# 03-231 Biochemistry SI
# Thursday, October 13, 2005

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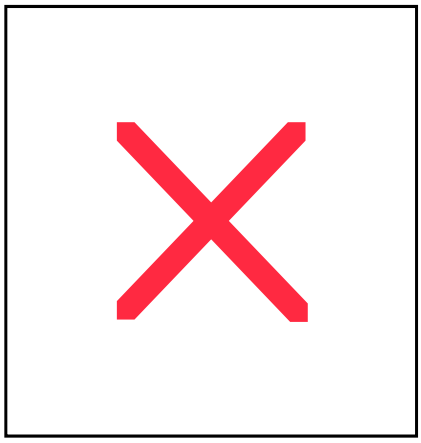
Study Tip –

**Nucleophilic Attack! (Theme: complementarity)**
Nucleo*phile* = nucleus loving. Therefore, a nucleophile must be at least partially _____ (+ or -) charged, because the nucleus of an atom is ____ (+ or -). The atom that the nucleophile attacks (a.k.a electrophile – electron loving) is at least partially ___ (+ or -) because electrons are ____ (+ or -).
Define a nucleophile: _____

List some functional groups that have the potential to be nucleophiles:

List some functional groups that have the potential to be electrophiles:

Identify and circle the nucleophile in each pair, then draw the arrows indicating the flow of electrons in a nucleophilic attack (hint: the intermediate is a tetrahedral intermediate)



Which is a better nuclophile? $CH_3$-$CH_2$-OH or $CH_3$-$CH_2$-$O^-$

List the catalysic triad: _____, _____, and _____
Which one is the best nucleophile?

How does the catalytic triad activate its nucleophile?

Draw an energy diagram for a reaction with AND without the catalysis of an enzyme

Be sure to include the following states: (S, ES, intermediate, EP, P)

How does an enzyme catalyze a reaction enthalpically? How does an enzyme catalyze a reaction entropically? Give an example for both in a serine protease.

**Enzyme kinetics: Factory and workers analogy**

Imagine you have a factory with 10 machines; each has to be operated by a skillful CMU graduate. During the first week of the operation, you only have $ (because CMU is a prestigious yet blood-sucking university) to hire one CMU graduate. During the 2nd week, due to your superior managing skills, you're able to hire 2. 3rd week → 3 graduates… The company size increases every week by 1, by the 15th week, you have 15 CMU graduates working for you.

Graph the relationship between production level and number of CMU graduates (hint: the production from machine with no CMU graduate operating on it gives 0 units per week; a machine with a CMU graduate operating on it gives 1 unit per week)