

PROBLEM SET 1

Given: Class 1

Due: Class 6

1. Look up the article: Moberg, C.L., Penicillin's Forgotten Man: Norman Heatley," Science 253:734-735., 1991. Describe Norman Heatley's role and contribution to the Penicillin story. (course outcome 7, program outcome h)
2. Look up the article: Reisman, H.B., Problems in the scale-up of biotechnology production processes, Critical reviews in Biotechnology 13:195-253, 1993. Identify and describe the problems related to scale-up of biotechnology production processes.
3. Why does the FDA approve the bioprocess and product together?
4. One goal of biochemical engineers is to design, i.e., genetically engineer bacteria to excrete proteins in the extracellular fluid. Describe how differences between gram positive and gram negative bacteria may affect your selection or influence the process.
5. You are tasked with designing a protein for a specific function.
 - a. What specific "structures of proteins do you need to consider?
 - b. The active site contains cysteine. What could happen if you substituted tyrosine for cysteine?
6. Separation processes play an important role in biochemical engineering. Some separation processes are filtration, sedimentation, and centrifugation. Organism size and density are important characteristics for these processes. Assuming that the densities are the same, provide the characteristic dimension of each type of organism below, and calculate the surface area to volume ratio (assuming spherical shape) for each organism. Rank the organisms from smallest to largest.

- Bacteriophage	- hepatocyte
- E. Coli	- Plant cell
- S. cerevisiae	- Mold pellet
- Chlorella	- Amoeba
7. Team assignment. Each team will make a verbal presentation (15 minutes) addressing a "team-topic" provided below. Each person in the team must participate by: (1) making a verbal presentation, and (2) preparing a one-page handout. **Identify the "engineering" connection/application.**

Team topics:

 1. Types of microorganisms for utilization by biochemical engineers (Section 2.1 of textbook)
 2. Living cell construction (Section 2.2)
 3. Living cell nutrients (Section 2.3)
 4. Your presentation and handout must be based on the utilization of the biological science for biochemical engineering applications. You are encouraged to use information sources outside the textbook.