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# UNIVERSITI SAINS MALAYSIA

KSCP Examination  
Academic Session 2009/2010

June 2010

## EBB 523/3 - Ceramic Processing

Duration : 3 hours

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Please ensure that this examination paper contains THREE printed pages before you begin the examination.

This paper consists of SIX questions.

**Instruction:** Answer **FIVE** questions. If candidate answers more than five questions only the first five questions answered in the answer script would be examined.

The answers to all questions must start on a new page.

All questions must be answered in English.

1. [a] What are the desirable powder characteristics and properties of advanced ceramics compared to traditional ceramics?  
(40 marks)
- [b] Describe 3 particle fracture mechanisms in a grinding/milling process of raw minerals used in production of ceramics.  
(60 marks)
2. [a] Explain the various problems with “aqueous-based systems” tape casting.  
(60 marks)
- [b] Discuss the role of each of the following additives in slips for ceramics:  
(i) Dispersant  
(ii) Solvent  
(iii) Binder  
(iv) Plasticizer  
(40 marks)
3. [a] Explain die friction in a die-compaction/pressing? How can it be reduced?  
(60 marks)
- [b] Explain the 4 parameters influencing the chemical equilibria, purity and the physical nature of the powder obtained from a wet chemical co-precipitation process.  
(40 marks)

4. [a] In term of processing and properties, give significant differences between ceramic, glass and glass ceramic.  
(50 marks)
- [b] Drying process occurs in three (3) stages corresponding to the ranges of liquid content in ceramic body. Discuss in detail.  
(50 marks)
5. Discuss the following topics:
- (i) Ceramic Foam Manufacturing Using Sponge Replication
  - (ii) Ceramic Injection Molding
  - (ii) Self-Propagating-High-Temperature Synthesis (SHS) of Ceramic
- (100 marks)
6. [a] Clearly explain every steps involved in solid state sintering and liquid-phase sintering. Give the differences between these methods.  
(60 marks)
- [b] There are several advantages in liquid phase sintering compared to solid state sintering, however ceramic product produced by solid state sintering may have superior properties compared to ceramic product produced by liquid-phase sintering. Describe it.  
(40 marks)