

Printed Pages: 02

Subject Code: RAS 102

Paper Id:

199105

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**B TECH
(SEM-I) THEORY EXAMINATION 2018-19
ENGINEERING CHEMISTRY**

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 7 = 14

- a) Explain spin –spin coupling briefly.
- b) Which of the following metal will protect Fe from corrosion by cathodic protection?
Mg, Al, Zn, Ni and Cu.
- c) Differentiate between L-S process and ion-exchange process.(any 2)
- d) Give the chemical reactions for the formation of polyurethane.
- e) A Sample of water was found to contain 40.5 mg/l Ca (HCO₃)₂, 46.5 mg/l Mg (HCO₃)₂, 32.1 mg/l NaCl. Calculate the temporary hardness of water sample.
- f) Explain why a metal rod half immersed in water corrodes from the bottom.
- g) What is the composition of Biogas?

SECTION B

2. Attempt any three of the following: 7 x 3 = 21

- a) Discuss the preparation, structure and applications of Fullerenes.
- b) How is Grignard reagent prepared? Give the applications of Grignard reagent.
- c) Discuss the principle and working of a galvanic cell. Calculate the standard free energy change of the reaction: $Fe^{2+} + Ag^+ \rightarrow Fe^{3+} + Ag_{(s)}$.
Given: $E_{Fe^{3+}/Fe^{2+}}^0 = 0.77V$; $E_{Ag^+/Ag}^0 = 0.80V$.
- d) Discuss the process of reverse osmosis with its advantages and applications.
- e) Explain the principle of IR spectroscopy. For XY₂ bent molecule show various types of stretching and bending vibration in IR spectroscopy.

SECTION C

3. Attempt any *one* part of the following: 07 x 1 = 07
- State the phase rule and discuss its application to water, vapour and ice system.
 - Explain Zeolite process of water softening.
4. Attempt any *one* part of the following: 07 x 1 = 07
- What are organometallic compounds? Write their preparation, classification and application.
 - Write a note on polymer composites
5. Attempt any *one* part of the following: 07 x 1 = 07
- Discuss the mechanism of electrochemical corrosion of iron with absorption of oxygen. How can anodic and cathodic metallic coatings help in protection against corrosion?
 - Draw the molecular orbital diagrams of N₂. Calculate its bond orders and predict its magnetic behavior.
6. Attempt any *one* part of the following: 07 x 1 = 07
- What are stoichiometric and non-stoichiometric defects? Explain Frenkel and Schotky defects found in solids.
 - Explain proximate analysis of coal. A coal of has the following composition by weight: C=90%, O=3%, S=0.5%, N=0.5% and Ash=2.5%. Net calorific value of the coal was found to be 8,490.5kcal/kg. Calculate the percentage of hydrogen and Gross calorific value.
7. Attempt any *one* part of the following: 07 x 1 = 07
- Explain boiler problems with their cause and effects.
 - Derive Nernst equation. Find the cell potential of a galvanic cell based on the following reduction half-reactions at 25 °C
 $\text{Cd}^{2+} + 2\text{e}^- \rightarrow \text{Cd} \quad E^0 = -0.403 \text{ V}$
 $\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb} \quad E^0 = -0.126 \text{ V}$
where $[\text{Cd}^{2+}] = 0.020 \text{ M}$ and $[\text{Pb}^{2+}] = 0.200 \text{ M}$.