10.542 – Biochemical Engineering

Spring 2005

Practice Problems for Quiz #1 – Immobilized Enzyme Kinetics, Biocatalysis

These problems do not need to be turned in.

- 1) Shuler & Kargi, Problem 3.14
- 2) Shuler & Kargi, Problem 3.17
- 3) You would like to identify an enzyme that will perform the following reduction, giving a high yield of the *R*-enantiomer.

You have at your disposable 10 different enzyme preparations that are candidate catalysts. For each enzyme, you set up a small reaction, charged with 1 g/L of substrate and let the reaction run at room temperature for 3 hours. You then obtain the following data (each value is the concentration, in g/L, of the compound listed):

Enzyme	Ketoacid	R-hydroxyacid	S-hydroxyacid
Red1	0.48	0.26	0.26
Red2	0.12	0.24	0.64
Red3	0.76	0.19	0.05
Red4	0.75	0.03	0.22
Red5	0.25	0.71	0.04
Red6	0.33	0.66	0.01
Red7	0.20	0.39	0.41
Red8	0.10	0.86	0.04
Red9	0.99	0.003	0.007
Red10	0.62	0.31	0.07

For each enzyme, calculate the conversion and the EE. Which enzymes would *not* be carried forward for process development? Of the remaining, which is your top candidate for process development and why?

4) 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.

5) 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.