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 <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

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

Group – A (Multiple Choice Type Questions)

Choose the correct alternative for the following: $10 \times 1 = 10$ 1. (i) Le-Blanc process is a primitive process for the manufacture of (a) Caustic soda (b) Soda ash (c) Bromine from sea water (d) Hydrochloric acid Why a Flash tank is used in soap manufacturing unit? (ii) (a) To remove impurities (b) To add alkali (c) To add excess steam (d) To remove excess steam (iii) Which of the following indicates continuous process for soaps? (a) Hydrolysis tower, mixer, blender, vacuum still (b) Vacuum still, hydrolysis tower, mixer and blender (c) Hydrolysis tower, blender, mixer, vacuum still (d) Hydrolysis tower, vacuum still, mixer, blender Sulphuric acid is mainly used in the _____ industry. (iv) (a) Fertilizer (b) Steel (c) Paper (d) Paint In Diammonium Phosphate production the ammonia loss should be kept below (v) (a) 5% (b) 3% (c) 10% (d) 15% Biuret formation can be avoided by (vi) (a) Maintaining the reaction temperature (b) Maintaining the reaction residence time (c) Both (a) and (b) (d) Maintaining the reaction pressure Polychlorides is a by-product of (vii) (a) Butadiene (b) Propylene oxide (c) Vinyl chloride (d) Isopropanol

- (viii) The name of the absorbent used in butadiene production is
 (a) Diethyl amine
 (b) Acetone
 (c) Caustic soda
 (d) Naptha
- (ix) Foots is a by-products of(a) Glycerine production(c) Soap production

(b) Vegetable oil extraction

- (d) Vitamin production
- (x) The yellow glycerine is produced during soap production from
 (a) Filtration Unit
 (b) Evaporator
 (c) Vacuum still
 (d) Mixing tank

Group – B

- 2. (a) Describe the schematic diagram for the sulfuric acid manufacturing process using lead chamber process. [(CO1) (Remember/LOCQ)]
 - (b) Write a short note on Hydration of SO₃. [(CO2) (Understand/LOCQ)]
 - (c) State the chlor alkali process using diaphragm cell method.

[(CO1)(Analyze/IOCQ)]

- 3. Describe the HCl manufacturing process from the following raw materials-
 - (i) Hydrogen and chlorine
 - (ii) Salt and sulfuric acid
 - (iii) Incineration of waste organics. [(CO1, CO2)(Remember/LOCQ)]

(4 + 4 + 4) = 12

 $(3 \times 4) = 12$

Group - C

- 4. Discuss the followings:
 - (i) Operating principles of diesel hydrodesulphurisation unit
 - (ii) Effects of process variables on catalytic reforming reactions
 - (iii) Major engineering problems associated with urea production.

[(CO4, CO5) (Analyse/HOCQ)]

5. (a) Write the reactions occurs during single superphosphate production.

[(CO1) (Remember/LOCQ)]

(b) Discuss the manufacturing process of ammonia synthesis with a help of a neat flow sheet. [(CO1, CO2) (Understand/LOCQ)]

4 + 8 = 12

Group - D

- 6. Write short notes on any three of the followings:
 - (i) Major engineering problems associated with the ethylene oxide production
 - (ii) Flow sheets of propylene oxide production

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(3 × 4) = 12

- (iii) Reactions of glycerine production
- (iv) Description of refining units of butadiene production.

[(C01,C02,C04,C05)(Analyze/I0CQ)]

- 7. (a) Discuss the manufacturing process of vinyl chloride production with the help of a neat flow sheet. [(CO1, CO2) (Remember/LOCQ)]
 - (b) Explain the major engineering problems associated with vinyl chloride production. [(CO5) (Understand/IOCQ)]

8 + 4 = 12

 $(6 \times 2) = 12$

Group - E

- 8. Answer the followings questions:
 - (i) What is annealing of glass?
 - (ii) Discuss the types of refractories based on chemical composition.
 - (iii) Discuss the slip casting process of ceramic.
 - (iv) What is hardening of cement?
 - (v) What are the specifications of boiler feed water and cooling tower water?
 - (vi) Discuss the advantages of enzymatic interesterification.

[(CO1) (Analyse/HOCQ)]

- 9. (a) Explain the major engineering problems associated with the hydrogenation of oil. [(CO5) (Analyse/IOCQ)]
 - (b) Explain the mechanism of enzymatic interesterification process with a help of a diagram. Give an example of transesterification process.

[(CO4) (Understand/IOCQ)] 6 + (4 + 2) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	41.67%	33.33%	25%

Course Outcome:

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.

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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

Department & Section	Submission Link
СНЕ	https://classroom.google.com/c/NDAyNTI4NjEzODkw/a/NDYzODY3OTA2Mzc0/details