UNIVERSITY OF GHANA
(All Rights Reserved)

BSc. (ENG) MATERIALS SCIENCE AND ENGINEERING
END OF FIRST SEMESTER EXAMINATION: 2015/2016
DEPARTMENT OF MATERIALS SCIENCE & ENGINEERING
MTEN 409: GLASSES, CEMENTS, AND CONCRETES (2 CREDITS)

INSTRUCTIONS:

ANSWER ALL FOUR (4) QUESTIONS **TIME ALLOWED: TWO (2) HOURS.**

1.

a. In physics, the standard definition of a glass (or vitreous solid) is a solid formed by rapid melt quenching. However, the term glass is often used to describe any amorphous solid that exhibits a glass transition temperature T_g. Based on the above statements and the atomic structure of glass, compare in details a vitreous solid with supercooled liquid

[25 marks]

2.

a. Briefly discuss Portland cement with all its chemical reactions.

b. The water to cement ratio is the most critical factor in the production of "perfect" concrete. Explain.

c. Time is also an important factor in determining concrete strength. Concrete hardens as time passes. Why?

d. Comment on the ingredients, properties, and applications of vitreous silica glass.

[25 marks]

3.

a. Crystalline. Semi-crystalline and amorphous synthetic silicates are materials of significant industrial importance, because of their nature and properties. Using the structural and kinetic approaches, and with the aid of appropriate graphs, explain the phase formations and the physical characteristics of synthetic silicate glasses (including glass-ceramics).

[25 marks]

4.

a. As a Production Manager of J & B Cement Works Ltd, explain how Portland cement is produced, to Polytechnic students who are on a field trip to your factory.

[25 marks]