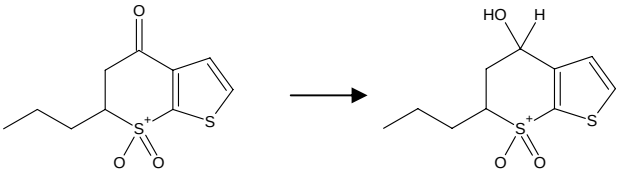
**10.492 – ICE Topics: Biocatalysis**
Fall 2004

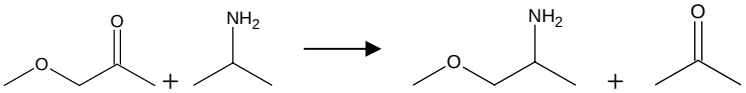
Homework #1
*Due Friday, Nov 12th at the beginning of class*. Solutions should be written and submitted on your own paper. All pages should be stapled together.

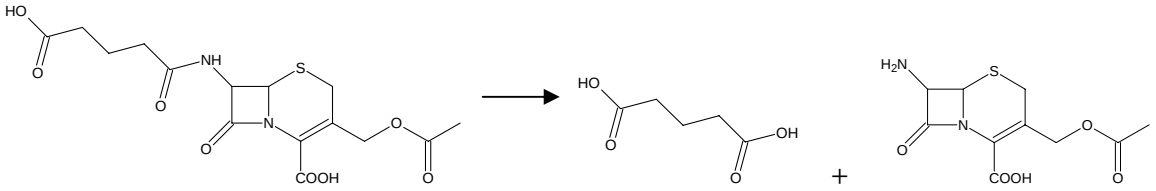
1) List three advantages of using biocatalysts over traditional (inorganic) catalysts for the production of chemical compounds.

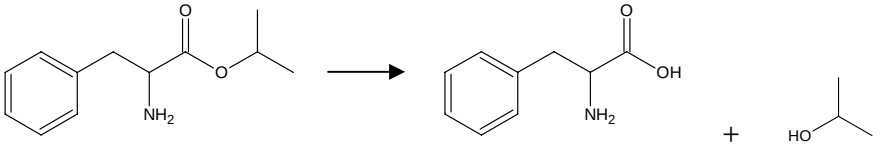
2) Name two cases in which one would likely not want to use biocatalysts and explain why.

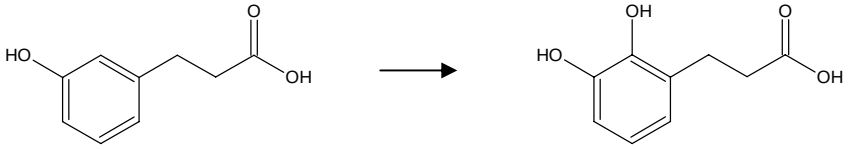
3) For the following chemical reactions, identify from which of the six enzyme classes an appropriate biocatalyst would most likely be found to perform the conversion. (Note: The reactions are not necessarily balanced as written.

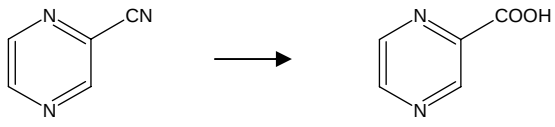
a)


b)


c)


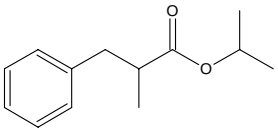
d)


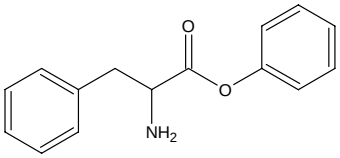
e)


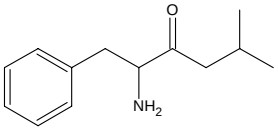
f)


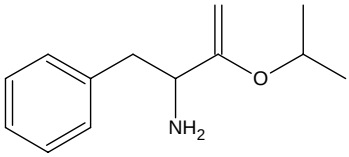
*(over)*

4) Look again at the bioconversion shown in Question 3(d). Using the same (unnamed) enzyme, evaluate whether the bioconversion is likely to occur for the following compounds. For each compound, give a brief statement as to why you think it will or will not be acted upon by the enzyme.

a) 


c) 


b) 


d) 


5) *Content for problem 5 removed due to copyright reasons.*

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6) An enzyme with a $K_M$ of $1x10^{-3}$ M was assayed using an initial substrate concentration of $3x10^{-5}$ M. After 2 min, 5 percent of the substrate was converted. How much substrate will be converted after 10 min, 30 min, 60 min? How long must the reaction be run to achieve 99% conversion? (Assume that the enzyme follows Michaelis-Menten kinetics.)