Total No. of Questions – [10 ]

Total No. of Printed Pages: 3

| G.R. No. | |
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U118-1011(ESE)

# DECEMBER 2018 / END-SEM

## F. Y. B.TECH. (COMMON) (SEMESTER - I)

## COURSE NAME: ENGINEERING CHEMISTRY

## COURSE CODE: [ES10184B]

## (PATTERN 2018)

Time: [2 Hours] [Max. Marks: 50]

**(*) Instructions to candidates:**

1) **Attempt Q.1, Q.2, Q.3, Q.4 OR Q.5, Q.6 OR Q.7, Q.8 OR Q.9 and Q.10**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed.**
4) **Use suitable data where ever required.**

**Q 1)** **a)** Explain removal of microorgaism by chlorination with chlorine gas with reaction, factors affecting efficiency , 2 advantages and 2 disadvantages **[4]**

**OR**

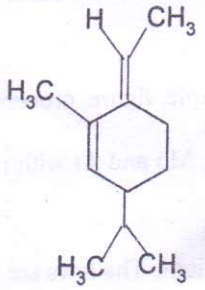
**b)** Give principles involved in zeolite treatment. An exhausted zeolite softener was regenerated by passing 150 litres of sodium chloride solution having strength 150 gm/lit of sodium chloride. How many litres of hard water sample having hardness 400 ppm can be soften using this softener. **[4]**

**Q 2)** **a)** Explain any 4 applications of NMR spectroscopy. **[4]**

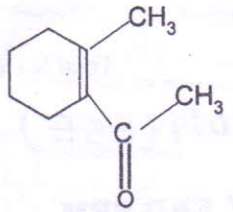
**OR**

**b)** Calculate $\lambda_{max}$ for the following compounds (Explain calculations) **[4]**

**i)**



ii)




Q 3) a) Give principle of fractional distillation of petroleum. Give figure for distillation process of crude oil. Give any three fractions obtained by the process with boiling range and composition in terms of carbon that are used as fuel. [6]

**OR**

b) Give construction, working with figure and formula for finding gross and net calorific value of solid fuel by Bomb calorimeter. [6]

Q 4) a) Define glass transition temperature. Explain any five factors affecting on it. [6]

b) Give functions of any four ingredients of Portland cement. [4]

**OR**

Q 5) a) Give structure, two properties and two applications of i) PHBV ii) Kevlar [6]

b) Give four points of differences between thermosetting and thermosoftening polymer. [4]

Q 6) a) Explain potentiometric titration of $Ce^{+4}$ions with $Fe^{+2}$ ions, giving cell reactions, procedure, calculation of electrode potential before, after and at equivalence point and titration curve. [6]

b) Explain the discharge reactions, 2applications and 2advantages of Ni-Cd cell. [4]

**OR**

Q 7) a) Describe construction of a lead-acid battery with figure. Give cell representation and electrode reactions during a discharge process two applications. [6]

b) Explain construction with figure, working reactions and 2 advantages of polymer electrolyte membrane fuel cell. [4]

Q 8) a) Explain wet corrosion with hydrogen evolution mechanism and oxygen absorption mechanism [6]

b) Explain any four factors affecting rate of corrosion on the basis of **nature of metal** [4]

**OR**

Q 9) a) Describe anodic protection of metal with principle, figure, process, 2 advantages, 2 disadvantages and 2 applications. [6]

b) Discuss oxidation corrosion in case of Mg, Cr, Mo and Al with reactions and type of oxide film formed [4]

Q 10) **Attempt following multiple choice questions:**

a) Faraday's laws are applicable for primary reactions. The laws are useful in [1]

i) Determination of equivalent weights

ii) To calculate the quantity of electricity required to deposite a given weight of metal

iii) To calculate charge on an electron

iv) All of the above

b) Operating temperature of SOFC is [1]
i) 2000-2100°C
ii) 1500-1600°C
iii) 1000-1100°C
iv) 500- 600°C

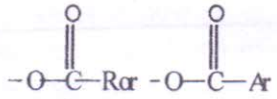
c) In a glass electrode the glass bulb is filled with [1]
(i) 0.01 M HCI (ii) 0.1 M HCI
(iii) 1 M HCI (iv) None of these

d) Principle of _____ protection is, the metal to be protected is forced to behave as cathode. [1]
(i) Cathodic (ii) Anodic
(iii) Both (i) & (ii) (iv) none of the above

e) Which of the following can be protected using sacrificial anodic method? [1]
i) Food containers (ii) Buried cables
(iii) Jewellery (iv) None of these

f) In _____ method, thermoplastic or thermosetting polymer are coated on the surface of metal. [1]
(i) electroplating (ii) cladding
(iii) powder coating (iv) cementation

**Data for UV – Visible Spectroscopy:**
**Woodward – Fieser rule for calculation of $\lambda_{max}$ in dienes, trienes and polyenes:**

| | | |
|---|---|---|
| 1 | Basic $\lambda_{max}$ for an unsubstituted, conjugated acylic (open chain) or heteroannular diene | 214 nm |
| 2 | Basic $\lambda_{max}$ for an unsubstituted, conjugated homoannular diene | 253 nm |
| 3 | Increments for | |
| | Each double bond extending conjugation(DEC) | 30 nm |
| | Each alkyl substituent or ring residue | 5 nm |
| | Each exocyclic double bond | 5 nm |
| 4 | Increments for substitutions | |
| | (a) H | 0 nm |
| | (b) Alkyl group (R) | 5 nm |
| | (c) Halogen Cl, Br | 5 nm |
| | (d) –OH or –OR | 5nm |
| | (e) Acyl group  | 0 nm |
| | (f) – S – Alkyl (-SR) | 30 nm |
| | (g) N- Alkyl ($-NR_2$) | 60 nm |

**Woodward – Fieser rule for calculation of $\lambda_{max}$ of enone derivatives α, β unsaturated compounds or ketones**

| | | |
|---|---|---|
| 1 | Base value: | |
| | a) Acyclic α, β unsaturated ketones | 215 nm |
| | b) 6 membered cyclic α, β unsaturated ketones | 215 nm |
| | c) 5 membered cyclic α, β unsaturated ketones | 202 nm |
| | d) α, β unsaturated aldehydes | 210 nm |
| | e) α, β unsaturated carboxylic acids & esters | 195 nm |
| 2 | H substitution | 0 nm |
| 3 | Alkyl substituent or Ring residue in α position | 10 nm |
| 4 | Alkyl substituent or Ring residue in β position | 12 nm |
| 5 | Alkyl substituent or Ring residue in γ and higher positions | 18 nm |
| 6 | Double bond extending conjugation | 30 nm |
| 7 | Exocyclic double bonds | 5 nm |
| 8 | Homodiene compound | 39 nm |
| 9 | Polar groups | |
| | a) –OH in α position | 35 nm |
| | –OH in β position | 30 nm |
| | –OH in δ position | 50 nm |
| | b) –OAc in α, β, γ, δ positions | 6 nm |
| | c) –OMe in α position | 35 nm |
| | –OMe in β position | 30 nm |
| | –OMe in γ position | 17 nm |
| | –OMe in δ position | 31 nm |
| | d) –Cl in α position | 15 nm |
| | –Cl in β position | 12 nm |
| | e) –Br in α position | 25 nm |
| | –Br in β position | 30 nm |
| | f) $-NR_2$ in β position | 95 nm |