

**CHEMICAL PROCESS TECHNOLOGY  
(CHEN 3101)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group – A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Fine particles are removed from SO<sub>2</sub> in a  
(a) Dust chamber (b) Electrostatic precipitator  
(c) Absorber (d) Setting tank.
- (ii) Single superphosphate is normally bagged in  
(a) Polyethylene lined LLDPE woven bags (b) Polyethylene lined LDPE woven bags  
(c) Polyethylene woven bags (d) Polyethylene lined HDPE woven bags.
- (iii) Chemical formula of mold used in a slip casting process is  
(a) CaCO<sub>3</sub> (b) CaSO<sub>4</sub>.2H<sub>2</sub>O (c) MgSO<sub>4</sub>. 2H<sub>2</sub>O (d) MgCO<sub>3</sub>.
- (iv) Example of the high temperature refractories is  
(a) Fire clay (b) Zircon (c) Quartz (d) Chromite.
- (v) Bleaching agent used to extract vegetable oil is  
(a) Hexane (b) Fuller Earth Carbon  
(c) Activated carbon (d) DEA.
- (vi) Hardness of boiler feed water should be less than  
(a) 0.5 ppm (b) 0.2 ppm (c) 1.2 ppm (d) 5 ppm.
- (vii) Biuret is formed  
(a) At higher temperature (b) At higher pressure  
(c) At lower temperature (d) At lower pressure.
- (viii) Stabilizer used in the vinyl chloride production is  
(a) Nickel molybdenum (b) Furfural  
(c) Phospite (d) DEA.
- (ix) Annealing process is done  
(a) To improve the strength of glass  
(b) To reduce the abrasion resistance of glass  
(c) To remove the internal stresses in glass  
(d) To reduce the cost of glass.

- (x) Raw materials used for the production of cement are
- |                      |                        |
|----------------------|------------------------|
| (a) Alkali and lime  | (b) Calcium and silica |
| (c) Silica and water | (d) Lime and silica.   |

**Group- B**

2. (a) Briefly discuss the manufacturing process of Sodium Carbonate in a Solvay tower with the help of a neat flow sheet. [(CO2)(Remember/LOCQ)]
- (b) How do you modify the combustion chamber to get a higher production of Hydrochloric acid? [(CO4)(Analyse/HOCQ)]
- (c) Which one is the most efficient process for the production of Sodium Carbonate? Justify your answer. [(CO1, CO5)(Analyze/HOCQ)]
- 6 + 3 + 3 = 12**
3. (a) Explain the thermodynamics and kinetic aspects of Nitric acid production. [(CO4, CO5)(Analyse/HOCQ)]
- (b) Why Nitric acid production plants are operated at elevated pressure? [(CO4, CO5)(Understand/IOCQ)]
- (c) Briefly discuss the conversion process of SO<sub>2</sub> into SO<sub>3</sub> in multistage reactor with a help of a neat sketch. [(CO2, CO4)(Understand/IOCQ)]
- 5 + 2 + 5 = 12**

**Group - C**

4. (a) What are the conventional method of Hydrogen production? Describe any one of them. [(CO4)(Understand/IOCQ)]
- (b) Briefly discuss the manufacturing process of single superphosphate with the help of a neat flow sheet. Also write down the important reactions. [(CO2)(Remember/IOCQ)]
- 4 + 8 = 12**
5. (a) Why removal of Sulphur is necessary in fuel? Describe the Sulphur removal process for straight run diesel fraction with the help of a neat sketch. [(CO2)(Analyze/HOCQ)]
- (b) Define the space velocity? Why it is important? [(CO1)(Remember/LOCQ)]
- (c) Discuss the process variables role in catalytic reforming of Naptha. [(CO4, CO5)(Remember/LOCQ)]
- (1 + 5) + (1 + 1) + 4 = 12**

**Group - D**

6. (a) Discuss the major engineering problems associated with Vinyl Chloride monomer production. [(CO4, CO3)(Understand/IOCQ)]
- (b) Write the important reactions occurring during Acrylonitrile production. [(CO1)(Understand/IOCQ)]
- (c) Draw the manufacturing flow sheet of Propylene Oxide production. [(CO2)(Remember/LOCQ)]
- 4 + 4 + 4 = 12**

7. (a) Draw a neat flow sheet for the manufacturing process of Glycerine from Propylene through acrolein route and write down the chemical reactions in each stage. [(C01) (Remember/LOCQ)]  
 (b) Discuss the major engineering problems associated with Ethylene Oxide productions. [(CO3, CO4)(Analyze/HOCQ)]  
 (c) Name any one of the solvent used for the extraction of BTX. [(C01)(Analyze/HOCQ)]  
**(4 + 3) + 4 + 1 = 12**

**Group - E**

8. (a) Explain the hardening mechanism of Cement. [(CO4, CO5)(Analyse /HOCQ)]  
 (b) Write a short note on Extrusion process. [(CO4, CO5)(Understand/HOCQ)]  
 (c) Explain the kinetic rate factors of Hydrogenation of oil. [(CO5)(Analyse/HOCQ)]  
**3 + 5 + 4 = 12**
9. (a) Draw a block diagram of drinking water treatment process. How it is different from industrial wastewater treatment? [(CO2)(Remember/LOCQ)]  
 (b) Why yellow Glycerine is sent to the mixer unit during soap production? [(CO4)(Understand/IOCQ)]  
 (c) What is enzymatic interesterification process? Discuss its benefits. [(CO3)(Remember/IOCQ)]  
**(4 + 3) + 2 + (1 + 2) = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	31.25	29.16	39.58

**Course Outcome (CO):**

After the completion of the course students will be able to

1. Describe sources and processes of manufacture of various industrially important chemicals.
2. Draw block diagrams/ process flow diagrams of the processes used for manufacture of industrially important chemicals.
3. Explain and calculate economic aspects of Projects involved in manufacturing of Chemicals.
4. Understand the applications of various unit operations involved in the manufacture of various chemicals and other useful materials.
5. Understand the implications of heat & mass transfer and fluid mechanics in chemical engineering industries.

\*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

