

Pulse Back

Use an investigation plan to connect changing heart rate with homeostasis.

HS-LS1-3 "Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Clarification Statement: Examples of investigations could include heart rate response to exercise..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each planned pulse measurement, circle each condition that should stay the same, and number the three ideas in the feedback pattern: disturbance, response, and return toward stability.

Tracking a Return to Balance

- ① During a basketball practice, a student noticed that her pulse sped up during repeated sprints and slowed after she rested. Her body needed to deliver more oxygen to working muscles and remove carbon dioxide, but it also needed to keep internal conditions within a safe range. This pattern can be investigated as a feedback mechanism. A change, such as increased activity, acts as a disturbance. The body responds by changing heart rate. As the need decreases during recovery, heart rate moves back toward its resting level. Returning toward a stable internal condition is evidence of homeostasis.
- ② To test this idea, a class could plan a safe, repeated investigation with volunteers who have permission to participate. Each volunteer would sit quietly for five minutes, then measure pulse for 30 seconds to establish a baseline. Next, each person would perform the same moderate stepping activity for two minutes. The class would measure pulse immediately afterward and again after one, three, and five minutes of seated recovery. The activity length, step pace, counting time, and recovery position should stay the same for every trial. A data table and line graph can show how heart rate changes over time.
- ③ Results from several volunteers will not be identical. Fitness, sleep, stress, medicines, and counting errors may affect individual pulse measurements. Repeating the procedure and comparing the overall pattern makes the evidence stronger than relying on one person's result. If most graphs rise after stepping and then decline toward each volunteer's baseline during recovery, the class has evidence that heart rate response helps maintain homeostasis. The data do not prove that every person's pulse returns at the same speed or to the exact original number. A careful conclusion describes the pattern, names the evidence, and recognizes limits of the investigation.

2 ANSWER WITH EVIDENCE Use the passage

1 What measurement establishes each volunteer's baseline, and why is that baseline useful?

2 What pulse data should the class collect to show the response to stepping and recovery?

3 Name two conditions that should stay the same in this investigation. Why should they be controlled?

4 What graph pattern would support the claim that heart rate response helps maintain homeostasis? State one limit of that conclusion.

3 YOUR TURN Your own words

Write a 5 to 7 sentence plan for an investigation using young plants to test whether water level affects root development as a response that can help maintain water balance. Include a question, groups, what you will change and measure, conditions you will control, repeated trials, and the result that would count as evidence.

PART 1 • READ AND MARK

Underline each planned pulse measurement, circle each condition that should stay the same, and number the three ideas in the feedback pattern: disturbance, response, and return toward stability. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What measurement establishes each volunteer's baseline, and why is that baseline useful?	The volunteer measures pulse for 30 seconds after sitting quietly for five minutes. The baseline provides a resting value for comparison with later measurements.
2	What pulse data should the class collect to show the response to stepping and recovery?	Measure pulse at baseline, immediately after stepping, and after one, three, and five minutes of seated recovery.
3	Name two conditions that should stay the same in this investigation. Why should they be controlled?	Possible controls include activity length, step pace, pulse-counting time, and recovery position. Keeping them the same makes comparisons among trials fair.
4	What graph pattern would support the claim that heart rate response helps maintain homeostasis? State one limit of that conclusion.	Most heart rates should rise after stepping and then decline toward each person's baseline during recovery. The data cannot show that every person's pulse returns at the same speed or exact original number.

PART 3 • YOUR TURN (SAMPLE ANSWER)

My question is whether bean seedlings given less water develop roots differently from seedlings given regular water. I will randomly assign 12 similar seedlings to two groups in identical pots. Both groups will have the same soil, light, temperature, and 14-day growing period. One group will receive 20 mL of water each day, while the other will receive 40 mL. I will record soil moisture and, at the end, measure the deepest root of each plant. I will calculate each group's average root depth and graph the results. If the lower-water group has consistently deeper roots while remaining healthy, that pattern would support a response to reduced water that could help maintain water balance.

Accept equivalent descriptions of the heart rate investigation when students identify baseline, repeated measurements, controlled conditions, and a rise followed by movement toward baseline. For the open task, accept other safe investigations if they include a measurable response, a changed condition, controls, repeated trials, and evidence connected to maintaining internal balance.