1. . 1 kg of cold water at 5ÂºC is added to a container of 5 kg of hot water at 65Âº C. What is the final temperature of the water when it arrives at thermal equilibrium? (A) 10ÂºC (B) 15ÂºC (C) 35ÂºC (D) 55ÂºC (E) 60ÂºC

2. . Which of the following properties must be known in order to calculate the amount of heat needed to melt 1.0 kg of ice at 0ÂºC? I. The specific heat of water II. The latent heat of fusion for water III. The density of water (A) I only (B) I and II only (C) I, II, and III (D) II only (E) I and III only

3. . Engineers design city sidewalks using blocks of asphalt separated by a small gap to prevent them from cracking. Which of the following laws best explains this practice? (A) The Zeroth Law of Thermodynamics (B) The First Law of Thermodynamics (C) The Second Law of Thermodynamics (D) The law of thermal expansion (E) Conservation of charge

4. . Which of the following is an example of convection? (A) The heat of the sun warming our planet (B) The heat from an electric stove warming a frying pan (C) Ice cubes cooling a drink (D) A microwave oven cooking a meal (E) An overhead fan cooling a room

5. . An ideal gas is enclosed in a sealed container. Upon heating, which property of the gas does not change? (A) Volume (B) Pressure (C) The average speed of the molecules (D) The rate of collisions of the molecules with each other (E) The rate of collisions of the molecules with the walls of the container

6. . A box contains two compartments of equal volume separated by a divider. The two compartments each contain a random sample of n moles of a certain gas, but the pressure in compartment A is twice the pressure in compartment B. Which of the following statements is true? (A) The temperature in A is twice the temperature in B (B) The temperature in B is twice the temperature in A (C) The value of the ideal gas constant, R, in A is twice the value of R in B (D) The temperature in A is four times as great as the temperature in B (E) The gas in A is a heavier isotope than the gas in B

7. . An ideal gas is heated in a closed container at constant volume. Which of the following properties of the gas increases as the gas is heated? (A) The atomic mass of the atoms in the molecules (B) The number of molecules (C) The density of the gas (D) The pressure exerted by the molecules on the walls of the container (E) The average space between the molecules

8. . 24 J of heat are added to a gas in a container, and then the gas does 6 J of work on the walls of the container. What is the change in internal energy for the gas? (A) –30 J (B) –18 J (C) 4 J (D) 18 J (E) 30 J

9. . When water freezes, its molecules take on a more structured order. Why doesn’t this contradict the Second Law of Thermodynamics? (A) Because the density of the water is decreasing (B) Because the water is gaining entropy as it goes from liquid to solid state (C) Because the water’s internal energy is decreasing (D) Because the surroundings are losing entropy (E) Because the surroundings are gaining entropy

10. . A heat engine produces 100 J of heat, does 30 J of work, and emits 70 J into a cold reservoir. What is the efficiency of the heat engine? (A) 100% (B) 70% (C) 42% (D) 40% (E) 30%