- M = mass of the substance undergoing the temperature change
- ΔT = temperature change: $\Delta T = T_{final} - T_{initial}$

Equation 5.14 $q = C\Delta T$

- C = heat capacity
- ΔT = temperature change

*The sign convention for q is the same as that for an enthalpy change: q is positive for endothermic processes and negative for exothermic processes

Specific Heat Values of Some Common Substances

Substance	Specific Heat (J/g · °C)	Substance	Specific Heat (J/g · °C)
Al(*s*)	0.900	Fe(*s*)	0.444
Au(*s*)	0.129	Hg(*l*)	0.139
C(graphite)	0.720	$H_2O(l)$	4.184
C(diamond)	0.502	$C_2H_5OH(l)$ (ethanol)	2.46
Cu(*s*)	0.385		

$$q_{sys} = -sm\Delta T$$ **Equation 5.15**

Heats of Some Typical Reactions and Physical Processes Measured at Constant Pressure

Type of Reaction	Example	ΔH (kJ/mol)
Heat of neutralization	$HCl(aq) + NaOH(aq) \longrightarrow H_2O(l) + NaCl(aq)$	–56.2
Heat of ionization	$H_2O(l) \longrightarrow H^+(aq) + OH^-(aq)$	+56.2
Heat of fusion	$H_2O(s) \longrightarrow H_2O(l)$	+6.01
Heat of vaporization	$H_2O(l) \longrightarrow H_2O(g)$	+44.0*

$$q_{surr} = sm\Delta T \qquad q_{cal} = -q_{rxn} \qquad q_{rxn} = -q_{cal}$$

*q_{Cal} and q_{rxn} are the heat changes for the calorimeter and the reaction, respectively.

Equation 5.16 $q_{cal} = C_{cal}\Delta T$

Equation 5.17 $q_{rxn} = -C_{cal}\Delta T$

*Energy content is a positive quantity.

5.5: Hess's Law

Hess's Law: the change in enthalpy that occurs when reactants are converted to products in a reaction is the same whether the reaction takes place in one step or in a series of steps
*In general, we apply Hess's law by arranging a series of chemical equations (corresponding to a series of steps) in such a way that they sum to the desired overall equation.

5.6: Standard Enthalpies of Formation

Standard Enthalpy of Formation (ΔH_f°): the heat change that results when 1 mole of a compound is formed from its constituent elements in their standard states
*The phrase "in their standard states" refers to the most stable form of an element under standard conditions, meaning at ordinary atmospheric pressure.
*The standard enthalpy of formation of any element in its most stable form is 0.

Standard Enthalpy of Reaction (ΔH_{rxn}°): the enthalpy of a reaction carried out under standard