CH4110 Biochemistry I
Pet Enzyme Project 3
Biological Picture

Chemical catalysts and enzymes differ in a number of ways. One is that many enzymes are a part of a pathway to produce one or more products. Another is that enzymes have the ability to be regulated and chemical catalysts, in general, do not. Yet another is that your enzyme is produced by a living organism for whom it presumably serves some purpose (selective advantage). For this assignment I want you to determine which pathway(s) your enzyme participates in, if your enzyme is regulated and if so, how that regulation takes place. In class we have discussed regulation of enzyme activity by allosteric activators and inhibitors, and covalent modification. Also, the abundance of enzyme molecules is often regulated at the levels of transcription (DNA into mRNA), translation (mRNA into protein), or mRNA or protein degradation. Other forms of regulation are the production of pre-enzymes that must be irreversibly modified to be active (cleavage, glycosylation, etc), sequestration of the enzyme into a subcellular compartment where it is inactive, and other, less common mechanisms. Your enzyme may be regulated in several ways, or it may not be regulated at all.

1. Go to the website http://metacyc.org/. This is a collection of a number (a large number) of metabolic pathways. Search for your enzyme; it may or may not show up. If there is an entry, you may get a page that allows to see reactions, or pathways. Select pathways. Print out the pathway. Another good place to check is ExPASY web site. If you can get a pathway this way, print it out. What is a major product of your pathway? What are some of the precursors in the pathway? If your enzyme does not appear on a pathway, why do you think this is? What is the biological function (big picture) of your enzyme – that is, what good does it do the organism that makes it?

2. Determine if your enzyme is regulated, and if so, at what level (see above). What signal or molecule regulates its activity and how?

3. Biological context of the regulation: How does the regulation of your enzyme benefit its organism? What would be the consequences of not regulating the enzyme for the organism producing it? If your enzyme is not regulated, why do you think regulation is not necessary?

4. Finally, the literature that you have looked at is the result of research that cost probably hundreds of thousands (if not millions) of dollars. The vast majority of this money was provided by the federal government in the form of grants to researchers. To receive a grant the researcher has to give a detailed explanation not only of the work the researcher intends to do, but also the importance of doing this work. Usually in biochemistry the success rate on grant applications is about 10-20%; thus this is a very competitive process. Knowing this, why do you think that the scientists and the federal government thought it was so important to learn about

this enzyme? What potential value is there in obtaining all this information? (Industries also have to have good motivation for doing research).

The remaining 10 pts are for English and style. I would like this to be in a **narrative** format. This means not just answers to questions, but one report that covers all the questions. Make sure that you give a good introduction to your enzyme. I may not remember which enzyme you had, or what it does. This information should be in the first paragraph. In the body of the report you should reference all information using the appropriate sources either by numbers or by authors. If you don't understand this, check the papers that you have been reading. They will all use one or the other format. The **complete** citation (again, including **all** authors, title of article, year, journal title, volume number and page numbers- see those papers) should be in a separate references section at the end of your narrative. As before, I would like you to use primary sources, but will accept review articles as well. Every report **must** have some primary sources. **Include a copy/print out of the front page of every article used in this report; the abstract is not sufficient unless we do not subscribe to that journal.**

As before, print out the last page of this document, fill in your group members last names and your enzyme name and include it as the final page of your report. Don't forget to hand in your peer evaluations with your report! Missing evaluations will result in point deductions for that member. You may submit these individually or as a group if you are able to reach a consensus.

Pet Enzyme Project III Grading Sheet (30 points possible)
Grading Sheet for Group members:

_____

With the enzyme: _____

(6 points each section)

_____ Biological function of your enzyme – big picture, precursors, downstream products, benefits to the organism.

_____ Regulation – how is the enzyme regulated, by what process or molecules?

_____ Context of regulation – benefit of regulation to the organism, consequences of not regulating this enzyme.

_____ Justification for funding the research of your enzyme.

_____ Style, form and proper English grammar ☺

WPI