Lab Lecture on Thermochemistry B: Salts and Society
Chemistry 141 Laboratory
Professor Abrash
September 25, 2011

Q: What is the purpose of today's lab?

Today we're going to apply what you learned last week in the first thermochemistry lab. You're going to use the knowledge and techniques to design and test either a hot pack or cold pack.

Q: How do they work?

Both take advantage of the fact the process of dissolving a salt can either release heat or absorb heat. Therefore dissolving a salt that releases heat, i.e., is exothermic, will cause the solution to heat, while dissolving a salt that absorbs heat, i.e., is endothermic, will cause the solution to cool.

Q: Cool? Cool! So all we have to do is make a solution that cools or heats?

There's a little more to it. You need to make a solution with a volume between 25mL and 100 mL that either heats or cools in the range 3^{o} to 5^{o}C.

Q: How do we figure out how much salt to use?

You do it in two steps, first figuring out how much heat you need, and then how much material is needed to generate that amount of heat.

Q: How do we figure out how much heat we need?

You turn around the equations you used last week. Last week you measured temperature changes, and figured out from them what the heat was. This week, we'll take the temperature change we want to achieve, and use it to determine the heat we'll need to achieve it.

The equation you need to use to determine the amount of heat is:

$$q_{system} = -(M * S * \Delta T + C_{cal} * \Delta T)$$

Q: But how do we figure out how much material we need to use to generate this amount of heat?

Remember that we showed how to calculate the enthalpy of solution, ΔH_{soln}, the heat evolved when a mole of a substance is dissolved. A critical concept here is that heat released depends on the amount of material – dissolving two moles of a material results in a heat release that's twice what you get by dissolving one mole.

Therefore, to figure out how many moles of your substance you need to generate a certain amount of heat, we flip around the equation that you used to determine ΔH las week:

$$\Delta H = \frac{q}{n_{reacted}}$$

to get

$$n_{reacted} = \frac{q}{\Delta H_{soln}}$$

Q: Are there any hints you can give us?

The most important is to test your amounts using the calorimeter setups from last week before you try to assemble your hot or cold packs.

Also remember that you are not going to be the ones that fill in the Product Review sheets on page 73. You will hand your sheet and your hot/cold packs to someone else in your group, and they will evaluate your inventions for you, just as you will do for another group.

Lab Reports: Reports are described on page 70 of the lab manual. Please note that all work may be done collaboratively by you and your lab partner (or partners), and that only one lab report needs to be turned in by each group.

Safety: Take the usual safety precautions: Hood work, minimum contact with skin, safety glasses.

Projects: Don’t forget that next week you need to turn in a list of three projects you’d like to work on, along with the names of the people you want to work with (presumably your partners).

Honor: All work for this project may be done collaboratively with your lab partner or partners. Only one lab report needs to be turned in per lab group.