September 25, 2003

Teacher: okay, this exam was traumatic. (Reading from page of notes on overhead). Many of you didn’t do well on the exam do to an error on our part. I checked over some things and my staff moved some of the D forms and they were copied on yellow paper, so check your test and make sure of what you took. The green forms are fine, but check them. C is always on yellow and D is on green, but I wont know until you bring me the forms. Check yours to be sure and then bring it to me.

I know some of you were disappointed in your outcome. I have asked some of the students from last year if they would be interested in tutoring. It would be about $10 an hour. It is possible to make a 0 on the first test and still make a B in the class. (Example on board.) Adding points from exams, final, quizzes and CSB. Divide that by 5.5 then add 2 points from your BOPs… Then it will bring that up to a B in the class. Right now, if you made a 50 that would be passing in the long run. You are allowed to goof up once, but only once and still pass. This time only, if you want to take the make-up or retake the make-up to prove that you know the material go ahead and let me know. I wont take the grade or average them, but I will use it if at the end you are right on the edge.
I am still taking names for the field trip to the Nuclear reactor, which is in October, on the 17th. There is still a problem with the attachments for the CSB.

Next week you have quiz in your lab. These quizzes are as important as the lab. They count 20 points. There is a review at 7 tonight, in room 105. Sunday review too, at 2 pm, using this door right outside.

This week in lab, you are looking at kinetics. You are looking at decomposition of H2O2 with KI, the catalyst. We have some hydrogen peroxide in here. You use the 3%, but this is 30%. What you have at home is good because it’s anti-microbial. Why is it?

Male Student: it kills microbes.

Teacher: yes. During the decomposition it releases the oxygen. We use 30% when we are trying to destroy tissue for analyzing. You can see with this something is happening. Over time it will change to the 2 products, water and oxygen. You added the KI, to the peroxide, and were able to see a change. This catalyst is a solid, but is just as effective. This is called our Jeanie in a Bottle. (Example on board.). There are many ways to catalyze the peroxide. Now, I am going to do your lab, but in a fun way.
Here is the clear 30% peroxide, (Example on board.), and you can see, it does not break down. You add the soap. It’s not a catalyst. Nothing is happening. Adding food coloring… Food coloring a catalyst? No. Adding the KI, next. This is a catalyst. We call this elephant toothpaste. There is steam…exothermic. Obviously this happens fast. The soap caused the foam, but it was the release of oxygen that made the reaction. This is your lab. You change the reactions in this h2o2; you can put the KI, on top. Also, you can write as (Example on board.), this. The potassium is a spectator while iodide is the catalyst.

Rate law expression
Here (Example on board.) is how you write it. Rate is (M/time), or molarity to time. For concentration, we use the brackets [ ], raised to some power. This K is the specific rate constant. You put in your own concentration and will be measuring the rate. The rate of reaction depends on the h2o2 and how it works as a catalyst.

Chemical kinetics
Thermo is used to predict if a rxn will go but not how fast. (Example on board.) It is an insoluble bases. You get Mg and a couple of waters. Looking at the del G, you know they rxn goes. If you have Cdiamond and add oxygen, then del G is –396kJ… Diamonds are not forever. {Laughter!} This will happen over time but not immediately. The rxn is very slow. This chapter is about taking and trying to figure out rxns. Lets look at rate.
Rate is the change in the concentration of product or reactant with time. In chemistry it is always a positive number and sometimes we must put a sign in to make rate positive. The reactant over time disappears and the product appears. So, often if you have a simple rxn you don’t think about the process. The process is about how it happens. It’s about the speed and the way it happens. That does have a special name.

(Example on board.). If the reaction goes to completion, A, over time will decrease exponentially. But, you have a mirror thing going on where B starts at 0 and increases over time, it is up at 1 M. It does not happen spontaneously or immediately. A to no A does not happen immediately. Now, lets look at what we mean by rate.

The rate of the reaction of any interval, del t, is written as t2 – t1. For your lab, you were to look at the beginning of the reaction. (Example on board.) A changes from here to here, t1 and t2...[a] 1 and [a]2  B is here and here. If you are following the product, it’s like this (Example on board.). Del B over del t. We picked this from the middle, but its okay.

If you had A+2B→3C: a and b are reactants and your c is your product. Then looking at the rate, you are losing b 2 times as fast as a; you are gaining c, 3 times as fast.
On the laboratory this week, you are looking for the slope of the line. Here you are looking for the slope of the interval here. We put the negative here to change it to positive. We do all we can to make them straight lines. In your lab, you will plot your data and it might look like (Example on board.) this. It is here where you want to draw your straight line… You mix the KI with the other. You have to do it at a constant rate… so the first few points would not be good.

Also, it might look like (Example on board.) this. What happened? Someone kicked your apparatus or it leaked… If you can understand what happened then you can use these lines. The line does not have to go through the origin; you are looking for slope. Your TA’s know that. We are doing a lot of graphing. Be sure when you use the excel, don’t use all the points. You have to look at it and make a judgment call for plotting.

**Rate of rxn depends on 4 factors:**

1. **Nature of reactants.** If aqueous, the rxn is faster than if they were solids or gases. **Chemical activity** is also involved. Looking at the table, left side is metals. At the 1A, those metals are further away from the nucleus. Lithium is smaller… As you go down it is easier for the rxn to happen. Increases in IA as you go down column. The **surface area** affects rates as chunks react slower than ground up chemicals.
2. **Concentration of reactants.** In general, as concentration of reactants increases the probability of collisions goes up. Now we start thinking of particles. Therefore, the probability of reaction occurring also increases. If you can get things to collide more then you will get reactions.

Simple one stop reaction in this **A → B + 2C**, it is a decomposition rxn. The rate is equal to (Example on board.) and shows that you are making c twice as fast. At any time t, the rate is proportional to [a] and the exponent 1. The rate law of expression: rate= k [a], for a specific temperature k specific rate constant. That is in your lab. This was a nice 1-step rxn. If [a] tripled, rate triples.

Most reactions are not 1 step. The rate law expressions must be determined experimentally. Any other case, you have to go to the lab and figure it for yourself. In this (Example on board.) these are the stoich coeff… And these are the compounds. The general form of rate law expression the exponents are not always the same. You will just have to do this experimentally. In the RLE, there are no products, just reactants raised to some power.

X is the order of rxn with respect to A. Y is to B; z is to C and these orders are 0, 1, 2 or 3. They can be added together, X+Y+Z, like this and is the overall order of rxn.