CRAWFORD UNIVERSITY

COLLLEGE OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF INDUSTRIAL CHEMISTRY
HARMATTAN EXAMINATION 2021/2022

COURSE CODE: ICH 325
COURSE TITLE: INTRODUCTION TO MATERIAL SCIENCE **UNITS: 3**
TIME ALLOWED: 3HRS **DATE: JANUARY 2022**
INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS.

1(a) Write short notes on each of the following. I) Ionic solids II) Metallic solids III) Covalent network solids (6 marks)

(b). Briefly describe the following crystal growth techniques
(I) Diffusion, (II) interfacial (III) sublimation techniques
2(a) Using a cube model , show the following Miller indices of direction (I) [001] (II) [110] (III) (211) (8 marks)

b) Differentiate between the following: (I) Non-stoichiometric and stoichiometric solids (II) Frenkel and Schottky defects (7 marks)

3(a) Write short notes on the following properties of crystalline solids: (I) Hardness (II) Cleavage and fracturing (III) Colour (5 marks)
(b) Describe the sol-gel process (5 marks)

4 Give the reaction schemes for the:

a) acid catalyzed hydrolysis and condensation of a silicon alkoxide precursor

b) base catalyzed hydrolysis and condensation of a silicon alkoxide precursor (6 marks)

5(a) Explain why the amorphous structured glass is transparent.

5b) Give five glass additives and their respective colours.

5c) Give the reactions that occur during the processing of cement.

6a) Outline the three categories of ceramics. 5 marks)

6b) Write short notes on the following as it relates to ceramics production:

i) -Grinding & milling
ii) -Mixing & forming
iii) -Drying
iv) -Firing & sintering