

**HOMEWORK #1**  
**BME 416/516 Fall 2007**

September 4, 2007

Due 8:00 am, September 11, 2007

Briefly (in 1-2 sentences) answer the questions:

1. Define the term “biomaterial.”
2. Describe the difference between “graft” polymerization and “cross-linking” polymer networks.
3. Why  $T_g$  is important for polymeric biomaterials?
4. What is hot rolling?
5. What is the significance of stress-strain curve for biomaterials?
6. Identify elastic modulus, yield point, ultimate strength and failure strength in the typical stress-strain curve.
7. Compare metals with polymers in terms of the ultimate or yield strength.
8. What is the isoelectric point of a protein?
9. What does “RGD” refer to? Explain its significance.
10. List the possible interactions between proteins and biomaterial surfaces.
11. Describe the physiological relevance and sequence of events involved in forming the “platelet plug.”
12. Describe the difference between intrinsic and extrinsic coagulation pathways.
13. Describe how heparin and plasminogen function as anticoagulants.
14. Explain how monocytes, macrophages, and foreign body giant cells are distinctly different and yet related.
15. Describe the differences between macrophages and neutrophil functions.
16. Describe diapedesis.
17. Describe the potential outcome of rough biomaterial surfaces.
18. Investigate the coatings for biomaterials to resist thrombosis (e.g., PEG/heparin coating or pre-clotting).
19. List the overall sequence of normal wound healing, starting from thrombosis/hemostatis to remodeling phase.
20. What is granulation tissue?
21. Discuss the effect of surface roughness of implants towards (1) protein adsorption, (2) infection, (3) foreign body reaction, (4) fibrous capsule formation, and (5) fixation of implants.
22. In THA, what are the most popular materials for (1) femoral stem, (2) head, (3) acetabular cup, and (4) cup liner, and why they are popular (i.e., what are their advantages)?
23. What is metal allergy?
24. Why does the sewing cuff of heart valve prostheses have roughened surface?
25. What is PTCA? What is balloon angioplasty?
26. Coronary artery stents are used in balloon angioplasty to primarily prevent \_\_\_\_\_.
27. What are stent grafts? What is aneurysm?
28. What is anastomosis?
29. Why is endothelialization required for vascular grafts?