Exam ELT-61226 Biomedical engineering: Biomaterials 14.10.2013

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NO calculators or dictionaries allowed! Answer in English!

NOTE that there are also questions on the other side of the paper.

1. Explain following terms shortly (1 p each)
   a. Hydrolytic degradation
   b. Stress shielding
   c. Biocompatibility
   d. In vitro
   e. Implant
   f. Biostable
   g. Bioactivity
   h. Nearly inert

2. Composites in medical applications. Answer following questions: (8 p)
   a. Explain why composites are used in medical applications and which benefits can be achieved over single materials?
   b. Which are the main drawbacks of using composites?
   c. Give an example of a case where composites are used to improve the properties or functionality of a biomedical device or a material.

3. Polymers as biomaterials. Answer following questions: (8 p)
   a. How can you classify polymers according to their origin? Which are the main factors distinguishing these groups from each other? How do these factors affect their use in medical applications? Give two examples of polymers belonging to each of the groups.
   b. Explain three different factors that affect degradation of polymers.
   c. Explain the main differences between hydrolytic and enzymatic degradation.
4. **Metals as biomaterials. Answer following questions (8 p)**
   
a. Explain the advantages and disadvantages that metals have as implantable biomaterials.

b. Explain the following graph after 10 years implantation. What has happened and why?

![Graph of tissue integration and fibrous capsule formation](image)

5. Based on your knowledge from this course, which kind of material(s) would you use for the development of implantable material that would release antibiotic to an infected bone tissue? Tell also why you chose this material. (4 p)