Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 Level 2nd Semester Examination – Dec./Jan. 2017
SCT 446-2 Composites and Bio Materials

Uva Wellassa University

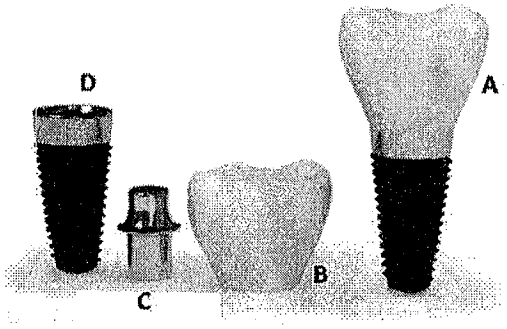
Instructions to candidates
Duration: Two (02) hours
Number of questions: Four (04) – Two questions each in Part I and Part II
Answer all questions
Use separate booklets to answer Part I and Part II
Mark allocation: Four hundred (400)

Part I : Biomaterials

1.

a) Materials in total dental implants should be able to resist drastic temperature and pH changes in the oral cavity. Discuss this statement. (20 Marks)

b) Given in the Figure below labeled as *A* is a total dental implant.



i. Name parts **B**, **C** and **D.** (10 Marks)

ii. Suggest suitable biomaterials to manufacture parts **B**, **C** and **D.** (10 Marks)

iii. Briefly explain all the major surgical steps involved in planting *A* in the oral cavity. (40 Marks)

c) Discuss advantages and disadvantages of using resin in tooth fillings over amalgam filling (20 Marks)

2.

a) What do you mean by "Biocompatibility'? (20 Marks)

b) What are the features of biocompatible materials? (20 Marks)

c) Briefly discuss the advantages of "Biodegradable" implants. (20 Marks)

d) Suggest two examples each for the following:

i. Second generation implants.

ii. Third generation implants (40 Marks)

④ C

Part II : Composites

3.

a) What do you understand by "large-particle composites"? (30 Marks)

b) Name two examples for large-particle composites. (10 Marks)

c) What is the characteristic feature of large-particle composites? (10 Marks)

d) A large-particle composite consisting of tungsten particles within a copper matrix is to be prepared. If the volume fractions of tungsten and copper are 0.70 and 0.30, respectively, estimate the upper limit for the specific stiffness of this composite. The following data is given. (50 Marks)

	Specific Gravity	Modulus of Elasticity (GPa)
Copper	8.9	110
Tungsten	19.3	407

4.

a) For a polymer-matrix fiber-reinforced composite

i. List three functions of the matrix phase. (15 Marks)

ii. What are the desired mechanical characteristics of matrix and fiber phases? (20 Marks)

iii. Give two reasons why there must be a strong bond between fiber and matrix at their interface (15 Marks)

b) In an aligned and continuous carbon fiber-reinforced nylon 6,6 composite, the fibers are to carry 97% of a load applied in the longitudinal direction.

i. Using the following data, determine the volume fraction of fibers that will be required. (30 Marks)

ii. What will be the tensile strength of this composite? Assume that the matrix stress at fiber failure is 50 MPa (7250 psi). (20 Marks)

	Modulus of Elasticity [GPa (psi)]	Tensile Strength [MPa (psi)]
Carbon fiber	260 (37×10^6)	4000 (580,000)
Nylon 6,6	2.8 (4.0×10^5)	76 (11,000)