

**BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE AND ENGINEERING
DEPARTMENT OF CHEMISTRY**

Programme: HBScCHT Part 2.2

Code: CH216 Industrial Chemistry II

Duration: Two (2) hours

ANSWER QUESTION ONE AND ANY TWO QUESTIONS FROM SECTION A AND ANY TWO QUESTIONS FROM SECTION B. EACH QUESTION CARRIES TWENTY MARKS.

- Q1 a) What is the chemical composition of crude oil? [5 Marks]
- b) Explain the basic principle behind Integrated Gasification Combined Cycle (IGCC). [5 Marks]
- c) Why is mono nitration of toluene carried out at less than 60 °C? [4 Marks]
- d) Briefly explain what a cationic surfactant is. [6 Marks]

SECTION A: ANSWER ANY TWO QUESTIONS

- Q2 a) Explain why biomass is considered an important raw material for the chemical industry. [5 Marks]
- b) What is the main advantage of this raw material over other potential raw materials? [3 Marks]
- c) Natural gas is an important raw material for the chemical industry. What is:
- i. Steam reforming reaction
- ii. Water gas shift reaction? [2x3 Marks]
- d) With the help of diagram and appropriate reaction equations explain the autothermal reforming process. [6 Marks]
- Q3 a) What are detergent and plasticizer alcohols? [5 Marks]
- b) Explain the manufacture of detergent alcohols through hydrogenation of fatty acids and their methyl esters. [6 Marks]
- c) With the help of reaction schemes explain how a C13 alcohol may be prepared via hydroformylation route. [6 Marks]
- d) How else can higher alcohols be prepared? [3 Marks]

- Q4 a) Initially ethylene based processes involved chlorination of ethene, followed by dehydrochlorination to vinyl chloride. What were the disadvantages of this process? [6 Marks]
- b) How can vinyl chloride be produced from acetylene? Why was this method discontinued? [6 Marks]
- c) With the help of appropriate equations, explain how vinyl chloride is produced industrially. [8 Marks]

SECTION B: ANSWER ANY TWO QUESTIONS

- Q5 a) Why is phenol more reactive than benzene? [3 Marks]
- b) Describe the manufacture bisphenol A. [8 Marks]
- c) One of the common applications of bisphenol A is the manufacture of various resins. Write reaction equations for the manufacture of:
- i. Epoxy resins
 - ii. Polycarbonates
 - iii. High temperature resistant polysulfone plastics.
- [3x3 Marks]
- Q6 a) Explain in general terms the manufacture of diisocyanates. [7 Marks]
- b) Draw the chemical structure of polymers that can be manufactured from such compounds [3 marks]
- c) What is the use of metolachlor? [3 Marks]
- d) With the help of reaction schemes, explain the manufacture of metolachlor. [7 Marks]
- Q7 a) How is rendering in natural fats extraction carried out? [5 Marks]
- b) What is the purpose of bleaching in natural fats extraction and how is it carried out. [6 Marks]
- c) Explain the process of hydrogenation of fats. [6 Marks]
- d) Give any three examples of unsaturated fatty acids. [3 Marks]

END OF EXAMINATION