

Name: _____ Date: _____ Per: _____

Chemistry - Specific Heat Lab Alternative Assignment **Total: 16/20 = your max score possible**

Please Show All Work for Credit. Please attach your Specific Heat Pre-Lab to the back.

1 point each problem

1. Perform the indicated conversion: $1.660 \text{ kcal} = \underline{\hspace{2cm}} \text{ J}$
A) $6.945 \times 10^3 \text{ J}$ B) 6.945 J C) $6.945 \times 10^{-3} \text{ J}$ D) 396.7 J E) 2.520 J

2. Perform the indicated conversion: $7.331 \text{ kcal} = \underline{\hspace{2cm}} \text{ kJ}$
A) 30.67 kJ B) 1.752 kJ C) 0.5707 kJ D) $1.752 \times 10^3 \text{ kJ}$ E) $3.067 \times 10^{-2} \text{ kJ}$

3. Perform the indicated conversion: $3.14 \times 10^3 \text{ cal} = \underline{\hspace{2cm}} \text{ J}$
A) 750 J B) $1.31 \times 10^4 \text{ J}$ C) 13.1 J D) $7.50 \times 10^5 \text{ J}$ E) $1.33 \times 10^{-3} \text{ J}$

4. Which of the following is a valid unit for specific heat (or specific heat capacity)?
A) $\text{cal/g } ^\circ\text{C}$ B) cal C) cal/g D) $^\circ\text{C}$ E) $\text{g } ^\circ\text{C/cal}$

5. The specific heat capacity of gold is $0.13 \text{ J/g}^\circ\text{C}$. How many calories of energy are needed to warm 0.744 g of gold from 30.0°C to 39.5°C ?
A) 0.92 cal B) 0.22 cal C) 1.6 cal D) 3.8 cal E) 30 cal

6. Calculate the heat given off when 127.2 g of copper cools from 155.0°C to 23.0°C . The specific heat capacity of copper is $0.385 \text{ J/g } ^\circ\text{C}$.
A) $1.13 \times 10^3 \text{ J}$ B) $7.59 \times 10^3 \text{ J}$ C) $4.36 \times 10^4 \text{ J}$ D) $6.46 \times 10^3 \text{ J}$ E) none of these

7. A 6.75-g sample of gold (specific heat capacity = $0.130 \text{ J/g } ^\circ\text{C}$) is heated using 32.4 J of energy. If the original temperature of the gold is $25.0 \text{ } ^\circ\text{C}$, what is its final temperature?
A) $61.9 \text{ } ^\circ\text{C}$ B) $11.9 \text{ } ^\circ\text{C}$ C) $53.5 \text{ } ^\circ\text{C}$ D) $46.9 \text{ } ^\circ\text{C}$ E) $36.9 \text{ } ^\circ\text{C}$
8. The molar heat of fusion of water is 6.02 kJ/mol . Calculate the energy required to melt 49.3 g of water.
A) $5.35 \times 10^3 \text{ kJ}$ B) 297 kJ C) 2.74 kJ D) 148 kJ E) 16.5 kJ
9. The molar heat of fusion of water is 6.02 kJ/mol . Calculate the energy required to melt 14.1 g of water.
A) 6.02 kJ B) 4.71 kJ C) 84.9 kJ D) 42.2 kJ E) none of these
10. Calculate the quantity of energy required to change 6.01 mol of liquid water to steam at 100°C . The molar heat of vaporization of water is 40.6 kJ/mol .
A) 6.76 kJ B) 40.6 kJ C) 244 kJ D) 60.1 kJ E) 46.6 kJ

Thermodynamics Vocab Worksheet

Fill the blanks in the following sentences with the correct thermodynamics term: (1/2 point each number)

- 1) A(n) _____ is used to lower the energy required to make a reaction take place. It makes chemical reactions go faster without being consumed.
- 2) Another word for freezing is _____.
- 3) The thing we measure when we want to determine the average kinetic energy of random motion in the particles of a substance is _____.
- 4) The _____ is the energy needed to raise the temperature of a substance by one degree Celsius.
- 5) A(n) _____ reaction is one where the products have lower energy than the reactants.
- 6) _____ reactions require energy in order to take place.
- 7) The _____ is the energy required to boil one mole of a substance, and its symbol is
(8) _____.
- 9) The _____ is used to describe how much energy is produced or used during a chemical change.
- 10) _____ is the amount of energy which a system has to have in order for a chemical change to take place.

Phase Change Worksheet (1/2 point each problem)

Please Box or Circle your Answers.

- 1) A 12 oz. can of soda weighs about 450 grams. How many joules are released when a can of soda is cooled from 25 degrees Celsius (room temperature) to 4 degrees Celsius (the temperature of a refrigerator). **The heat capacity of liquid water is 4.18 J / gram x °C.**
- 2) How many joules are required to heat 250 grams of liquid water from 0⁰ to 100⁰ C ?
- 3) How many joules are required to melt 100 grams of water? **The heat of fusion of water is 6.01 kJ / mole.**
- 4) How many joules are required to boil 150 grams of water? **The heat of vaporization of water is 40.67 kJ / mole.**

- 5) How many joules are required to heat 200 grams of water from 25°C to 125°C ? **The heat capacity of steam is $1.84 \text{ J} / \text{g} \cdot ^{\circ}\text{C}$**
- 6) How many joules are given off when 120 grams of water are cooled from 25°C to -25°C ? **The heat capacity of ice is $2.09 \text{ J} / \text{g} \cdot ^{\circ}\text{C}$.**
- 7) How many joules are required to heat 75 grams of water from -85°C to 185°C ? **The heat capacity of steam is $1.84 \text{ J} / \text{g} \cdot ^{\circ}\text{C}$.**
- 8) How many joules are required to heat a frozen can of juice (360 grams) from -5°C (the temperature of an overcooled refrigerator) to 110°C (the highest practical temperature within a microwave oven)?

- 9) How many joules are released when 450 grams of water are cooled from $4 \times 10^7 \text{ }^\circ\text{C}$ (the hottest temperature ever achieved by scientists) to $1 \times 10^{-9} \text{ }^\circ\text{C}$ (the coldest temperature achieved by scientist).
- 10) How many joules are required to raise the temperature of 100 grams of water from $-269 \text{ }^\circ\text{C}$ (the current temperature of space) to $1.6 \times 10^{15} \text{ }^\circ\text{C}$ (the estimated temperature of space immediately after the big bang)?