CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN INDUSTRIAL CHEMSTRY

CHIN 221: INDUSTRIAL INORGANIC CHEMICALS

STREAMS: BSC (INDUSTRIAL CHEM) **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 15/04/2020 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS: Answer question **One** (Compulsory) and any other **Two** questions

QUESTION ONE [30 MARKS]

(a) The Haber process is used for the industrial manufacture of ammonia:

(i) Describe the manufacture of ammonia using chemical equation [2 marks]

(ii) Give and explain the optimum conditions for ammonia production [4 marks]

(b) Consider the reaction below:

$2SO_2(g) + O_2(g) \text{ ===== } 2SO_3(g) \quad \Delta H = -98.3$ kJ/mol at 25 ^oC

(i) State and explain the reaction conditions that favor high yields of SO_3 [3 marks]

(ii) Write an equation to represent the large scale production of SO_3 from a source other than sulphur [2 marks]

(iii) Explain why V_2O_5 preferred over Pt catalysts although the latter is more effective [1 mark]

(c) Discuss the processes used in the manufacture of Portland cement [10 marks]

(d) Discuss the methods used for ore dressing [8 marks]

QUESTION TWO [20 MARKS]

(a) Describe with relevant equations the process of sodium carbonate manufacture using the Solvay process [10 marks]

(b) State the major uses of soda ash [2 marks]

(c) Describe the major steps of the industrial manufacture of nitric acid using the Ostwald process [8 marks]

QUESTION THREE [20 MARKS]

(a) The Chlor-Alkali process is used for the industrial manufacture of caustic soda.

(i) Describe with aid of a diagram the process of caustic soda production using the membrane cell [5 marks]

(ii) What are the major advantages and disadvantages of the membrane cell process? [2 marks]

(iii) Describe the process of sodium hypochlorite production using salt water [3 marks]

(b) Using a well labeled diagram and relevant equations describe the process of production of pig iron using a blast furnace [10 marks]

QUESTION FOUR [20 MARKS]

(a) Describe the large scale production of hydrogen gas through:

(i) Petrochemical processes [5 marks]

(ii) Electrochemical processes [5 marks]

(b) Discuss the manufacture of titanium from its major ores [10 marks]
