Dougherty Valley • AP Chemistry

**S-11**

Energy and Chemical Reactions

STUDY LIST From Paul Groves

Exothermic & Endothermic

I can…

* state the sign of ΔH is based on observations of warming or cooling of the surroundings.
* correctly apply the terms exothermic and endothermic to situations where the surroundings are warming or cooling.
* draw a PE curve (uphill or downhill) based on information about warming or cooling of the surroundings.
* state that an **EXOTHERMIC** reaction:
  + feels **hot**
  + has a **downhill** Potential Energy diagram
  + has an equation where energy is on the **right**
  + has **more potential energy in the reactants** than in the products
  + has a **negative** ΔH value

Measuring Heat

* state the units of heat capacity (J/°C) and specific heat capacity (J/g·°C) and the use of each.
* convert between the heat units of calories and Joules. (4.184 J = 1 calorie)
* use calorimetry (q = mCΔT) to calculate heat changes during temperature changes.
* calculate the heat transferred when two objects, at different temperatures, come into contact.
* calculate the final temperature of a hot object added to a cold sample of water.

Chemical Work = Expanding Gases

* relate physical work (w=F·d) and chemical work (w=P·ΔV).
* calculate **PV work** done by an expanding gas.
* state that no work is done in a **constant volume** situation such as a bomb calorimeter.

Energy = Heat and Work

* state the difference between work and heat energy.
* state the difference between system and surroundings.
* recognize the system and the surroundings in a chemical or physical system.
* calculate the change in internal energy based on changes in heat absorbed by the system and work done by the system.
* state that ΔH is a more general (and useful) measure of energy than ΔE and that ΔH = q when a reaction occurs at constant pressure.

Calculating ΔH -- Hess’s Law

* state the definition of a state function.
* list examples of properties that are and are not state functions.
* write the equation for the **heat of formation** of a substance.
* state that the heat of formation of an **element** under standard conditions has a value of zero.
* use **Hess’s Law** to calculate the energy of a chemical or physical change.

Calculating Heat During Phase Changes – Heats of Fusion and Vaporization

* use heats of vaporization or heats of fusion to calculate heat changes during phase changes.
* write an equation showing the heat of fusion or heat of vaporization.

Calculating ΔH (Enthalpy) of a Reaction using Data

* use q = mCΔT to calculate the heat of a reaction or phase changes in J and then kJ.
* calculate the moles of substance changed.
* Calculate ΔH by dividing kJ by moles.