and cloudy, and some fish got sick. What went wrong? _____

Think-Pair-Share: THINK (1 minute): Write your initial idea about what might have happened:

PAIR (2 minutes): Turn to your partner and share your ideas. Write one new idea you heard:

SHARE (2 minutes): Be ready to share with the class!

Phase 2: EXPLORE (15 minutes)

Let's investigate step-by-step what happens in a fish tank!

Part A: Fish and Their Effects Start with an empty tank. Click '`Add Fish`' and add 2 guppies.

- **Predict:** What will happen when you add fish? _____

Track the changes over time:

—— 0 Added 2 guppies _____ Pattern I Notice ———— Only ammonia present _____ _____

Pattern Check with Partner:

- What pattern do you see in how the compounds change? _____

Part C: Plants Join the System Add aquatic plants and observe:

- **Predict:** What will plants do to the nitrogen compounds? _____

Phase 3: EXPLAIN (10 minutes)

Making Sense of the Nitrogen Cycle

Work with your group to complete:

Pattern Detective: List 3 patterns you discovered:

- Pattern 1: When fish are added, _____

- Pattern 3: Plants affect _____

Cause and Effect Chain: Fill in what causes what: _____ Fish eat → Fish produce _____ → Bacteria convert _____ to _____ → More bacteria convert _____ to _____ → Plants use _____

Making a Claim: Complete this CER (Claim-Evidence-Reasoning):

CLAIM: The nitrogen cycle needs different organisms working together

EVIDENCE: (Use specific observations)

- Fish: _____

- Plants: _____

REASONING: Each organism has a role because _____

Group Share: Draw a diagram showing how all the parts connect!

Phase 4: ELABORATE (10 minutes)

The Aquarium Challenge!

Your group will investigate one of these '`What if?`' scenarios:

Group A: What if you never do water changes? _____ **Group B:** What if you add only plants (no fish)? _____ **Group C:** What if you overfeed the fish daily? _____ **Group D:** What if you add all three types of bacteria? _____

Your Investigation: Test your scenario in the simulator for 2 minutes Record your most important finding:

Create a 30-second presentation to teach the class your discovery!

Phase 5: EVALUATE (5 minutes)

Understanding Check:

Pattern Recognition: Describe the pattern of nitrogen changes you observed: _____ First _____ appears, then _____, finally _____

Predict: Your friend sets up a new tank with 5 goldfish but no bacteria. What will happen over the first week? Why?

Systems Thinking: If all the bacteria in an aquarium died, what would happen to:

- The fish: _____

- The plants: _____

Model Evaluation (Discuss, then write):

- One pattern this model shows really well: _____

Take Home: Complete the Model Evaluation Form

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Sentence Starters for Discussions:

- ‘`I noticed that when...`‘
- ‘`The data shows...`‘
- ‘`I think this happens because...`‘
- ‘`Compared to my partner’s results...`‘

Key Vocabulary Box:

- **Ammonia (NH_3):** Toxic waste from fish
- **Nitrite (NO_2^-):** Less toxic, made from ammonia by bacteria

- **Nitrate (NO_3^-):** Least toxic, plant food
- **Nitrogen Cycle:** How nitrogen moves through living things

Key Vocabulary

See activity for vocabulary specific to this topic.