

UNIVERSITY COLLEGE LONDON

UNIVERSITY OF LONDON

EXAMINATION FOR INTERNAL STUDENTS

FOR THE FOLLOWING QUALIFICATIONS:

B.Sc. (Intercal)

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. Wear particles released at the articulation of joint replacements cause osteolysis. Describe the mechanical and biological processes that lead to osteolysis. Why is the osteolytic process different in knee joint replacement compared to hip replacement?
2. Discuss the advantages and disadvantages of cemented versus cementless fixation of the femoral component in total hip replacement surgery.
3. Describe the factors which need to be considered when defining the centre of the femoral head in designing revision hip implants.

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. Explain why forces acting across joints are larger than the supported bodyweight. Give an example of a force or pressure transducer used *in vivo*, highlighting its key features.
2. Define an isotropic and an anisotropic material. Give an example of each material.
3. Briefly describe the characteristics of **five** materials commonly used for orthopaedic implants. Include their mechanical properties, wear properties and biocompatibilities.
4. Describe the different methods that may be used in the laboratory for evaluating a newly designed orthopaedic implant before it can be used in patients.
5.
 - a. List the limitations associated with the use of degradable polymers for clinical application.
 - b. Give the advantages and disadvantages for the use of polymethylmethacrylate as a bone cement in clinical applications.
6. Articular cartilage is described as a biphasic, viscoelastic material. Describe the structure of articular cartilage with reference to its biphasic and viscoelastic properties.
7. Define biocompatibility. What are the advantages and disadvantages of testing biomaterials for biocompatibility?
8. Define the following terms:
 - a. Osseointegration
 - b. Bone bonding
 - c. Bioactive
 - d. Osseoinductive
 - e. Osseoconduction