Lesson Self-Check

CAN YOU EXPLAIN IT?

FIGURE 14: Both robots and humans are complex systems.

Robots have many of the capabilities of humans, including taking in and processing information and completing many of the same tasks as humans. Robots can be used to complete tasks that are too dangerous or difficult for humans to complete.

Some robots are built to perform a specific task and do not resemble any sort of organism. Other robots, though, may have human-like forms and could be used to provide companionship or health care. When promoting one of their humanoid robots, similar to the one in Figure 14, an imaginary robotics company claims, "This living machine is the perfect companion."

Explain Refer to the notes in your Evidence Notebook to explain whether or not a robot fits the criteria of a living system. Consider the following questions when developing your explanation:

1. Which properties of systems does the robot have, and which does it not?
2. Which properties of living things does the robot have, and which does it not?
3. What potential emergent properties could this robot have?

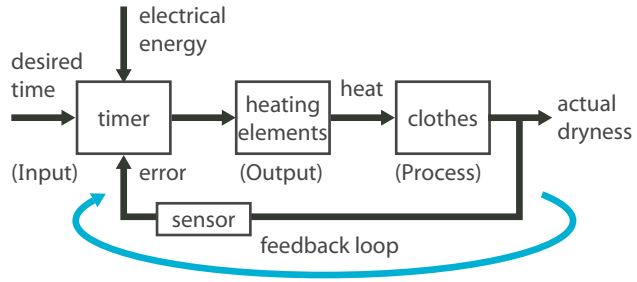
For each of the above questions, include specific examples and evidence to support your claims.

CHECKPOINTS

Check Your Understanding

Use the diagram to answer Questions 1–5.

FIGURE 15: This conceptual model shows the basics of how a dryer works.



1. How does the sensor interact with the other components of this system?
   - **a.** The sensor detects the heat of the clothes and makes the timer generate more heat.
   - **b.** The sensor detects the dryness of the clothes and then sends information to the timer.
   - **c.** The sensor detects whether the heating element is functioning properly and then sends input to the timer.
   - **d.** The sensor detects how much time is left and sends input to the heating element to increase or decrease the heat.

2. Which of these is not a direct input for the timer in this system?
   - **a.** time manually entered by the user
   - **b.** electrical signals from the sensor
   - **c.** dryness of the clothes
   - **d.** heat from the heating element
   - **e.** electricity from the wall outlet

3. Given the model, would you say this system is a closed system or an open system? Explain your answer.

4. Explain how the feedback loop works in this model.

5. Would a small load of laundry take longer to dry than a larger load? Use the diagram to explain your answer.

6. What is an emergent property?
   - **a.** a property that a system has but that its individual component parts do not have
   - **b.** a new property exhibited by a component of a system
   - **c.** a property of an individual component but not the system as a whole
   - **d.** a property that is not always exhibited by a system

7. Pick two of Earth's spheres (biosphere, atmosphere, geosphere, hydrosphere), and draw a model showing how these two systems interact. Your model should show components of these systems, at least one way these components interact, and inputs and outputs that move from one system to another.

8. Is movement a characteristic of living things? Explain why this characteristic should or should not be considered a characteristic of living things, giving specific examples to support your claim.

9. Explain what a feedback loop is using the terms *input, output*, and *homeostasis*.

MAKE YOUR OWN STUDY GUIDE

In your Evidence Notebook, design a study guide that supports the main idea from this lesson:

Models can be used to illustrate the relationships between components of living and nonliving systems.

Remember to include the following information in your study guide:

- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider the properties of systems and system models and how systems can be used to model the levels of organization within living organisms.