

**HI-Tech Institute of Engineering and Technology**  
**IMPORTANT QUESTIONS SET II**

**Subject: Engineering Chemistry BAS-102**

**NOTE: i) Attempt all sections. If require any missing data then choose suitably.**

**MM =70**

**SECTION A**

**1. Attempt all the following questions in brief**

**7x2= 14**

Qno.	Question	CO
a.	Differentiate between addition polymerization & condensation polymerization.	5
b.	Graphite is better lubricant than molybdenumdisulphide Why?	2
c.	Calculate the amount of rust ( $Fe_2O_3 \cdot 3H_2O$ ) formed by complete rusting of 1kg of iron?	3
d.	What do you understand by polymer blend?	5
e.	An exhausted zeolite softener was regenerated by passing 200 liters of NaCl solution, having strength of 0.2 gm/L of NaCl .Find the total volume of water that can be softened by this zeolite softener, if the hardness of water is 350 clarke.	4
f.	Differentiate between BMO and ABMO.	1
g.	Calculate the EMF of the following cell $Zn/Zn^{2+}(0.001M)    Ag^+(0.1M)/Ag$ the standard potential of $Ag/Ag^+ = 0.80$ V and $Zn/Zn^{2+}$ is 0.76 V.	3

**SECTION B**

**2. Attempt any three parts of the following questions**

**3X7 = 21**

Qno	Question	CO
a	i) Discuss the proximate analysis of coal? ii) 1.56 gm of a sample of coal was treated by kjedahl method and $NH_3$ gas evolved was absorb in 50 ml of 0.1 N $H_2SO_4$ .After absorption, the excess residue acid required 6.25 ml of 0.1 N NaOH for neutralization. Calculate the % of $N_2$ in coal sample.	4
b	i) Write short notes on ion –exchange process. ii) 500 ml of a water sample, on titration with N/50 HCl gave a titre value of 29ml to phenolphthalein end point and another 500 ml sample on titration with same acid gave a titre value of 58 ml of to methyl orange end point. Calculate the alkalinity of the water sample in terms of $CaCO_3$ and comment the type of alkalinity present .	4
c	i) What is nano-technology? Write a short note on nano materials. ii) Define liquid crystal, classify them and give applications.	1
d	i) Define chemical shift. Show the expected NMR signals and their splitting in the following compounds. $CH_3CH_2CH_2OH$ and $C_6H_5 CH_3$ . ii) Discuss the green route of synthesis of adipic acid.	2 1
e	i) Show molecular orbital's of HF molecule with the help of diagram and calculate its bond order. ii) Discuss in brief dia-stereomers , enantiomers and meso compounds with suitable example.	1 2
f	i) Differentiate the following: a) Thermo plastic and Thermo setting polymers b) Homo Polymer and Co-polymer ii) Calculate the gross and net calorific value of coal having the following compositions carbon 85%,hydrogen =8%,sulphur=1%,nitrogen=2%, ash=4%, latent. heat of steam=587 cal/g.	5 4
g	i) Explain bio- degradable polymers with examples. ii) Write the method of preparation and uses of the following polymers: Nylon 6, Lucite , Thiokol, Teflon, Kevlar and Bakelite.	5

## SECTION C

Qno 3	7X1=7	CO
i) Define HCV and LCV of a coal sample and calculate their values if analysis data of a solid fuel using Bomb calorimeter are given here weight of crucible = 3.5 gm; weight of crucible and coal=4.9 gm; water equivalent of calorimeter=570gm; water taken in calorimeter =2100gm; observed rise in temperature =2.4 <sup>0</sup> C; cooling correction =0.045 <sup>0</sup> C; Acid correction =50 Cal; Fuse wire correction=3.5 cal; cotton thread correction =1.5 Cal; Hydrogen % =1.0 and latent heat of steam =580 Cal/ gm. ?		4
ii) Explain the NMR spectrum of CH <sub>3</sub> CH <sub>2</sub> OH molecule. What is spin-spin coupling; explain with the help of splitted signals of the above molecule?		2

Qno 4	7X1=7	CO
i) What is electrochemical theory of corrosion? Discuss the mechanism of electrochemical corrosion of iron with, Absorption of Oxygen & Evolution of Hydrogen. Explain the term cathodic protection. Indicate how metallic coatings prevent corrosion.		3
ii) What is biomass? Write short note on biogas.		4

Qno5	7X1=7	CO
i) Discuss preparation, structures and properties of carbon nano tubes		1
ii) What are Secondary batteries? Discuss the various reactions involve during the charging and discharging of lead storage battery.		3

Qno6	7X1=7	CO
i) What is shielding and de-shielding. an organic compound with molecular weight 130 shows the following bands in IR spectrum (i) 3080 to 2860 cm <sup>-1</sup> (ii) 1825 cm <sup>-1</sup> (iii) 1755 to 1455 cm <sup>-1</sup> In its nmr spectrum two signals result (i) triplet $\delta$ (8.7) (ii) quartet $\delta$ (7.08) determine the structure of the compound.		2
ii) Discuss in brief the basic principle of IR spectroscopy .A compound having molecular formulaC <sub>2</sub> H <sub>4</sub> O <sub>2</sub> while studied for its IR analysis resulted the following peak in the spectrum : 2900 -2950 , 1710 and 3500- 3650 cm <sup>-1</sup> .The compound also gave effervences with Na <sub>2</sub> CO <sub>3</sub> . Suggest the structure of the compound.		

Qno 7	7X1=7	CO
i) What are corrosion inhibitors'? Explain the mechanism of their action. Write short notes on (i) Pitting Corrosion (ii) Concentration Cell corrosion.		3
ii) Discuss the corrosion issues and prevention in i) Power generation Industry. ii) Chemical Processing Industry.		

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