First Law of Thermodynamics Quiz Answer Key PDF

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What type of system allows energy exchange but not matter exchange?

A. Open system

B. Closed system ✓

C. Isolated system

D. None of the above

Provide an example of an adiabatic process and explain its characteristics.

An example of an adiabatic process is the expansion of air in a piston where the gas expands without heat exchange with the environment, leading to a decrease in temperature.

What is the significance of the First Law of Thermodynamics in understanding energy conservation?

The First Law of Thermodynamics is significant because it establishes that the total energy in a closed system is conserved, meaning energy can only change forms but cannot be created or destroyed.

Which processes are characterized by no heat exchange? (Select all that apply)

A. Isothermal

B. Adiabatic ✓

C. Isochoric

D. Isobaric

Which of the following are state functions? (Select all that apply)

A. Internal energy ✓

B. Work

C. Heat

D. Temperature ✓

Which of the following statements about energy conservation are true? (Select all that apply)

A. Energy can be transformed from one form to another. ✓
B. Total energy in an isolated system remains constant. ✓
C. Energy can be created in a closed system.
D. Energy can be destroyed in an open system.

In which type of system is neither energy nor matter exchanged with the surroundings?

A. Open system
B. Closed system
C. Isolated system ✓
D. None of the above

Which unit is used to measure energy in the International System of Units (SI)?

A. Calorie
B. Watt
C. Joule ✓
D. Newton

What is the main principle of the First Law of Thermodynamics?

A. Energy can be created and destroyed.
B. Energy cannot be created or destroyed, only transformed. ✓
C. Energy is always conserved in open systems.
D. Energy is independent of mass.

Describe the difference between an open system and a closed system in thermodynamics.

In thermodynamics, an open system is one that can exchange both energy and matter with its environment, whereas a closed system can exchange energy but not matter.

Which systems allow for the exchange of both energy and matter? (Select all that apply)

A. Open system ✓
B. Closed system
C. Isolated system
D. None of the above

Explain how the First Law of Thermodynamics applies to a refrigerator.

A refrigerator operates by removing heat from its interior and expelling it to the environment, thereby maintaining a lower temperature inside. This process adheres to the First Law of Thermodynamics, as the energy used to remove heat is derived from electrical energy, demonstrating that energy is conserved and transformed rather than created or destroyed.

In an adiabatic process, what is the value of heat transfer (Q)?

A. Positive
B. Negative
C. Zero ✓
D. Equal to work done

Which process occurs at constant volume?

A. Isothermal
B. Adiabatic
C. Isochoric ✓
D. Isobaric

What happens to the internal energy of a system if the work done by the system is greater than the heat added?

A. Increases
B. Decreases ✓
C. Remains constant
D. Beecomes zero

What factors can change the internal energy of a system? (Select all that apply)

A. Heat added to the system ✓
B. Work done by the system ✓

C. Change in system volume

D. Change in system temperature ✓

In an isothermal process, what remains constant?

A. Pressure

B. Volume

C. Temperature ✓

D. Internal energy

In an isobaric process, which of the following is true? (Select all that apply)

A. Pressure remains constant ✓

B. Volume remains constant

C. Work done is PΔV ✓

D. Temperature remains constant

How does the First Law of Thermodynamics relate to energy efficiency in engines?

The First Law of Thermodynamics relates to energy efficiency in engines by indicating that the total energy input must equal the sum of useful work output and energy losses, thus limiting the maximum efficiency achievable.

Discuss the implications of the First Law of Thermodynamics for renewable energy sources.

The implications of the First Law of Thermodynamics for renewable energy sources include the necessity to harness and convert natural energy flows (like solar, wind, and hydro) into usable energy, while ensuring that energy losses are minimized to maintain sustainability.