

UNIVERSITY COLLEGE LONDON

UNIVERSITY OF LONDON

EXAMINATION FOR INTERNAL STUDENTS

FOR THE FOLLOWING QUALIFICATIONS:

B.Sc. (Intercal)

Health Sciences C104: Biomechanics

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| COURSE CODE | : | HESCC104 |
| UNIT VALUE | : | 0.5 |
| DATE | : | 10-MAY-04 |
| TIME | : | 10.00 |
| TIME ALLOWED | : | 3 Hours |

Answer **FOUR** questions out of **SIX** (20 marks for each question)
Answer **EACH** question in a **SEPARATE** book

Use diagrams to illustrate your answers where possible.

1. Discuss the relevance of force-measuring orthopaedic implants to science and clinical practice. Which parameter(s) are sensed in such devices and how? With reference to **one** particular design of instrumented implant, discuss the advantages and disadvantages of its method of operation and *in vivo* use (power supply, site of instrumentation, sealing) and explain the transducer principle. How might the transducer be less than ideal?

2. You have been given the task of selecting implant materials for the following two patients:

Patient A is a 10 year old female who has a malignant bone tumour of the proximal femur that requires a proximal femoral limb salvage prosthesis.

Patient B is 78 year old male with an osteoarthritic right hip who requires a total joint replacement.

Suggest materials that are appropriate for use in these two patients and the mode of fixation giving your rationale.

3. Following cemented total hip surgery, describe complications related to cementing technique which occur at the cement interfaces. Briefly describe ways in which research has attempted to solve these problems.

4. What are the biomechanical and material consequences of using alumina oxide on plastic, ceramic on ceramic, metal on metal and metal on plastic articulation for a hip replacement?

5. Bone, articular cartilage, menisci, ligament and tendon are described as viscoelastic materials. Define viscoelasticity and, with reference to one of these materials, indicate how its structure and composition is related to its viscoelasticity.

6. What are the **early and late local complications** following total hip replacements? Suggest possible solutions based on scientific evidence to prevent these complications.