CHAPTER 4 REVIEW

KEY

1. Water has an unusually high specific heat capacity. Which one of the following statements logically follows from this fact?

A. Compared to other substances, hot water causes severe burns because it is a good conductor of heat

B. Compared to other substances, water will quickly warm up to high temperatures when heated.

C. Compared to other substances, it takes a considerable amount of heat for a sample of water to change its temperature by a small amount.

2. Explain why large bodies of water such as Lake Michigan can be quite chilly in early July despite the outdoor air temperatures being near or above 90°F (32°C).

it takes a lot of energy to warm up water

3. The table below describes a thermal process for a variety of objects (indicated by bold-faced text). For each description, indicate if heat is gained or lost by the object and whether Q for the indicated object is a positive or negative value.

Process	Heat Gained or Heat Lost?	Q: + or -?
An **ice cube** is placed into a glass of room temperature lemonade in order to cool the beverage down.	gained	+
A cold **glass of lemonade** sits on the picnic table in the hot afternoon sun and warms up to 32°F.	gained	+
The **burners** on an electric stove are turned off and gradually cool down to room temperature.	lost	−
The teacher removes a large chunk of **dry ice** from a thermos and places it into water. The dry ice sublimes, producing gaseous carbon dioxide.	gained	+
Water vapor in the humidified air strikes the window and turns to a dew drop (drop of liquid water).	lost	−

. An 11.98-gram sample of zinc metal is placed in a hot water bath and warmed to 78.4°C. It is hen removed and placed into a Styrofoam cup containing 50.0 mL of room temperature water T=27.0°C; density = 1.00 g/mL, c=4.186 j/g°C). The water warms to a temperature of 28.1°C. Determine the specific heat capacity of the zinc. **Hint- use the density to determine the mass of the room temperature water**

$Q_{H_2O} = -Q_{zinc}$

$50g(4.186)(28.1-27) = 11.98(c)(28.1-78.4)$

$\frac{230.23}{602.594} = \frac{602.594c}{602.594}$ $\quad c = .337\ J/g \cdot C°$

$m_{H_2O} = \rho \cdot V$

.50 mL

m: 50 g

5. Jake grabs a can of soda from the closet and pours it over ice in a cup. Determine the amount of heat lost by the room temperature soda as it melts 61.9 g of ice (ΔH_{fusion} = 333 J/g).

$Q = mL$

$61.9g\ (333\ J/g)$ $\quad Q_{lost} = 20,612.7J$

6. The heat of sublimation ($\Delta H_{sublimation}$) of dry ice (solid carbon dioxide) is 570 J/g. Determine the amount of heat required to turn a 5.0-pound bag of dry ice into gaseous carbon dioxide. (Given: 1.00 kg = 2.20 lb)

$Q = mL$

$2272.72g\ (570\ J/g)$

$1.29E^6\ J$

$5.0lb \left| \frac{1kg}{2.20lb} \right.$

~~2.27kg~~

$m = 2.27\ kg \left| \frac{1000g}{1kg} \right. = 2272.72$

7. Determine the amount of heat required to increase the temperature of a 3.82-gram sample of solid para-dichlorobenzene from 24°C to its liquid state at 75°C. Para-dichlorobenzene has a melting point of 54°C, a heat of fusion of 124 J/g and specific heat capacities of 1.01 J/g/°C (solid state) and 1.19 J/g/°C (liquid state).

$Q = mc_{solid}\Delta T + mL + mc_{liquid}\Delta T$

75°C

54°C 54°C

$3.82(1.01)(54-24) + 3.82(124) + 3.82(1.19)(75-$

$115.746 + 473.68 + 95.4618$

$Q = 684.89\ J$