

**CHEMICAL PROCESS TECHNOLOGY - I
(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) The currying time of continuous - den process during superphosphate production is
(a) 24 hrs (b) 10 – 20 days
(c) 5 days (d) 2 to 6 weeks.
 - (ii) In modified solvay process for soda ash production, NH₃ is recovered as
(a) Pure NH₃ (b) Co- product NH₄CO₃
(c) Co- product NH₄OH (d) Co- product NH₄Cl₄.
 - (iii) Formation of clinker nodules takes place in
(a) Tube mill unit (b) Blending unit
(c) Kiln section (d) Rotary drier.
 - (iv) Which reagent is used for drying ethylene dichloride in the manufacturing process of vinyl chloride?
(a) Calcium Carbonate (b) Sodium sulfate
(c) Silica gel (d) Sulfuric acid.
 - (v) Dilute HCl acid can be concentrated to 35% HCl by
(a) Normal fractional distillation (b) Normal azeotropic distillation
(c) Vacuum distillation (d) extractive distillation with MgCl₂
 - (vi) Which of the following is not an activated nickel catalyst preparation reaction?
(a) $\text{Ni(OH)}_2 + \text{H}_2 \rightarrow \text{Ni} + \text{H}_2\text{O}$ (b) $\text{Ni(CO)}_4 \rightarrow \text{Ni} + 4\text{CO}$
(c) $2\text{Al} \cdot \text{Ni} + 6\text{NaOH} \rightarrow \text{Ni} + 2\text{NaAlO}_3 + 3\text{H}_2$ (d) $\text{NiCO}_3 + \text{H}_2 \rightarrow \text{Ni} + \text{H}_2\text{O} + \text{CO}_2$.
 - (vii) Contact process for the manufacture of sulphuric acid yields
(a) 90% H₂SO₄ only (b) 80% H₂SO₄ only
(c) 95% H₂SO₄ only (d) 98% H₂SO₄ and higher.

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- (viii) Which chemicals are added as corrosion inhibitors in Solvay method?
(a) Chloride and iodine (b) Cyanides and Iron
(c) Cyanides and sulfides (d) Sulfides and chloride.
- (ix) What is the purpose of adding cleansing agent?
(a) Increase wet ability and decrease surface tension
(b) Decrease wet ability and increase surface tension
(c) Decrease wet ability
(d) Increase surface tension.
- (x) Phosphoric acid is used in cooling tower water treatment unit to
(a) Inhibit the corrosion (b) Promote the Catalyst
(c) Inhibit the scale formation (d) Prevent the algal growth.

Group – B

2. Write short notes on the followings:
(i) Drinking water treatment procedure
(ii) Boiler feed water specification and corrosion removal process
(iii) Reverse osmosis membrane
(3 × 4) = 12
3. (a) Explain the manufacturing process of caustic soda using mercury cell with help of neat flow sheet.
(b) Differentiate the diaphragm cell and membrane cell processes.
6 + 6 = 12

Group – C

4. (a) Briefly discuss the commercial production of hydrochloric acid production with help of neat flow sheet.
(b) Discuss the thermodynamic and kinetic considerations for the nitric acid production process.
8 + 4 = 12
5. (a) Explain the nitric acid manufacturing process with the help of a neat flow sheet.
(b) Discuss the major engineering problems associated with manufacturing of hydrochloric acid.
8 + 4 = 12

Group – D

6. (a) Briefly describe the manufacturing process of Urea production with a help of neat flow sheet.

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- (b) Explain the controlling parameters of biuret formation.

10 + 2 = 12

7. (a) Write the chemical reactions involved in superphosphate production. Discuss the major engineering problems associated with ammonium phosphate production.

- (b) Describe any one process for production of hydrogen with the help of a neat flow sheet.

(3 + 3) + 6 = 12**Group – E**

8. Explain the followings:

- (i) Hardening of cement
- (ii) Properties of refractories
- (iii) Glass forming

(3 × 4) = 12

9. (a) How do you classify the Portland cement?

- (b) What are the advantages and disadvantages of wet process and dry process for manufacturing the Portland cement?

4 + 8 = 12

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