



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2023/2024**

- COURSE NAME : GLASS AND CERAMICS TECHNOLOGY
- COURSE CODE : BWC 33503
- PROGRAMME CODE : BWC
- EXAMINATION DATE : JULY 2024
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
  2. THIS FINAL EXAMINATION IS CONDUCTED VIA  
 Open book  
 Closed book
  3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

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**CONFIDENTIAL**

- Q1** (a) Define glass materials by considering its structural and thermal properties.  
(2 marks)
- (b) List **THREE (3)** modern applications for each of the following materials:
- (i) Soda lime silicate glass,  
(ii) Iron phosphate glass.  
(6 marks)
- (c) Draw the enthalpy versus temperature diagram for a glass forming melts. In the diagram, label the glass and crystal regions, fictive temperatures and melting temperature as well as compare the difference between the fast cooled glass and slow cooled glass.  
(8 marks)
- (d) Outline the general processes of forming obsidian glass from volcanic magma.  
(4 marks)
- Q2** (a) List **THREE (3)** types of furnaces that are commonly used in the production of glass.  
(3 marks)
- (b) Determine the weight percent of  $\text{NH}_4\text{H}_2\text{PO}_4$  and  $\text{Fe}_3\text{O}_4$  raw materials to produce 100 g iron phosphate glass with the formula of  $40\text{Fe}_2\text{O}_3 - 60\text{P}_2\text{O}_5$  (mol %). In your calculation, consider element weight  $\text{Fe} = 55.845$ ,  $\text{O} = 15.999$ ,  $\text{P} = 30.974$ ,  $\text{N} = 14.007$  and  $\text{H} = 1.008$ .  
(5 marks)
- (c) Sketch and explain the block diagram showing the glass blowing procedure from the batch calculation of raw materials until the annealing process using conventional glass melting method.  
(10 marks)
- (d) Compare the heat transfer mechanisms between electrical box furnace and gas furnace in the context of preparing glass materials.  
(2 marks)

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- Q3** (a) Explain the basic principle on how a ceramic object is formed through the slip casting process.  
(8 marks)
- (b) State the differences between dry pressing and cold isostatic pressing (CIP) for ceramic shaping.  
(4 marks)
- (c) Briefly explain the basic steps involved in ceramic injection moulding (CIM).  
(8 marks)
- Q4** (a) A newly developed ceramic material exhibits cracking during the drying stage. Outline a troubleshooting approach to identify the potential cause(s) of this issue.  
(6 marks)
- (b) Sintering is a crucial step in achieving desired properties in many advanced ceramics.  
(i) Discuss the factors that influence the rate of sintering.  
(ii) Explain how these factors can be manipulated to control the microstructure and properties of a specific ceramic material.  
(8 marks)
- (c) Recent advancements in microwave technology have shown promise for faster and more energy-efficient ceramic firing. Compare and discuss the advantages and limitations of microwave firing compared to conventional firing methods.  
(6 marks)

- END OF QUESTIONS -

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