

B.Tech. Computer Science Engineering / Electronics and Telecommunication Engineering /
Instrumentation Engineering (NEP Pattern) Semester-II
STBSC202 - Engineering Chemistry

P. Pages : 2

Time : Three Hours



GUG/S/25/16796

Max. Marks : 80

-
- Notes :
1. All questions carry equal marks.
 2. Assume suitable data wherever necessary.
 3. Diagrams and Chemical equation should be given wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.
 5. All questions are compulsory.
 6. Use of non-programmable calculator is permitted.

1. a) Calculate the lime (90% pure) and soda (95% pure) required for softening 3,00,000 litres of water showing following constituents per litre; **12**
 $\text{Ca}(\text{HCO}_3)_2 = 81\text{mg}$, $\text{Mg}(\text{HCO}_3)_2 = 73\text{Mg}$, $\text{CaCl}_2 = 11\text{mg}$, $\text{MgSO}_4 = 60\text{mg}$.
Dissolved $\text{CO}_2 = 22\text{mg}$, silica = 10 mg, $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ was used as a coagulant @ 13.9 PPM. Also calculate carbonate, non – carbonate and total hardness equivalent of CaCO_3 in the water sample.
- b) A zeolite Softener was 80% exhausted by removing the hardness completely when 7000 lit of water sample are passed through it. The zeolite bed require ISO lit of 3% NaCl solution for complete regeneration. Calculate hardness of water sample. **4**

OR

2. a) Explain Calgon and phosphate conditioning. **5**
b) Explain priming and foaming. **5**
c) Describe Permutit method. Mention its advantages and limitations with a labelled diagram. **6**
3. a) What is anodic protection? Explain the process with a neat labelled diagram. **4**
b) What is corrosion of metals? Describe the mechanism of electro-chemical corrosion. **6**
c) What are fuel cells? Explain working of $\text{H}_2 - \text{O}_2$ alkaline fuel cell with its advantages and limitations. **6**

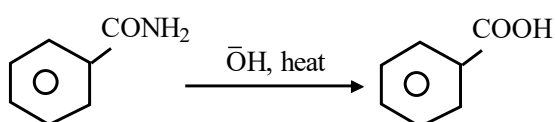
OR

4. a) What is 'Cathodic protection' for controlling corrosion? How it is done by using impressed current and sacrificial anode? Explain with examples. **6**
b) What is primary and secondary battery? **4**
c) Explain **6**
i) Stress corrosion. ii) Pitting corrosion.
5. a) A producer gas has the following percentage composition by volume: **12**
 $\text{Co} = 25\%$, $\text{H}_2 = 10\%$, $\text{Co}_2 = 10.3\%$, $\text{CH}_4 = 3.5\%$ and $\text{N}_2 = 50.7\%$ calculate:
i) Theoretical quantity of air required per m^3 of this gaseous fuel.
ii) % composition of products of combustion including water vapour formed.
iii) If 25% excess air is used find the % composition of dry products of combustion.

- b) Distinguish between octane and cetane number. 4

OR

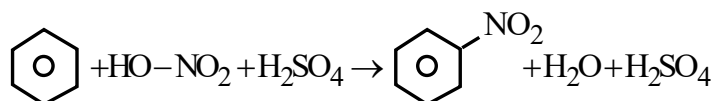
6. a) Describe the construction and working of Bomb calorimeter with a labelled diagram. 5
- b) Explain proximate analysis of solid fuel. 5
- c) Write short notes on : 6
- i) Knocking in IC engine. ii) LPG and CNG.
7. a) Discuss Green pathways for manufacture of, 6
- i) Adipic acid ii) Indigo dye.
- b) 2 gm of benzamide on alkaline hydrolysis forms 1.75gm benzoic acid product calculate yield. 4



- c) Discuss goals of green chemistry. 6

OR

8. a) What is the need of green chemistry? 4
- b) Discuss green and traditional pathways for manufacture of Indigo dye. 8
- c) Calculate atom economy and environmental load factor (E) for the following reaction 4



9. Explain in details. 16
- i) SBR
- ii) Fibre reinforced plastic
- iii) Free radical mechanism
- iv) Phenol formaldehyde (Bakelite)

OR

10. a) Discuss preparation properties and uses of the following 8
- i) HDPE ii) LDPE
- b) Distinguish between thermoplastic and thermosetting polymers. 4
- c) Write down the functionality of Monomer. 4
