Halliday/Resnick/Walker
Fundamentals of Physics 8th edition

Classroom Response System Questions

Chapter 20 Entropy and the Second Law of Thermodynamics

Reading Quiz Questions
20.1.1. Which of the following situations is considered to be a reversible process?

a) A raw egg is thrown from a second story window to the ground below.

b) The pizza is put into the 425 °F oven and baked for 15 minutes.

c) After the party, Joe damages his car by striking a traffic light.

d) The tornado levels an entire neighborhood.

e) None of these are reversible processes.
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c) After the party, Joe damages his car by striking a traffic light.

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e) None of these are reversible processes.
20.2.1. Which one of the following statements best describes a reversible process?

a) All heat input into the system is converted into work during the process.

b) The overall entropy of the system does not increase during the process.

c) The initial and final temperatures for the process are the same.

d) The entropy of the system decreases during the process.

e) Statements (b) and (c) both describe a reversible process.
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20.2.2. In which of the following systems does an increase in the entropy occur during an irreversible process in the system?

a) a closed system

b) an ideal gas system

c) an open system

d) a allotropic system

e) a cladistic system
20.2.2. In which of the following systems does an increase in the entropy occur during an irreversible process in the system?

a) a closed system
b) an ideal gas system
c) an open system
d) a allotropic system
e) a cladistic system
20.2.3. According to the text, how does entropy differ from energy?

a) Entropy does not obey a conservation law.

b) Entropy may be spelled differently, but otherwise it is a form of energy.

c) Entropy always remains constant.

d) Entropy relates to the transfer of energy.

e) Energy can only decrease, but entropy can only increase.
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20.3.1. In which one of the following processes will there be no net change in the entropy of the system described?

a) gasoline is combusted in the engine of a truck

b) a block of paraffin is melted in a pan on top of a stove

c) a crystal is grown as a rod is pulled from a container of molten silicon

d) in a closed vessel, benzene is first evaporated and then allowed to condense

e) the cells of a fertilized egg double in number as it grows
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20.3.2. Which of the following choices exhibits the lowest degree of entropy?

a) a diamond crystal

b) liquid oxygen

c) ammonia vapor

d) water in a pond

e) a block of paraffin
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a) a diamond crystal
b) liquid oxygen
c) ammonia vapor
d) water in a pond
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20.3.3. Which one of the following statements correctly describes the term *state property*?

a) A state property gives a complete description of the system.

b) A state property describes any system property that is conserved.

c) A state property indicates which microstate the system is in.

d) A state property is a property that does not depend on the history of the system.

e) A state property describes the amount of heat added to or removed from a system.
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e) A state property describes the amount of heat added to or removed from a system.
20.4.1. Which one of the following statements is consistent with the second law of thermodynamics?

a) The temperature of an ice cube can sometimes be lowered as it spontaneously gives heat to the surroundings.

b) Heat flows spontaneously from a hot object to a cooler object.

c) The internal energy of a system is determined by the flow of heat into or out of the system and the amount of work done.

d) The specific heat capacity at constant volume of a monatomic gas is different than that of a diatomic gas.

e) A refrigerator can cool the room it is in if the door is left open.
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20.4.2. A block that slides on a rough surface slows down and eventually stops. The reverse process never occurs. That is, a block at rest never begins to move and accelerate on a rough surface without the action of an external agent. The second situation is forbidden because it would violate which of the following choices.

a) second law of thermodynamics

b) first law of thermodynamics

c) both the first and second laws of thermodynamics

d) conservation of momentum

e) conservation of total energy
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b) first law of thermodynamics
c) both the first and second laws of thermodynamics
d) conservation of momentum
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20.4.3. What, if anything, occurs within a closed system with regard to its entropy, according to the second law of thermodynamics?

a) The entropy of the closed system can only increase.

b) The entropy of the closed system can only decrease.

c) The entropy of the closed system can only remain constant.

d) The entropy of the closed system can either remain constant or increase.

