



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020**

COURSE NAME : BIOMATERIALS
COURSE CODE : BEU 41103
PROGRAMME CODE : BEJ
EXAMINATION DATE : JULY 2020
DURATION : 3 HOURS
**INSTRUCTION : ANSWERS ALL QUESTIONS.
OPEN BOOK EXAMINATION**

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

Q1 **Figure Q1(a)** shows the photomicrographs of immuno-fluorescence imaging of a section of unknown tissue.

(a) Identify part A, B and C of the tissue as shown in **Figure Q1(a)**.

(6 marks)

(b) Explain the cells and tissue microstructure identified for part A, B and C in **Figure Q1(a)**.

(12 marks)

(a) Explain a biomaterial which is suitable to fabricate an artificial tissue to repair this tissue shown in **Figure Q1(a)**.

(2 marks)

Q2 (a) Examples of synthetic biopolymers are Poly-lactic acid (PLA), poly glycolic acid (PGA) and polycaprolactone (PCL). Distinguish **THREE (3)** advantages and disadvantages of applying them as biomaterials.

(6 marks)

(b) Fibronectin existence is highly abundant in human body.

(i) Define fibronectin and its properties.

(2 marks)

(ii) Identify types of fibronectin available.

(3 marks)

(iii) Suggest the molecule on the fibronectin which mediates cell binding.

(2 marks)

(iv) Explain the functions of fibronectin in wound healing.

(3 marks)

(v) The cells with their integrin proteins specific to fibronectin binding was inhibited. Deduce the consequences of this inhibition.

(4 marks)

- Q3** (a) In considering for types of biomaterials to be used for any implant, biocompatibility is an important consideration. Suggest and explain **TWO (2)** techniques that can be performed to evaluate the toxicity of the implant.

(6 marks)

- (b) Metal is an important example of biomaterials safe to be used in various applications such as implants and coatings.

- (i) Give **TWO (2)** specific applications of metal as biomaterials and justify **TWO (2)** reasons for each metal suggested for the applications.

(6 marks)

- (ii) An artificial hip implant was found with cracked on the surface. Analyze this problem and investigate this problem with explanation of the fabrication process.

(8 marks)

- Q4** **Figure Q4** shows the photomicrographs of immuno-fluorescence imaging of cytoskeleton and vinculin expressions of fibroblast cultured on the glass substrate and a soft gel substrate, respectively.

- (a) Draw a diagram of cell adhesion to a substrate and cell-cell adhesion. Label it clearly to explain briefly the cell-substrate and cell-cell adhesions.

(6 marks)

- (b) If these cells were to be cultured on a soft bed of hydrogel, estimate the responses of the cytoskeletons on the hydrogels.

- (i) Distinguish **THREE (3)** differences of the cytoskeleton expressions when the cells are cultured on the glass substrate and in the hydrogel.

(6 marks)

- (ii) Explain the reason and roles of the cell expressed such characteristics on soft and hard substrates.

(4 marks)

- (iii) Deduce the organisation of the cytoskeleton in the keratinocytes by drawing the structural organisation of the cytoskeleton in response to soft and hard substrates.

(4 marks)

- Q5**
- (a) Explain if the “ideal” biomaterial is always bioinert. (2 marks)
 - (b) A patient complaint about itchiness, swells and redness of skin after application of a new topical cream. Analyze this problem and suggest the reasons for this symptom. (4 marks)
 - (c) State **THREE (3)** differences between acute and chronic inflammation. (6 marks)
 - (d) List **FOUR (4)** features of implant associated with infections and recommend strategies that can be used to decrease or prevent implant-associated infections. (4 marks)
 - (e) Explain the causes of restenosis when vascular stent is implanted and the effects of the restenosis to the physiological system. (4 marks)

-END OF QUESTIONS –

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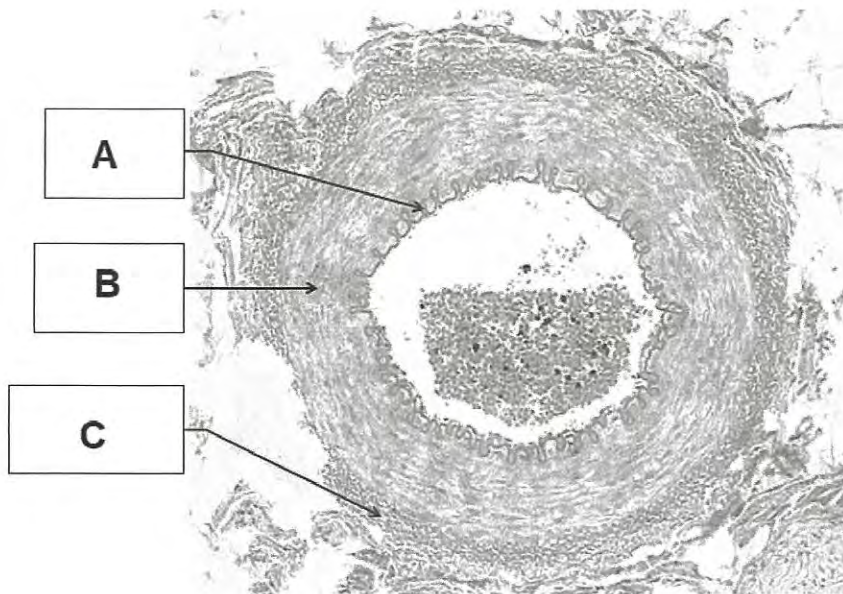


Figure Q1(a)

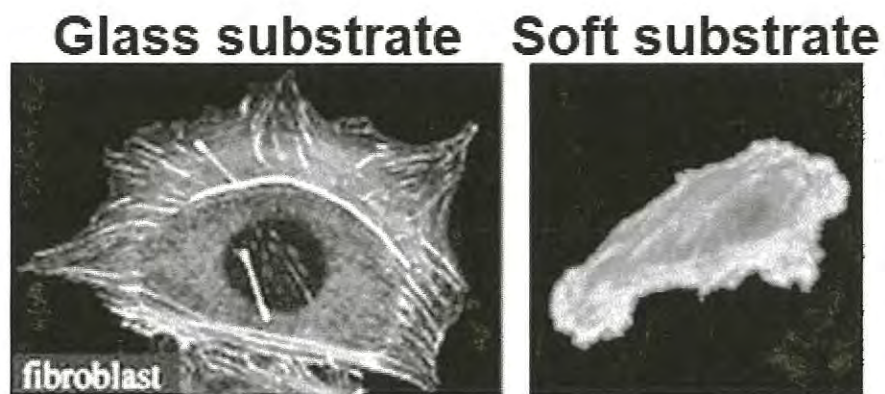


Figure Q4