UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	BIOMATERIALS
COURSE CODE	:	BEU 41103
PROGRAMME	:	BEJ
EXAMINATION DATE	:	JUNE/JULY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Describe the **TWO (2)** biological difference between soft and hard tissues.

(4 marks)

(b) Organs are made of tissues, typically with dominant tissues and supporting tissues. Name and explain the functions of **FOUR (4)** different classess of tissues.

(4 marks)

(c) A person's diet is restricted only to carbohydrate without proteins and fruits every day continously for a year.

(i) Predict what would happened to the structure of the skin tissues especially to the synthesis of collagen.

(2 marks)

(ii) Draw a diagram to explain the failure of construction of collagen fibers synthesis

(2 marks)

(iii) State how this affects the synthesis of skin tissue.

(2 marks)

(iv) Recommend the food he should uptake to solve this problem.

(2 marks)

(d) Compare **TWO (2)** differences between Xenograft and Allograft.

(4 marks)

Q2 The protocol for analyzing two dimensional (2D) cell culture is very common but three dimensional (3D) cell cutlure is the current research trend. In your research lab, 3D microtissues of epithelial cells of size ranging from 200 - 300 micrometre were synthesized using a novel method.

(a) Suggest and explain **THREE (3)** methods that could be applied to evaluate the biological relevance of the microtissues.

(10 marks)

(b) Identify and state **FOUR (4)** potential applications of this type of microtissues.

(4 marks)

(c) Design a process through a flow chart to prepare microtissues samples for examining the histological section of the microtissue.

(6 marks)

Q3 (a) Synthetic bio-inert materials are currently used as an alternative to autogenous bone graft. Calcium hydroxyapatite (HA) and Beta tri-calcium phosphate (β-TCP), which belong to the calcium phosphate ceramics group that are biocompatible and osteo-conductive of cells. Suggest and explain **FOUR (4)** methods to assess the mechanical and physical properties of a biocomposite that were enhanced with HA and TCP. In your description, please include drawings to describe the test.

(8 marks)

(b) After examining the mechanical/physical properties and you would like to examine the surface properties of a biopolymer (Polytethylene Oxide), suggest **FOUR (4)** physical and mechanical properties methods that is of your concern for long term bio-implantation.

(12 marks)

Q4 You are required to design an artificial skin graft that can be used for replacement of burn skin. Alginate is an extract from the seaweed and it is an USA Food and Drug Administration (FDA) approved biomaterial. It has been incorporated into many new hydrogels design.

(a) State the **TWO (2)** advantages and disadvantages of Alginate in the design of the biomaterial.

(4 marks)

(b) The mechanical properties are important to ensure that the cells are adaptable to the stiffness of the material and restructure themselves accordingly. Suggest and explain **TWO (2)** techniques that could be used to assess the two mechanical properties of a alginate-glycerine composite.

(6 marks)

(c) Alginate is a polysaccharides. State the advantages of adding glycerine and gelatine to the alginate hydrogel composites.

(4 marks)

(d) Paraffin and polycarbonate were prepared for thermal analysis. It was found that paraffin after polymerisation could be remelted to polymerise into

another shape. However, the cured polycarbonte under cooling is not reversibe after heat application.

(i) Suggest the difference between the polymer structure of thermoplastic and thermosetting polymers.

(2 marks)

(ii) Explain briefly the **THREE (3)** forming processes of thermoplastic and thermosetting polymer.

(2 marks)

(iii) State the application for thermoplastic and thermosetting polymer.

(2 marks)

Q5 (a) Explain if the "ideal" biomaterial is always chemically inert.

(2 marks)

(b) A patient complaint about itchness, swells and redness of skin after application of a new topical cream. Evaluate 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 methods that can used to decrease or prevent implant-associated infections.

(4 marks)

(e) Explain the causes of restenosis when vacular stent is implanted and the effects of the restenosis to the physiological system.

(4 marks)

- END OF QUESTIONS –