PEEBEDU

Plant Response Simulator

Name: _____ **Period:** _____ **Date:** _____

> Open **peebedu.com** and navigate to **Plant Response Simulator**. Click the **Start Exploring!** button to begin. Read the introduction popup, which describes two plant responses: Phototropism (growth toward light) and Photoperiodism (flowering based on day length).

Part 1 — Model Evaluation (MAPP Framework)

Scientific models are simplified representations of complex biological phenomena. Use the MAPP framework below to evaluate the Plant Response Simulator as a scientific model.

M — Mode

What type of model is the Plant Response Simulator? Describe how this computational simulation represents plant responses to environmental stimuli. In your answer, identify at least three specific simulation elements and explain what each one is designed to show about how plants respond to their environment.

A — Accuracy

(a) Identify two things this simulation represents **accurately** about plant responses to environmental changes. For each, name the specific simulation feature and explain what aspect of plant behavior it demonstrates.

(b) Identify two things this simulation **oversimplifies or leaves out** about plant responses. Consider what you cannot observe in the simulation that would be important for a complete understanding of how organisms respond to environmental cues.

P — Purpose

What is the learning goal of this simulation? Explain how the Plant Response Simulator is designed to help you understand how organisms respond to changes in their environment through behavioral and physiological mechanisms. In your answer, connect at least one specific simulation feature to an ecological example of why that response matters for plant survival.

P — Permanency

Could this model change with new scientific evidence? Describe one way that new discoveries might change or improve a simulation like the Plant Response Simulator. Explain why scientific models, including computational simulations, are revised as new evidence becomes available.

Small-Group Discussion

With your group, discuss the following:

- What are the strengths of this simulation as a model for plant responses?
- What are its limitations?
- If you could add one feature to improve this simulation, what would it be and why?
- How does the simulation help you connect observable plant behaviors to underlying biological mechanisms?

Part 2 — Free Response Questions

Conceptual Analysis

Question 1 — Phototropism and Environmental Response

> *Simulation Task: In the Phototropism tab, drag the sun to the far left of the screen and observe the plant's response. Then drag the sun to the far right and watch how the plant changes direction. Pay attention to where the auxin dots accumulate and which side of the stem grows faster.*

(A) (1 pt) **Describe** how plants respond to changes in the direction of a light source in their environment.

(B) (1 pt) **Explain** how the unequal distribution of auxin observed in the simulation leads to differential growth that causes the plant stem to bend toward the light source.

(C) (1 pt) **Predict** what would happen to a plant growing in a dense forest where light is only available from directly above through a small canopy gap, compared to a plant growing in an open field with light available from all directions.

(D) (1 pt) **Justify** how phototropism provides a selective advantage to plants competing for limited light resources in a natural ecosystem.

EK 8.1.A.1

Analyze Model / Visual Representation

Question 2 — Photoperiodism and Seasonal Flowering

> *Simulation Task: Switch to the Photoperiodism tab. Set the day length slider to 8 hours and observe which plants flower. Then slowly increase the day length to 16 hours, noting at what point each plant type begins or stops flowering. Record which plants are flowering at 8 hours, 12 hours, and 16 hours.*

(A) (1 pt) **Describe** how photoperiodism allows plants to respond to seasonal changes in their environment.

(B) (1 pt) **Explain** how the ability to detect and respond to changes in day length enables plants to coordinate their flowering with environmental conditions that maximize reproductive success.

(C) (1 pt) **Represent** the flowering responses of all three plant types at two different day lengths.

Draw your diagram here.

(D) (1 pt) **Explain** how photoperiodism could have evolved in plant populations using principles of natural selection.

EK 8.1.A.1, 8.1.A.2