Exam 4 Review Sheet
Chemistry in Context

Remember all the USUAL stuff about Exams

Bring pencils and your calculator. Go to the right room.

A-R go to WEL 2.224

S-Z go to UTC 3.112

PLEASE bubble in your correct name and UTEID and version number. Do that FIRST! We will remind you. PLEASE DO THIS! Look at our previous exam review sheets for a bigger version of all of this.

Which Chapter/Sections are covered?

All of Chapter 4, although what I emphasized the most. You're STILL responsible for basic nomenclature of ionic compounds. You should know all the material covered on homework08. Unfortunately, there was no homework09 for you in time for the exam. Do realize that there is plenty of material in this chapter that did NOT make it to a homework. You are still responsible for ALL the material that we covered. Stoichiometry, is still important and in Chapter 4 you learned how to calculate for the energy content of reactions (ΔH).

Definition of Terms

The book is full of terms. These are typically in boldface type and their definitions follow with highlighting. Know these terms. These should be easy multiple choice type questions.

Hold overs from Chapters 1, 2, and 3

Same as last time. Still know the basics – especially definitions and terms. Still know basic conversion type math problems. Know your metric prefix system and how to apply it. Still know binary ionic and covalent nomenclature from exam 1.

Any NEW Nomenclature?

Yes. Know your basic hydrocarbons (alkanes) as shown in Table 4.5 on page 194. In addition to that, you should know the difference (structure wise) between octane and isooctane (p 197). Also ethanol and MTBE, full name and structure.

Basic Thermodynamics

We discussed the 1st Law and the 2nd Law of Thermodynamics. We learned that we are constantly looking at and calculating heat and work as our main "currencies" of energy. Work is summarized as organized molecular motion while heat is disorganized or random molecular motion. The 1st Law says that all energy is conserved (none lost, none gained). The 2nd Law tells us about spontaneous changes and whether they are likely to occur or unlikely to occur. The second law also introduced entropy (S or ΔS). Know what entropy is and what is considered high entropy and low entropy. What happens with entropy during a spontaneous process?

Calculations and ΔH

ΔH is the enthalpy change for a process. If the process is a chemical reaction, then ΔH is the change in enthalpy for the reaction. It is also known as the heat of reaction. A positive value for ΔH is an endothermic reaction – one where heat is absorbed as the reaction proceeds. A negative value for ΔH is an exothermic reaction – one where heat is released as the reaction proceeds.

Be able to calculate amounts of heat absorbed or released by various reactions. Usually, this reactions are combustion reactions which release a great amount of heat. Heat behaves stoichiometrically just like all the other reactants and products in a reaction.

Be able to calculate approximate ΔH for reactions using bond energy tables (Table 4.2, p 182). You will be given a table or the values will be given in the problem. You need to know HOW to use them. There are examples on pages 183-184.

Energy Transformation - Electricity

Know what the basic scheme is for a conventional power plant (p 174). Also have a good idea of the efficiencies involved in such a process (p 175).

Activation Energies

Know the definition here and how it is illustrated on p 186. How does it influence a reaction rate? How does the forward activation energy ($E_{a,f}$) and the reverse activation energy ($E_{a,r}$) combine to give ΔH ? How does a catalyst work? How does it change the look of a potential energy diagram? BTW, a potential energy diagram IS what is shown in Figure 4.8 on p 186.

Burn baby burn...

Throughout history mankind has used fire as an energy source. We now have numerous substances/technologies for generating and even distributing energy. Look at the recent history depicted in Figure 4.10. Look at where we are and where we've been. Also take a look at Table 4.3 and get a feel for the various energy contents of those common fuels.

Coal

What is it? Advantages and disadvantages? Why is coal considered a dirty fuel? How does coal compare to petroleum as far as world supply goes?

Petroleum

What is it? Advantages and disadvantages? Does crude oil only provide oil? What does it provide then? Know the basic set up and method for a fractionating tower for the refining of petroleum. Know what the basic fractions are and where they come off the tower. Note that "where" is not only a physical location on the tower but also a temperature and a carbon range.

Are we stuck with whatever mix the crude oil supplies? Or can we take some of the less desirable products and make them into more desirable products? Answers are no and yes in that order. What two methods are used to make gasoline type products (think isooctane)? Know the difference in cracking (equation 4.7 and 4.8 are examples) and reforming (equation 4.9 is an example).

Octane vs Isooctane

Which would you prefer in your car? Know the structural differences. One has very desirable ignition properties in you car and one does not. What is engine knocking or pre-ignition? How was this problem solved decades ago? What is TEL? What is an octane rating? How do we get a higher octane rating? We now use oxygenated gasolines. Ethanol and methanol are used and so is MTBE. What's the story on MTBE?

Ethanol – Gasohol – Biodiesel

Why is ethanol being pushed as an alternative fuel? Advantages? What is gasohol? What is E85 ? What's biodiesel? Once again, advantages?

Garbage as Fuel

Why not just burn garbage? Any of these plants in production?

Conservation?

You should know the arguments here. Don't worry about memorizing numbers, but do read this and get a feel for what the book is telling you. After a class such as this and reading this book, you should have some insight on this matters. What has the SUV done for our fuel use? In general, do cars have better or worse fuel economies than they did 20 years ago? If you're quick to answer "better" then you should read page 211 and 212 of our book - again.

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