

UNIVERSITY COLLEGE LONDON

UNIVERSITY OF LONDON

EXAMINATION FOR INTERNAL STUDENTS

FOR THE FOLLOWING QUALIFICATIONS:

M.Sc.

Orthopaedics 3002: Biomaterials and Biomechanics

COURSE CODE	:	ORTH 3002
UNIT VALUE	:	0.50
DATE	:	23-January-06
TIME	:	10.00
TIME ALLOWED	:	3 Hours

SECTION A

Answer **TWO** questions out of the following **THREE** (25 marks per question)
Use diagrams to illustrate your answer where appropriate

Answer each question in a **SEPARATE** book

1. Compare and contrast the constrained and the unconstrained knee implants and discuss the clinical indications for their use.
2. How can tissue-engineering strategies be used to regenerate bone and cartilage?
3. Indicate the mechanisms where by particles generated at the articulation are able to induce osteolysis around a femoral stem and an acetabular cup.

SECTION B

Answer **SIX** questions out of the following **EIGHT** (5 marks per question)
Use diagrams to illustrate your answer where appropriate

Answer each question starting on a **NEW PAGE** of the answer book

1. Describe the effect of increasing the offset of the femoral head in total hip replacement.
2. Describe the differences between a stress - strain curve and a load – deformation curve.
3. Briefly describe the advantages and disadvantages of using metal-on-metal articulation in total hip replacements.
4. Regarding polymers:
 - a) Describe the appearance of AMORPHOUS and CRYSTALLINE polymer chains. What effect do these chains have on the mechanical properties of the polymer?
 - b) Define the Glass Transition Temperature (T_g) of a polymer.
 - c) Briefly describe the two types of polymerisation processes that occur in the formation of polymers.
5. Describe two theories for optimising the fixation of cemented femoral components within bone. Which theory is most favourable in terms of implant longevity and why?
6. Relate the general properties of bioceramic materials to the advantages and disadvantages of their use in orthopaedic implants.
7. Describe what is meant by metal fatigue and why it is important to avoid in implant design.
8. Regarding muscle contraction, describe the difference between isometric contraction and isotonic contraction, and give one example for each muscle contraction.