



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (CHE-NEW)/SEM-5/CHE-503/2010-11**  
**2010-11**  
**CHEMICAL PROCESS TECHNOLOGY – I**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

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

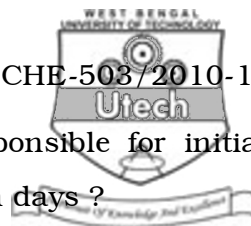
**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

- i) Magnesite brick is an example of
  - a) acidic refractory      b) basic refractory
  - c) neutral refractory      d) none of these.
- ii) In which electrolytic cell process  $\text{Cl}_2$  is not produced as byproduct ?
  - a) Mercury cell process
  - b) Diaphragm cell process
  - c) Membrane cell process
  - d) None of these.





viii) Which component of cement is responsible for initial strength of concrete during first seven days ?

- a) Tricalcium aluminate ( $C_3A$ )
- b) Tricalcium silicate ( $C_3S$ )
- c) Dicalcium silicate ( $C_2S$ )
- d) Tetracalcium aluminate ferite ( $C_4AF$ ).

ix) What is the % range of  $P_2O_5$  in Triple superphosphate ?

- a) 32% to 40%
- b) 42% to 50%
- c) 52% to 60%
- d) none of these.

x) Undesirable side product produced in urea manufacturing process is

- a) ammonium carbamate
- b) biuret
- c) ammonium nitrate
- d) none of these.

xi) Mixing of what ingredient with paint may prevent fine surface cracking of painted surface ?

- a) Suitable diluent
- b) Suitable drier
- c) Suitable plasticizer
- d) Suitable pigment.



xii) In chemical process of pulp production, lignin is eliminated by

- a) hydrolysis & solubilization
- b) screening
- c) filtration
- d) none of these.

**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. a) Explain the process of  $\text{NH}_3$  recovery in the Solvay process of soda ash production with necessary chemical reactions.  
  
b) In Solvay process, why ammonia must be absorbed in brine first, then  $\text{CO}_2$  is to be added ?  $4 + 1$
3. What is the chemical composition of Portland cement ?  
Mention the characteristic reactions occurring at setting of cement.  $2 + 3$
4. What physicochemical principles determine the effective conditions for ammonia synthesis from the raw materials  $\text{N}_2$  &  $\text{H}_2$  in Haber's process ?  $5$



5. What are the major engineering problems associated with the manufacture of nitric acid ? How are they overcome ? 3 + 2
6. What are refractories ? Mention the broad group of refractories with example. 2 + 3

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following. 3 × 15 = 45

7. For the production of soda ash by Solvay process what are the functions of  $\text{NH}_3$  absorption tower and carbonating tower ? Draw a neat flow diagram of the process and discuss the ammonia recovery step. Write down the relevant reactions involved in the total process. What are the advantages of dual process ?
8. Describe with a neat sketch, the production of NaOH from brine by any feasible process in Indian conditions. What are the major engineering problems for the process and how can they be minimized ?



9. With a neat flow diagram, describe Haber's ammonia synthesis process. Mention special features of ammonia converter with schematic diagram. What are the engineering problems in ammonia synthesis process ?
10. With the help of flow diagram, discuss the method of manufacture of Sulfuric acid by DCDA process. What is acid mist ? What are the major engineering problems associated with the manufacture of Sulfuric acid ?
11. What is Portland cement ? What are the different raw materials used for cement production ? Give a brief description of dry and wet processes for manufacturing Portland cement. What is the chemical composition of "clinker" ? Write down the major engineering problems in cement production.



12. Write short notes on any *three* of the following : 3 × 5

- a) Elemental Sulphur mining by Frasch process
- b) Superphosphate of lime
- c) Manufacturing process of nuclear Uranium, a nuclear fuel
- d) Prilling process for manufacture of Ammonium nitrate
- e) Glass
- f) Paint & Varnishes.

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