

Chapter 9 – Matter and Energy

Section Review 9.1

1. Which system has a higher random, average kinetic energy of its atoms: a glass of iced tea or a cup of hot tea? Explain.
2. Explain why particles in a gas are free to move far away from each other.
3. Why might you experience lower air pressure at the top of a mountain than at sea level?

Section Review 9.2

1. What is the difference between temperature and thermal energy? Discuss particles of matter in your answer.
2. Calculate the heat energy needed to raise the temperature of 20 kg of water from 0° C to 35° C.

Section Review 9.3

1. Name one example of heat transfer through conduction.
2. What is the primary type of heat transfer that occurs between a hot and a cold fluid when they are mixed together?
3. Which object would you expect to emit more thermal radiation: a lamp that is turned on, or a rock at room temperature? Explain your answer.
4. In which direction will heat flow between an ice cube and the air in the room where it is located? Explain your answer.

Chapter 9 Review

Understanding Vocabulary

Select the correct term on page ____ to complete the sentences.

1. Because the atoms of carbon, hydrogen, and oxygen are combined in a specific ratio and cannot be separated by physical means, a sugar molecule is a(n)_____.
2. Water melts at 0°C and iron at 1,500°C because _____ forces are higher between iron atoms.
3. A change of 1° in the _____ represents the same change in temperature as 1 Kelvin.
4. The most common form of matter found throughout the universe but *not* on Earth is _____.
5. Knowledge of an object's temperature and mass are required to determine the quantity of _____ it contains.
6. Of the three forms of heat transfer, those that *cannot* occur in a vacuum are ____ and ____.

Reviewing Concepts

Section 9.1

1. What is Brownian movement and what is its importance in the explanation of matter?
2. Describe the appearance of table salt at the macroscopic and atomic levels.
3. Explain the difference between an element and a compound, and give one example of each.
4. Explain how a mixture is different than a compound.
5. Explain the difference between the kinetic energy association with temperature and then kinetic energy of an object moving in a certain direction.

6. Name two factors that determine the phase of matter for a substance.

a.

b.

7. Describe the four phases of matter.

a.

b.

c.

d.

8. Give an example for each of the following:

a. solid-solid mixture

b. liquid-solid mixture

c. liquid-liquid mixture

d. liquid-gas mixture

e. gas-gas mixture.

9. Describe the processes of melting and freezing on the molecular level.

10. Describe the process of water boiling on the macroscopic and molecular level.

11. What is evaporation and how does it differ from boiling?

12. Compare the difference between the freezing points and boiling points of water on the Fahrenheit scale and the Celsius scale. Which degree represents a larger temperature change?

13. If any exist, what are the upper and lower limits of temperature?

14. What is the source of pressure in fluids?

15. What makes the Kelvin scale of temperature more useful to scientists than the Fahrenheit or Celsius scale?

16. A student in Italy flies to visit family in New York. He hears the pilot report the weather on arrival as “clear and sunny with temperatures in the low 20s.” He changes on the plane into shorts and a T-shirt. Explain his behavior.

Section 9.2

17. Explain the difference between temperature and thermal energy.

18. What is heat? How is heat related to temperature?

19. Which has higher thermal energy, a swimming pool of water at 70° Fahrenheit, or a teacup of water at 80° Fahrenheit? Does higher thermal energy always mean a higher temperature?

20. Name three units of energy used to measure heat and describe what type of situations each is usually used for.

a.

b.

c.

21. What is the meaning of the term *specific heat*? What causes it to vary from substance to substance?

22. Considering the specific heat of water, explain how oceans help to regulate the temperature on Earth.

Section 9.3

23. Define the three main types of heat transfer.

a.

b.

c.

24. Describe the flow of thermal energy when you hold a cold can of soda in your hand. What types of heat transfer are occurring?

25. Why do you think pots and pans for cooking are made out of metal?

26. What properties make a material a good thermal insulator? Give three examples of good thermal insulators.

27. Compare the ability of solids, liquids, and gases to conduct heat.
28. Why does hot air rise? What type of heat transfer is occurring?
29. Why does convection *not* occur in solid materials?
30. Name a property of matter that increases its ability to absorb thermal radiation.
31. Explain, using your knowledge of heat transfer, why it is difficult to keep cool when it is 100° F outside.