

Connected Tank

Trace how parts of an aquaponics system depend on one another.

8.5.D "examine and model the parts of a system and their interdependence in the function of the system;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each part of the aquaponics system. Number each sentence that explains how a change in one part affects another part.

A School Aquaponics System

- ① At Lincoln Middle School, a small aquaponics tank grows tilapia and lettuce in one connected system. Fish eat measured food and release waste into the water. A pump moves the water from the fish tank through a filter and into trays holding lettuce roots. The plants do not grow in soil. Their roots take nutrients from the moving water, while clean water returns to the fish tank. Electricity powers the pump, and a timer turns the grow lights on and off each day.
- ② The system works because each part affects other parts. Helpful bacteria in the filter change fish waste into forms of nitrogen that lettuce can use. If the pump stops, water no longer carries waste to the bacteria or nutrients to the roots. The fish tank may become polluted, and the lettuce may lack nutrients. If the lights stay off for several days, lettuce makes less food through photosynthesis. Then the plants remove fewer nutrients, which can also lower water quality for the fish.
- ③ Students check the system each morning. They observe water level, water temperature, fish behavior, and the color of the lettuce leaves. When evaporation lowers the water level, they add treated water so the pump can keep moving water safely. When leaves become pale, students test for nutrient problems and check whether the filter is working. Their observations lead to actions that protect connected parts. This feedback helps the group adjust the system before one problem causes several failures.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 How does the pump connect the fish, bacteria, and lettuce in this system?

2 What could happen to both the fish tank and the lettuce if the pump stops? Use details from the passage.

3 Explain how several days without grow lights can eventually affect the fish.

4 How do students use feedback to prevent a system failure when the water level is low?

3 YOUR TURN _____ Your own words

Model a bicycle as a system. Complete the table with four parts, each part's job, and how its failure would affect a connected part or the bicycle's function.

PART	JOB	CONNECTION AND EFFECT IF IT FAILS

PART 1 • READ AND MARK

Underline each part of the aquaponics system. Number each sentence that explains how a change in one part affects another part. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How does the pump connect the fish, bacteria, and lettuce in this system?	The pump moves water carrying fish waste to the filter bacteria and moves nutrient-containing water to the lettuce roots.
2	What could happen to both the fish tank and the lettuce if the pump stops? Use details from the passage.	The fish tank may become polluted because waste is not carried to the bacteria, and the lettuce may lack nutrients because water is not carried to its roots.
3	Explain how several days without grow lights can eventually affect the fish.	Without lights, lettuce makes less food through photosynthesis. The plants then remove fewer nutrients from the water, which can lower water quality for the fish.
4	How do students use feedback to prevent a system failure when the water level is low?	They observe the low water level and add treated water so the pump can continue moving water safely.

PART 3 • YOUR TURN (SAMPLE ANSWER)

PART	JOB	CONNECTION AND EFFECT IF IT FAILS
Pedals	Provide the rider's force	The pedals turn the chain. If pedals cannot turn, the chain cannot move the bicycle forward.
Chain	Transfers turning force	The chain transfers force from pedals to the rear wheel. If it breaks, the rear wheel is not driven.
Rear wheel	Moves the bicycle forward	The rear wheel receives force from the chain. If it is flat, the bicycle cannot roll effectively.
Brakes	Slow or stop the wheels	Brakes act on the wheels. If brakes fail, the rider cannot safely control the bicycle's stopping.

Accept equivalent descriptions of system parts and cause-and-effect links supported by the passage. For the bicycle model, accept other accurate parts if each row states a job and a realistic dependency or failure effect.