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20.5.1. Which one of the following statements best describes the operation of a heat engine?

a) A heat engine transfers heat from a higher temperature reservoir to a lower temperature reservoir through work performed on the system.

b) A heat engine transfers heat from a lower temperature reservoir to a higher temperature reservoir through work performed on the system.

c) A heat engine performs work and generates an equal amount of heat in a cyclic process.

d) A heat engine decreases the entropy of the universe by generating an equal amount of heat and work.

e) A heat engine uses input heat to perform work and rejects excess heat to a lower temperature reservoir.
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e) A heat engine uses input heat to perform work and rejects excess heat to a lower temperature reservoir.
20.5.2. Which one of the following statements concerning heat engines is false?

a) A heat engine receives heat from a hot reservoir.

b) A heat engine is a device that uses heat to do work.

c) Heat engines generally operate near one hundred percent efficiency.

d) Part of the heat input to the engine is used to do work by the working substance within the engine.

e) Part of the input heat is rejected to a cold reservoir.
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d) Part of the heat input to the engine is used to do work by the working substance within the engine.

e) Part of the input heat is rejected to a cold reservoir.
20.5.3. Which one of the following statements concerning the efficiency of a Carnot heat engine is true?

a) The efficiency of an irreversible engine is typically greater than that of a reversible engine operating under the same circumstances.

b) The efficiency is dependent on whether an ideal or a non-ideal gas is used.

c) One hundred percent efficiency would be possible if the engine can be operated in reverse.

d) The efficiency is not dependent on the temperatures of the hot and cold reservoirs.

e) One hundred percent efficiency would be possible if heat could be rejected into a cold reservoir at zero kelvin.
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20.5.4. Heat engines are often used to do work for humans. The rejected heat that goes to the cold reservoir is a source of what that may be environmentally harmful?

a) air pollution

b) thermal pollution

c) water pollution

d) ozone depletion

e) friction
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b) thermal pollution
c) water pollution
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e) friction
20.5.5. Consider the following types of processes: (1) adiabatic, (2) isobaric, (3) isothermal, and (4) isochoric. Which of these processes occurs during a Carnot cycle?

a) 1 and 2 only

b) 3 and 4 only

c) 1 and 3 only

d) 1, 2, and 3 only

e) 1, 3, and 4 only
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20.5.6. The amount of work that can be done when heat transfers between two objects depends on the amount of heat and which of the following properties?

a) pressure within the system

b) mass of the two objects

c) heat capacities of the two objects

d) volume of the two objects

e) temperatures of the objects
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20.5.7. Which one of the following statements concerning an ideal engine is true?

a) The entropy of the system decreases with time.

b) No heat transfer occurs between the system and its surroundings.

c) All system processes are reversible.

d) The temperature of the system is usually constant.

e) The system cannot be used to perform work.
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20.6.1. Which one of the following statements best describes a refrigeration process?

a) Work is done on a system that extracts heat from a cold reservoir and rejects it into a hot reservoir.

b) Work is done on a system that extracts heat from a hot reservoir and rejects it into a cold reservoir.

c) Work is done by a system that extracts heat from a cold reservoir and rejects it into a hot reservoir.

d) Work is done by a system that extracts heat from a hot reservoir and rejects it into a cold reservoir.

e) Heat is extracted from a cold reservoir and rejected to a hot reservoir and the system does work on the surroundings.
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e) Heat is extracted from a cold reservoir and rejected to a hot reservoir and the system does work on the surroundings.
20.6.2. The quality of a refrigeration process is expressed by which of the following parameters?

a) coefficient of thermal expansion

b) efficiency

c) Carnot parameter

d) thermal factor

e) coefficient of performance
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e) coefficient of performance
20.6.3. Which one of the following statements concerning an ideal refrigerator is true?

a) The coefficient of performance is equal to one.

b) No heat transfer occurs between the system and its surroundings.

c) All system processes are reversible.

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20.7.1. Which one of the following statements concerning real engines is true?

a) Real engines are superior to Carnot engines.

b) Real engines are allowed to violate the second law of thermodynamics.

c) Real engines have processes that are reversible and occur without energy losses.

d) The efficiency of a real engine is always less than or equal to that of a Carnot engine.

e) All real engines are based on the Stirling engine rather than the Carnot engine.
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20.8.1. Which one of the following is a basic assumption of statistical mechanics?

a) All microstates are improbable.

b) All microstates are equally probable.

c) The entropy of a system cannot decrease.

d) Energy is conserved in all thermodynamic processes.

e) Momentum is conserved in all thermodynamic processes.
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20.8.2. There are one hundred indistinguishable particles in a box. The particles may occupy one of two microstates, labeled A and B. How does the probability of there being 50 particles in each microstate compare with the probability of finding 100 particles in one of the two states?

a) The probability of finding 100 particles in one microstate is equal to the probability of finding 50 particles in each microstate.

b) The probability of finding 100 particles in one microstate is slightly less than the probability of finding 50 particles in each microstate.

c) The probability of finding 100 particles in one microstate is slightly greater than the probability of finding 50 particles in each microstate.

d) The probability of finding 100 particles in one microstate is much less than the probability of finding 50 particles in each microstate.

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