



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**DEPARTMENT OF PURE AND APPLIED SCIENCES**  
**SEPTEMBER, 2020\_1 EXAMINATIONS**

**COURSE CODE:** CHM 417

**CREDIT UNIT:** 2

**COURSE TITLE:** INDUSTRIAL CHEMICAL PROCESSES 11

**TIME:** 2 HRS

**INSTRUCTION:** *Answer question 1 and any other 3 questions*

**QUESTION ONE**

- (a) Explain Smelting method using examples and equations (6marks)
- (b) Briefly discuss the major steps involved in metallurgy. (6marks)
- (c) State with chemical formulae the main constituent of hydraulic cement. (4marks)
- (d) With the aid of chemical equation only, state how ammonium phosphate is prepared. (4marks)
- (e) Explain how HCl is produced from the chlorination process, indicating its concentration. (5marks)

**QUESTION TWO**

- (a) With respect to metallurgy, write short notes on
  - i. Reduction with carbon (3 ½ marks)
  - ii. Reduction of complex salts 5mks
  - iii. Auto reduction method (2 ½ marks)
- (b) What is the importance of a regenerative system? (1mark)
- (c) List the physical methods of purifying metals. (3marks)

**QUESTION THREE**

- (a) Mention the qualities of a good electrode. (2 ½ marks)
- (b) Discuss the industrial application of magnesium by electrolysis of Magnesia. (6marks)
- (c) Considering what happens at the cathode in the Chlor-alkali process, differentiate between the mercury cell, diaphragm and membrane cell processes. (3marks)
- (d) Using chemical equations only, show the reactions in the chlor-alkali process. (3 ½ marks)

**QUESTION FOUR**

Using a schematic diagram only, describe the process used in the manufacture of Phosphate fertilizers. (15marks)

## QUESTION FIVE

- (a) Discuss in detail the production and use of Urea as a fertilizer. (10marks)
- (b) Show with a well labeled diagram the Chlorination process of HCl production. (5marks)