



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**FIRST YEAR SECOND SEMESTER
MAIN EXAMINATIONS**

FOR THE DEGREE OF MSC (CHEMISTRY)

COURSE CODE: SCH 817

COURSE TITLE: CHEMICAL PROCESS INDUSTRIES

DATE: 14/12/2022

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

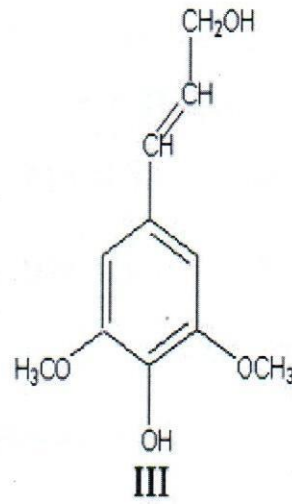
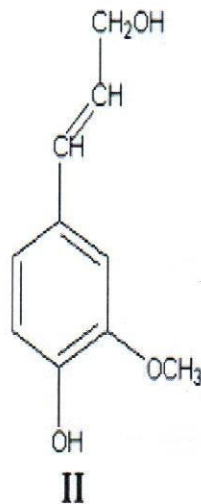
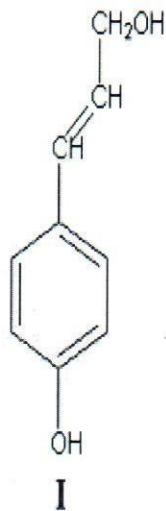
Time: 2 Hours

Answer question ONE and any other TWO of the remaining

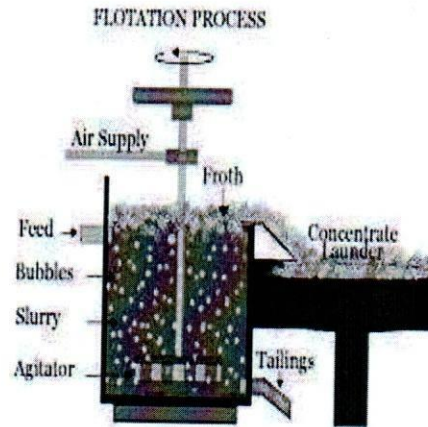
KIBU observes ZERO tolerance to examination cheating

QUESTION ONE [30 MARKS]

- a. State the meaning of the following parameters as used in sugar industry, in each case explain each parameter is determined
- Brix [2 marks]
 - Purity coefficient [2 marks]
- b. Lignin is a complex chemical compound most commonly derived from wood and an integral part of the secondary cell walls of plants.
- c. Name the following units of lignin [3 marks]



- d. Kappa number is a key test method for determining the level of lignin remaining in a sample of finished or in process pulp.
- Outline procedure how you would determine Kappa number by titration method [3 marks]
 - Name two importance of Kappa number [2 marks]
- e. Metallurgy is the process of extraction of metals from their ores
- Name two mode of occurrence of element in nature [2 marks]
 - The figure below is used in Froth floatation process for concentration of sulphide ores such as copper pyrite CuFeS_2 , Galena PbS and Zinc blende ZnS . Explain how it concentrate sulphide ores [3 marks]



- f. Leather is one of the most widely traded commodities globally. The growth in demand for leather is driven by fashion industry
- i. State the difference between top grain leather and full grain leather **[2 marks]**
 - ii. Explain tanning is done using vegetable tannages **[3 marks]**
 - iii. List three characteristics of vegetable tanned leather **[3 marks]**
- g. Commonly use industrial gases are hydrogen, oxygen, nitrogen, carbon dioxide and carbon dioxide
- i. Hydrogen is use in manufacture of methanol; with help of chemical equation(s) show methanol synthesis **[3 marks]**
 - ii. Name two uses of carbon dioxide **[2 marks]**

QUESTION TWO [15 MARKS]

- a. List two properties and two examples of the following magnetic materials
- i. Diamagnetic materials **[2 marks]**
 - ii. Paramagnetic materials **[2 marks]**
 - iii. Ferromagnetic materials **[2 marks]**
- b. Relays are electromagnetically operated switches. State three situations where relays are useful **[3 marks]**
- c. Ceramic is a material that is neither metallic nor organic. It may be crystalline, glassy or both crystalline and glassy.
- i. Give three differences in traditional ceramic and advanced ceramics **[3 marks]**

- ii. Explain two type of refractories in each case give an example [3 marks]

QUESTION THREE [15 MARKS]

- a. The bleaching agents used in paper and pulp industries can be classified in three different groups: Group I, Group II and Group III
- i. Name two bleaching agents used in each group [3 marks]
 - ii. Explain action of Group I bleach and product [4 marks]
 - iii. List two limitations of bleaches used in paper and pulp industry [2 marks]
- b. Metal form reduction or electro nation of metal oxide is still impure and it is still crude metal
- i. List four impurities present in crude metals [2 marks]
 - ii. Briefly explain the following refining methods
 - a) Liquation [2 marks]
 - b) Chromatographic adsorption method [2 marks]

QUESTION FOUR [15 MARKS]

- a. With aid of diagram explain the following glass forming processes
- i. Float glass process [2 marks]
 - ii. Rolled glass process [2 marks]
- b. The flow chart below shows the processes involved in production of sugar and bio ethanol from sugarcane. Use it to answer the questions that follow
- i. Name steps involved in **A, B, C** and **D** [4 marks]
 - ii. The presence of microbial contamination in the wort during fermentation process results in losses and promotes the industry dependence of chemicals and antibiotics to control the contamination. Describe how sterilization is carried out before the fermentation process [3 marks]
 - iii. Give two reasons why the yeast *Saccharomyces cerevisiae* is preferred in ethanol production [2 marks]

- iv. Write two equations leading to formation of bio-ethanol from sucrose in fermentation chamber [2 marks]

