



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF PURE AND APPLIED SCIENCE**  
**OCTOBER/NOVEMBER, 2019 EXAMINATIONS**

**COURSE CODE: CHM417**

**COURSE TITLE: INDUSTRIAL CHEMICAL PROCESS II**

**CREDIT: 2 Units**

**TIME ALLOWED: 2 Hours**

**INSTRUCTION: Answer Question ONE (1) and any other THREE (3) Questions**

**QUESTION 1**

1 (a) List four industrial products that can be obtained from nitric acid. **2marks**

(b) Define the following electrolyte terms : (i) anode **2marks** ; (ii) cathode **2marks** and (iii) electrolytes . **2marks**

c. (i) What is roasting? **2marks** (ii) List four types of roasting **2marks**

d. Write balanced equations for the precipitation of silver and gold from their respective ores using zinc metal: (i)  $\text{NaAg}(\text{CN})_2$  **2marks** and (ii)  $\text{KAu}(\text{CN})_2$  **2marks**

e. Write a balanced equation to show the absorption of  $\text{SO}_3$  in sulphuric acid and give the name of the product **2marks**

f. Discuss furnace method of refining impure blister copper. **7marks**

**TOTAL = 25 MARKS**

**QUESTION 2**

2 (a) Discuss the production of magnesium by electrolysis of magnesia/magnesium oxide **8marks**

(b) Give a very brief discussion of three methods of preparation of  $\text{SO}_2$  for use in the manufacturing of sulphuric acid **7marks**

### QUESTION 3

3(a) What is Solvay process? **2 marks**

(b) With the aid of appropriate balanced equations outline the chemical reactions that take place in solvay tower **6 marks**

(c) Discuss the last two stages in the Solvay process **7marks**

**TOTAL = 15 MARKS**

### QUESTION 4

4 (a) What is alloying? **2 marks**

(b) Define the following (i) Calcination **2 marks** (ii) Hydrometallurgy **2 marks**

(c) Write the chemical equations to show the calcinations of the following (i) malachite **2 marks**  
(ii) calamine **2 marks** (iii) dolomite **2 marks**

(d) Outline three advantages of hydrometallurgy **3marks**

**TOTAL = 15 MARKS**

### QUESTION 5

5a (i) Outline the three basic stages involved in the production of nitric acid from the oxidation of ammonia. Write balanced equations for each of these stages. **5 marks**

5b. List three processes that are used in removing impurities that are associated with bauxite  
**3 marks**

5(c) Give a block diagram/chart to show steps involved in the ostwalds process of manufacturing of nitric acid  
**7 marks**