

## Exam Review Worksheet

CALORIMETRY

- 1) Define these terms:
- Heat = flow of the material energy from higher temp to lower temp
  - Temperature = measure of the average kinetic energy of a sample
  - The Law of Conservation of Energy = Energy is neither created nor destroyed only transferred.
  - Specific Heat = energy required to raise the temp of 1 gram of substance by 1°C
  - Heat of Fusion = energy required to melt 1 mole of solid
  - Heat of Vaporization = energy required to boil 1 mole of liquid
  - Endothermic = gain of heat energy
  - Exothermic = loss of heat energy
- 2) A student performs an experiment in which 45.0 grams of metal is heated to 80.0°C. The metal is transferred to a cup of water. The water gains 9000 kJ of energy as the metal cools to 40°C.
- Is the process endothermic or exothermic for the water? *endothermic*
  - Is the process endothermic or exothermic for the metal? *exothermic*
  - Determine the specific heat of the metal. *.05 J/g°C*
- 3) If you did a calorimetry experiment in which you put a cube of iron metal that is very hot into a cup of room temperature water, the water would get warmer; and the metal would get cooler as heat flows from higher temp to lower temp.
- 4) The larger the value of specific heat of a substance, the more heat it requires to even get warmer; meaning to raise the temperature 1°C. Conversely, it also means it will give off more energy when the same substance cools 1°C compared to other substances with lower specific heat values. The lower the specific heat value of a substance means that it will not require much energy to heat and lose much energy to cool. Water has a very high specific heat values compared to many substances. It takes a longer amount of time (and more heat) for water to start feeling warm as opposed to the metal pan it is being boiled in.
- 5) A 100 g chunk of metal with a specific heat of 0.24 J/g°C is heated from 20°C to 40°C. What is the total energy change, or heat gained, of the chunk of metal (write all units)?  *$Q = 100g \cdot .24 J/g°C \cdot 20°C$*
- 6) A 50 g metal cube loses 1350 J (and is expressed as -1350 J) as it is cooled from 150°C to 120°C. What is the specific heat of this metal substance (write all units)?  *$-1350 J = 50 g \cdot C \cdot 30°C \dots solve for C$*
- 7) When you want to know the amount of energy change (or heat gained or lost) when a substance CHANGES PHASES (and not only changing temperatures...getting warmer or cooler), you must use heat of Fusion ( $\Delta H_f$ ) or heat of Vaporization ( $\Delta H_v$ ) values.
- 8)  $\Delta H_f$  is the heat gained (when going from solid to liquid or melting) or lost (when going from liquid to solid or freezing) of one MOLE of a particular substance.
- 9)  $\Delta H_v$  is the heat gained (when going from liquid to gas or boiling) or lost (when going from gas to liquid or condensation) of one MOLE of a particular substance.
- 10) Write the equation you would use to figure out the heat released or absorbed when changing phases from solid to liquid or vice versa.  $q = n \Delta H_f$
- 11) Write the equation you would use to figure out the heat released or absorbed when changing phases from liquid to gas or vice versa.  $q = n \Delta H_v$
- 12) You melt 72 g of ice. The  $\Delta H_f$  value of water is about 6 kJ/mol. How much heat is released/absorbed?  
 72 g | 1 mol | 6 kJ = 24 kJ  
 | 18 g | 1 mol
- 13) You condense 3.6 g of steam. The  $\Delta H_v$  value of water is about 41 kJ/mol. How much heat is released/absorbed? Is heat released or absorbed?  
 3.6 g | 1 mol | 41 kJ = 8.2 kJ  
 | 18 g | 1 mol

ACID-BASE TITRATION

- 14) An acid releases H<sup>+</sup> ions when put in solution (in water).
- 15) A base releases OH<sup>-</sup> ions when put in solution (in water).
- 16) Strong acids release all of H<sup>+</sup> ions; weak acids release some all of H<sup>+</sup> ions.