

Name _____

Systems in Thermodynamics: Open, Closed, and Isolated

Open-Ended Response Answer Key

1. The self-sustaining ecosystem in a glass jar would be a closed system. While it exchanges energy with the surroundings (light enters and heat escapes), it is designed to keep matter (the organisms, soil, and air inside the jar) contained. This containment allows for studying the interactions within the ecosystem without external influences.
2. Thermodynamics plays a crucial role in understanding energy conversion processes, including those in solar panels. Solar panels convert sunlight into electricity while adhering to the principles of energy conservation in closed systems. The absorbed sunlight's energy is converted into electrical energy, demonstrating the preservation of energy within the closed system of the solar panel.
3. Scientists encounter challenges in achieving perfect isolation due to the inevitability of some interactions with the outside environment, such as heat transfer. To minimize these interactions, precautions include using highly insulated containers, vacuum chambers, and precise control over experimental conditions. This is necessary because isolated systems are essential for understanding fundamental scientific principles without external influences affecting the results.
4. Closed systems are valuable in chemistry experiments because they allow chemists to control the environment within the system, preventing substances from escaping or entering. This control is crucial for accurately studying chemical reactions and transformations, especially when measuring changes in mass, volume, or concentration. Closed systems help ensure that the observed changes are solely due to the reactions occurring within the system, leading to more precise and reliable results in chemical research.

