Exam BME-1167 Biomedical engineering: Biomaterials **17.10.2011**

Answer ONLY 5 questions out of 6

NO calculators or dictionaries allowed!

Question 1.

a) Define following terms shortly (3p)
   1. Copolymer
   2. Hydrolytic degradation
   3. Biostable polymer
   4. Miscible polymer blend
   5. Hydrogel
   6. Therapeutic range

b) How can polymers be modified for biomedical applications? (2p)

c) How would you test the mechanical properties of a material intended for scaffold use for bone tissue engineering? (1p)

Question 2.

a) Define the possible interactions between implanted material and the tissue at the implantation site. (3p)

b) Explain 4 different environmental factors affecting polymer degradation. (2p)

c) Define biodegradation and what is understood by physical, chemical or biochemical degradation. (1 p)

Question 3.

a) Explain the disadvantages of using metals in biomedical applications. (3 p)

b) Biocompatibility of metals. What are the major reasons defining the biocompatibility of metals? Give an example of a metal that has good biocompatibility and why. (2 p)

c) Explain stress shielding. Why does it cause problems? (1p)

Question 4.

a) Why are calcium phosphate ceramics widely used in bone applications? What happens when they are implanted in contact with bone? (3p)

b) Define osteoconduction and osteoinduction. What happens on the surface of the material and in the body? (2 p)

c) Explain shortly: How would you design a vascular prosthesis? Which materials would you use and why? (1 p)

Question 5.

a) Why are composites an attractive alternative when materials for implantable applications are designed? (3p)

b) Coatings are also considered as composites. Which are the major aims when coatings are applied on the surfaces of biomaterials? (2p)

c) What are bionanocomposites? (1 p)

Question 6.

a) Define following terms shortly (3p)
   1. Biomaterial
   2. Implant
   3. Tissue engineering
   4. Bioactive glass
   5. Continuous phase
   6. Surface erosion

b) Choose one way of classifying biomaterials and explain it. Give an example of a material belonging each of the groups in your chosen classification. (2p)

c) Why normal window glass can not be used as biomaterial? (1p)