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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019**

COURSE NAME : BIOMATERIALS
COURSE CODE : BEU 41103
PROGRAMME CODE : BEJ
EXAMINATION DATE : JUNE / JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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TERBUKA

- Q1** (a) Examples of natural materials or polymer are proteins and polysaccharides. Distinguish **THREE (3)** advantages and disadvantages of their properties. (6 marks)
- (b) Collagen existence is highly abundant in human body.
- (i) Define collagen and its properties. (2 marks)
- (ii) Differentiate types of collagen fibers available. (3 marks)
- (iii) Describe the reason for collagen modification. (2 marks)
- (iv) Explain the strategies to be used for modification of amino acid residues from collagen. (3 marks)
- (v) Elaborate the function of collagen fibers during bones formation. (4 marks)
- Q2** (a) While considering for types of biomaterials to be used for any implant, both positive and negative responses are critical. Discuss the importance of these responses. (4 marks)
- (b) Ceramic is an important example of biomaterials safe to be used in various applications such as implants and coatings.
- (i) Classify between an inert ceramic and a resorbable ceramics and their effect to be used on the tissue. (4 marks)
- (ii) Identify **TWO (2)** types of natural ceramic and how we can use them synthetically. (2 marks)
- (iii) With the aid of diagram, explain the formation process of silicon-based ceramics. (3 marks)
- (iv) Elaborate on biomineralization in living organisms. (3 marks)

- (c) Elaborate the causality of temperature dependent deformation to certain polymer.

(4 marks)

Q3 Figure Q3(a) and (b) show the photomicrographs of immuno-fluorescence imaging of cytoskeleton and vinculin expressions of keratinocytes cultured on the glass substrate and a soft liquid crystals substrate, respectively.

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

(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.

(4 marks)

- (iii) Deduce the organisation of the cytoskeleton in the keratinocytes and draw the structural organisation of the cytoskeleton to the vinculins for the keratinocytes shown in **Figure Q3(a) and (b)**.

(4 marks)

Q4 Tissue engineering is the current and future research to engineer organ graft that are in high demand. Designing an artificial tissue graft involves multi-disciplinary areas of engineering, biology and materials science. You are asked to design a soft tissue graft for cartilage that is easily wound-out for obese patients.

- (a) Suggest a type of synthetic biopolymer which is suitable for the above application and state **THREE (3)** reasons why you choose this biomaterial as a solution.

(8 marks)

- (b) Draw the structure of an elastic cartilage and cells, and, explain the functions and importance of the cartilage.

(6 marks)

- (c) Suggest the **TWO (2)** types of natural polymers that can be found in the cartilage and explain how these natural polymers would function in the artificial cartilage that you have synthesized.

(6 marks)

- Q5** (a) Explain if the “ideal” biomaterial is always chemically inert.

(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 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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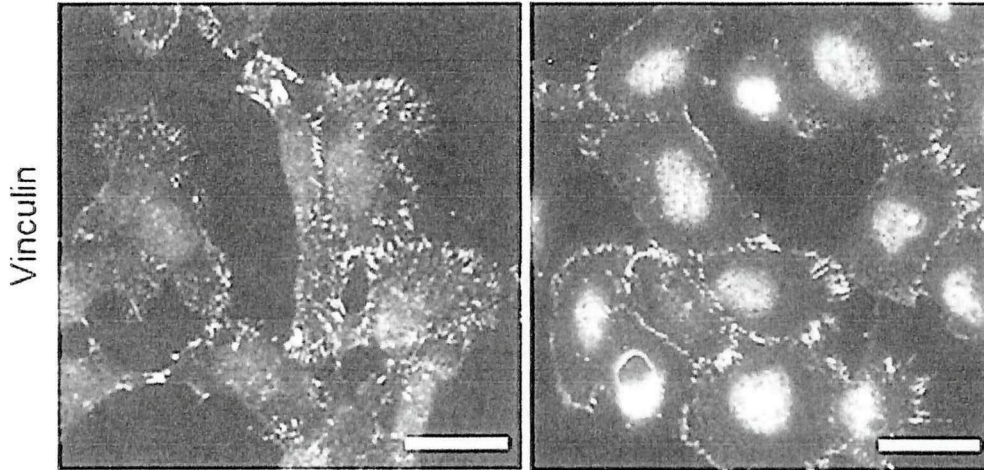


Figure Q3(a)

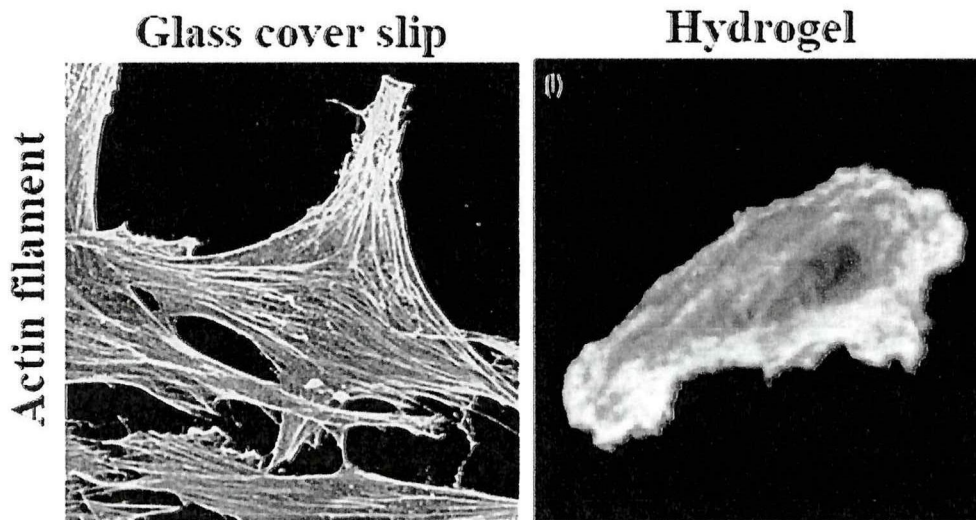


Figure Q3(b)