

UNIVERSITY COLLEGE LONDON

UNIVERSITY OF LONDON

EXAMINATION FOR INTERNAL STUDENTS

FOR THE FOLLOWING QUALIFICATIONS:

B.Sc. (*Intercal*)

Orthopaedics 3002: Biomaterials and Biomechanics

COURSE CODE : ORTH3002

DATE : 20-MAY-05

TIME : 10.00

TIME ALLOWED : 3 Hours

05-C1007-3-50

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TURN OVER

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. List the different types of bearing surfaces used for total hip replacements. What are the advantages/disadvantages of these different bearings in terms of their lubrication properties; the generation of wear debris and the biological effect of the different debris generated?
2. Discuss the implant design goals for total knee arthroplasty.
3. Compare and contrast the different methods used for long bone fracture fixation.

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. As part of the development of a new design of knee implant you have been asked to investigate the level of force experienced by the knee during a particular activity. You ask whether data for the "joint reaction force" or the "bone-on-bone force" is required.
 - a) Explain what the difference is between these two measurements.
 - b) Which do you think is likely to be more important in this case, and why?
2. Describe one design of instrumented femoral prosthesis used for measuring force or pressure in vivo, explaining the measurement principles, and give one example of the use of this data.
3. What are the main physiological processes involved in cell adhesion?
4. List the advantages and disadvantages of different types of scaffold/cell carrier materials that are used to augment bone repair either in segmental defects or adjacent to orthopaedic implants.
5. Describe the processes and mechanisms that lead to corrosion of metal alloys in the body.
6. Give an example of a bioactive ceramic used for bone integration and an example of a ceramic material used as an orthopaedic bearing. What material properties make your two examples bioactive or wear resistant?
7. State the important differences in the mechanical and material properties of Cobalt Chrome Molybdenum alloy and Titanium alloy (Ti₆AL₄V) with respect to their use in joint replacement implants.
8. Describe the most commonly used clinical methods for articular cartilage repair.