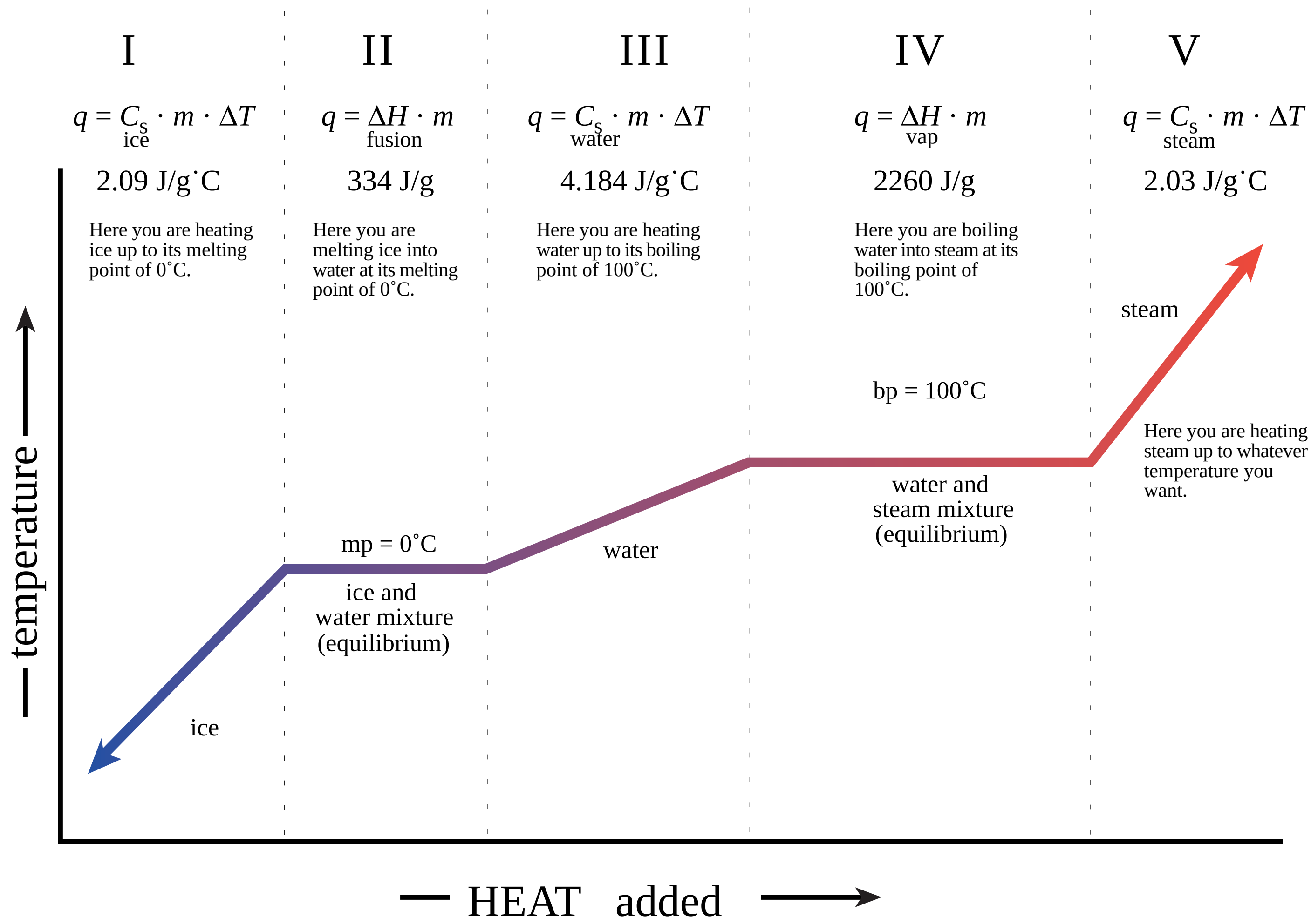

Something Different is Happening in Each of the 5 Zones

Each of the 5 zones shown above have their own unique formulas for calculating heats. Note that zones I, III, and V are all zones where you have only one phase present and the temperature is changing. The slopes of the curve are NOT zero in these 3 zones. As a matter of fact, the slopes of the heating curve lines ARE the inverse of the specific heats of those phases. Although the diagram is not drawn to scale, it does attempt to show that the slope is larger for ice and steam (smaller C_s's) than it is for water. Most general chemistry books show similar curves. Just note that the curve here has "per gram" quantities and many books show "per mole" quantities.

Specific Heats are per gram and use ΔT, ΔH of transition do NOT use ΔT

Note that C_s is the specific heat for each of the phases (solid, liquid, and gas). Specific heats are written and used in a "per gram" way. For that reason, *m* must be the mass in grams for each of the phases. Also note that the specific heats for each phase are different. The ΔH's are enthalpies of phase transition. The lower one is the enthalpy of fusion (melting) and the upper on is the enthalpy of vaporization. Notice how there is no ΔT to be used for phase transitions. The temperature is constant during phase transitions for pure substances.

Water is shown above but ALL substances follow the same TYPE of curve

Realize that all substances have this same basic curve set up. The differences are going to be the transition temperatures, and what the values of the C_s's and ΔH's are. In many problems you don't even need to know the exact transition temperatures in that you can always reference from them with ΔT. Like you start at 10˚C below the melting point of a metal and then increase the temperature to 25˚C above the melting point. You don't need to know the melting point to calculate the heats involved in this. Just use the ΔT's that are given.

One transition that is not shown above is sublimation (solid to gas with no liquid in between). Realize though that the curve would still look similar to half the curve shown above. You would heat the solid to the sublimation temperature, then sublime the solid to gas, and finally heat the gas. There would only be 3 zones for that type substance and you would need a ΔH of sublimation for the transition.