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Paper Code: RAS102

B TECH

(SEM I) ODD SEMESTER EXAMINATION 2016-17

ENGINEERING CHEMISTRY

[Time: 3 hrs.] **[Max. Marks: 70]**

SECTION-A

Q.1. Attempt all parts from this section. All parts carry equal marks. **[7x2=14]**

(a) Ethylene polymerizes but ethane does not. Why?
(b) How many proton signals would you expect in the NMR spectra of the following compound? (i) Cyclobutane and (ii) 2- Chloropane.
(c) F_2 is diamagnetic while O_2 is paramagnetic. Why?
(d) Explain why alkalinity of water cannot be due to simultaneous presence of OH^-, CO_3^- and HCO_3^- ?
(e) 0.2 gm of sample of coal was used in bomb calorimeter for sulfur estimation. The weight of precipitate was found to be 0.05 gm. Calculate the percentage of sulfur in the given coal sample.
(f) Explain why β-carotene absorbs light in visible reason?
(g) Calculate the density of a BCC crystal. The side of cube is 4 A^0 and M=60 (Avigador's number= $6.023x10^{-23}$).

SECTION-B

Q.2. Attempt any **FIVE parts** from this section. Each parts carry equal marks. **[5x7=35]**

a) What is optical activity? Give the stereoisomerism of tartaric acid.
b) Explain the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion.
c) Calculate the temporary and permanent hardness of water sample having following composition: $Ca(HCO_3)_2$= 21 mg/l, $Mg(HCO_3)_2$= 25 mg/l, $CaCl_2$=16.4 mg/l and $MgCl_2$=5.2 mg/l.
d) What are organometallic compounds? Write preparation and application of Grignard Reagent.
e) With the help of phase rule diagram show how it is possible to have super cooled water.
f) What is meant by shielding and deshielding? A compound having molecular formula $C_9H_{11}Br$ gave the following set of ^1H NMR data: δ 7.25 (5H, singlet), δ 3.40 (1H, multiple), δ 2.75 (2H, doublet), δ 1.45 (3H, doublet). Giving explanation assign the structure of the compound.
g) What are liquid crystals? Discuss the classification and application of liquid crystals.
h) Differentiate between thermoplastic and thermosetting resins. What polymer is formed by the reaction of maleic anhydride and ethyl glycol?

SECTION-C

Q.3. Attempt any **THREE** parts from this section. Each parts carry equal marks. **[3x7=21]**

a) A coal has the following composition by weight: C=90%, O=3%, N=0.5% and ash=2.5%. NCV of the coal was found to be 8,490.5 kcal/kg. Calculate the percentage of hydrogen and GCV of the given coal sample.
b) What is permutit? Describe the softening of water by permutit process.
c) Discuss the structure, preparation and applications of fullerenes.
d) What is TMS? Why it is used in NMR spectroscopy? Show the number of expected NMR signals and their splitting pattern in following: (i) $CH_3C_6H_5$, (ii) $CH_3OCH_2CH_3$ and (iii) $CH_3CH_2CH_2Cl$.
e) Explain giving suitable examples the Saytzeff and Hoffmann orientation. Why carbanion character increases in I, Br, Ci and F?
f) Draw the molecular orbital diagram of O_2 and find out the bond order and magnetic behavior.