Ch. 15 Temperature, Heat and Expansion; 11th edition
pg. 280 Review questions

2. What are the freezing and boiling temperatures of water in Celsius, Fahrenheit and Kelvins?

Ans. Water freezes at 0˚C = 32˚F = 273 K
Water boils at 100˚ C = 212˚ F = 373 K

5. Which defines temperature-translational kinetic energy, rotational kinetic energy, vibrational kinetic energy, or all three of these?

Ans. Just translational kinetic energy.

7. When you touch a cold surface, does cold travel to your hand? Explain.

Ans. No. Heat always travels from high temperature objects to low temperature objects. Heat flow from your hand toward the cold object.

8. Distinguish between temperature and heat.

Ans. Temperature is a measure of the average kinetic energy of the molecules and atoms of a system. Heat is the amount of energy that is transferred from one place to another because of a temperature difference.

9. Distinguish between heat and internal energy.

Ans. Internal energy is the sum of all energies stored in a substance. Heat is the energy that is transferred because of a temperature difference.

10. What determines the direction of heat flow?

Ans. Heat always flows from high temperature objects to low temperature objects.

12. Distinguish between calorie and Calorie.

Ans. One Calorie equals 1000 calories. Nutritionists use the term Calorie instead of kilocalorie.

15. Does a substance that heats up quickly for its mass, have a high or low specific heat capacity?

Ans. It has a low specific heat capacity.

17. How does the specific heat capacity of water compare to other common substances.

Ans. Water has one of the highest specific heat capacities known. There are however a few substances whose specific heat capacity is higher.

Extra: Why doesn't the Kelvin scale have any negative numbers?

Ans. When the molecules and atoms of a system have an average kinetic energy of zero, they cannot give any net energy to their surroundings. The system cannot lose any energy and is at its coldest possible temperature. By agreement, the system is at zero Kelvins and cannot get any colder.

Exercises Ch. 15; 11th edition pg.281-282

14. Why does the pressure of gas enclosed in a rigid container increase as the temperature increases?

Ans. On average, the molecules of a higher temperature substance are moving faster and impart a greater force per unit area to the walls of the container as they randomly collide with it.

23. In the old days, on a cold winter night it was common to bring a got object to bed with you. Which would be better to keep you warm-a 10-kilogram iron brick or a 10-kilogram jug of hot water at the same temperature? Explain.

Ans. Ask and answer this one in class for plus two points.

26. Why does the presence of large bodies of water tend to moderate the climate of near by land?

Ans. Ask and answer this one in class for plus two points.

28. Desert sand is very hot during the day and cool during the night. What does this tell you about its specific heat capacity?

Ans. The sand must have a low specific heat capacity.

Extra: What is temperature a measurement of?

Ans. Temperature is a measure of the average kinetic energy of the molecules and atoms of a substance.

Problems Ch. 15

Extra: If you wish to warm 100 kg of water by 20°C for your bath, how much heat is required? Give your answer in calories and joules

Ans. $Q = mc\Delta T = 100{,}000g(1\frac{cal}{g^\circ c})20^\circ c = 2{,}000{,}000$ calories

Since approximately 4.2 joules = 1 calorie, we would need 8,400,000 joules of energy.