

Heat & Internal Energy

- 1) How can energy be transferred to or from a system?
- A) Energy can only be transferred as potential energy being converted to kinetic energy.
 - B) Energy can be transferred only as heat.
 - C) Energy can be transferred only as work.
 - D) Energy can be transferred as heat and/or work.
- 2) Which of the following is an example of a state function?
- A) The length of time it takes to go from New York to Los Angeles
 - B) The mileage traveled going from San Francisco to Los Angeles
 - C) The amount of time it takes to change the channel when *Gossip Girl* comes on.
 - D) The difference in altitude between Chicago and Denver
- 3) Which of the following is NOT a state property?
- A) pressure
 - B) work
 - C) internal energy
 - D) temperature
- 4) Which of the following is the best example of an isolated system?
- A) water in a Styrofoam coffee cup
 - B) liquid in a beaker with a watch glass over it
 - C) soda in an unopened soft drink can
 - D) coffee in a closed thermos bottle
- 5) How does a closed system differ from an open system?
- A) A closed system does not do any work on the surroundings.
 - B) A closed system cannot exchange matter with the surroundings.
 - C) Energy is conserved in a closed system, but not in an open system.
 - D) A closed system cannot exchange heat with the surroundings.
- 6) A chemical reaction where heat is transferred to the surroundings is a(n) _____ reaction.
- 7) Which of the following is an endothermic process?
- A) jet fuel burning in a jet engine
 - B) combustion of methane
 - C) freezing of water
 - D) vaporization of water
- 8) Which is true if $q = -95 \text{ J}$?
- A) Both the system and the surroundings are gaining 95 J.
 - B) Both the system and the surroundings are losing 95 J.
 - C) The system is gaining 95 J, while the surroundings are losing 95 J.
 - D) The system is losing 95 J, while the surroundings are gaining 95 J.
 - E) The system is losing -95 J, while the surroundings are gaining 95 J.

9) Which of the following signs on q and w represent a system that is doing work on the surroundings, as well as losing heat to the surroundings?

- A) $+q, +w$
- B) $-q, -w$
- C) $+q, -w$
- D) $-q, +w$

10) How much heat is needed to raise the temperature of 5.28 gal of water from $25.0\text{ }^{\circ}\text{C}$ to $88.0\text{ }^{\circ}\text{C}$?
(1 gal = 3.785 L)?

11) 14.0 g of metal at $24.0\text{ }^{\circ}\text{C}$ has 255 joules of heat added to it. The metal's specific heat is $0.105\text{ J/g }^{\circ}\text{C}$.
What is its final temperature?

12) 1219 joules of heat raise the temperature of 250 g of metal by $64\text{ }^{\circ}\text{C}$. What is the specific heat in $\text{J/g }^{\circ}\text{C}$?

13) Lead, water, sulfur, and arsenic have specific heats of 0.128, 4.18, 0.706, and $0.329\text{ J/g }^{\circ}\text{C}$, respectively.
Which of these would require the smallest amount of heat to increase its temperature by $10\text{ }^{\circ}\text{C}$? Explain your choice. (Assume all samples have the same mass)

- 14) 1674 J of heat are absorbed by 25.0 mL of an aqueous solution of NaOH ($d = 1.10 \text{ g/mL}$, specific heat = $4.10 \text{ J/g } ^\circ\text{C}$). Calculate the change in temperature of the solution.
- 15) 100.0 g of nickel at $150 \text{ }^\circ\text{C}$ was placed in 1.00 L of water at $25.0 \text{ }^\circ\text{C}$. The final temperature of the water was $26.3 \text{ }^\circ\text{C}$. What is the specific heat of nickel?
- 16) What is the final temperature when 150.0 mL of water at $90.0 \text{ }^\circ\text{C}$ is added to 100.0 mL of water at $30.0 \text{ }^\circ\text{C}$?
- 17) A 25.0 g piece of iron at 398 K is placed in a Styrofoam coffee cup containing 25.0 mL of water at 298 K. Assuming that no heat is lost to the cup or the surroundings, what will the final temperature of the water be? The specific heat capacity of iron = $0.449 \text{ J/g}^\circ\text{C}$ and water = $4.18 \text{ J/g}^\circ\text{C}$.