Printed Pages : 7

EAS202

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 199207

Roll No.

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING CHEMISTRY

Time : **3** Hours] [Total Marks : **100**

SECTION – A

1 Attempt all ten parts. Each part carries equal marks. **10×2=20**

(i) Calculate the number of atoms per unit cell in BCC and FCC.

(ii) Why does $CH_3(H)C=C=C=C(H)C_2H_5$ exhibits geometrical isomerism?

(iii) Predict the number of ^1H NMR signals and splitting in $(CH_3)_2$ CHCl and $H_2C=CHCH_3$.

(iv) Give examples of two indicators used for acid base volumetric titrations.

(v) On the basis of molecular orbital theory explain why F_2 is diamagnetic while O_2 is paramagnetic ?

(vi) Calculate the order and molecularity of the following reaction :

$$CH_3COOC_2H_5 + H_2O \text{ (excess)} \xrightarrow{H^+} CH_3COOH + C_2H_5OH$$

(vii) Draw the conformations of n-butane which have the highest and the lowest energy.

(viii) Explain why salicylic acid is more acidic than benzoic acid?

(ix) Giving reasons arrange the following in increasing order of stability:
$(C_6H_5)_3C^+$; $(CH_3)_3C^+$; $(CH_3)_2C^+H$; $CH_3C^+H_2$.

(x) What will happen if a Zn rod is vertically half submerged under water?

SECTION – B

2 Attempt any three parts of the following : **3×10=30**

(a) (i) Draw and explain the energy profile of S_N2 reaction.

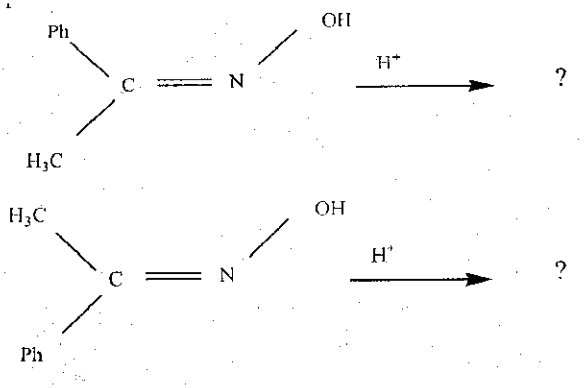
(ii) Give the preparation, properties and uses of PMMA and PTFE.

(b) (i) Distinguish between :
Order and Molecularity of a reaction;
Racemic mixture and Meso compound

(ii) A first order reaction is 15% complete in 20 minutes. What time will it take to be 60% complete ?

(c) (i) Draw the molecular orbital diagram of N_2 and CN and calculate the bond orders.

(ii) Explain clearly with the help of mechanism, why the two keto oximes shown below will give different products?



(d) (i) Write a brief note on fullerenes indicating their properties and applications.

(ii) Explain the term organometallic compounds. Write the preparation and synthetic applications of Grignard reagent.

(e) (i) Describe vulcanization of rubber. State the improvement in the properties of rubber after Vulcanization is carried out.

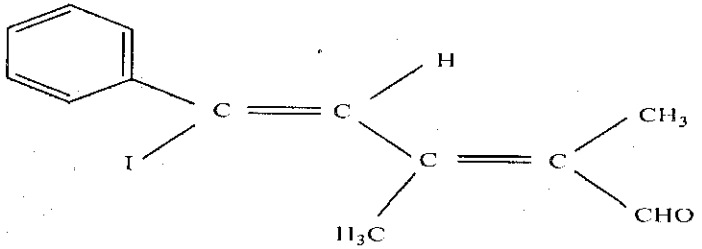
(ii) How can an underground iron pipeline be protected from corrosion by sacrificial anodic and impressed current cathodic protection methods?

SECTION – C

Note : Attempt all five questions. **5×10=50**
Each question carries equal marks

3 Attempt any one part of the following :

(a) Give five examples of compounds showing optical isomerism without the presence of chiral carbon. What is E-Z configuration : Assign E or Z configuration to the following and draw all its possible stereo isomers :

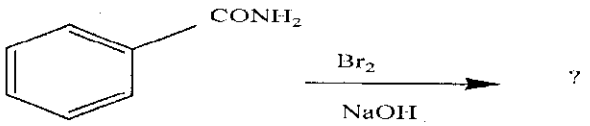


(b) Explain the Proximate analysis of coal. The ultimate analysis of coal gave the following results : Carbon = 84%, hydrogen = 5.5%, sulphur =1.5%, nitrogen = 0.6%, oxygen 8.4%. Calculate the Gross and Net Calorific Value of coal (Latent heat of steam is 587 cal/g).

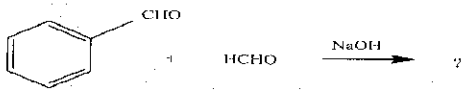
4 Attempt any one part of the following :

(a) Give the products and discuss the mechanism of the following reactions :

(i)



(ii)



(b) What are the different types of Volumetric analysis? Explain the titrimetric analysis of any two of the following :

(i) Determination of hardness of water by Complexometric method.

(ii) Sodium hydroxide against oxalic acid.

(iii) Potassium dichromate against ferrous ammonium sulphate in acidic medium.

5 Attempt any one part of the following :

(a) (i) Distinguish between chain growth and step growth polymerization.

(ii) Give the structures and important applications of polymers formed when: Adipic acid reacts with 1,6 - Diamino hexane; Terephthalic acid reacts with ethylene glycol

(b) Giving examples, describe the different types of liquid crystals. Discuss the applications of liquid crystals.

6 Attempt any one part of the following :

(a) What is the basic principle of ^1H NMR spectroscopy? What is the significance of splitting, shielding and deshielding? A compound having the molecular formula $C_{10}H_{14}$ gave the following ^1H NMR data : δ 0.88 (6H, doublet), δ 1.86 (1H, multiplet), δ 2.45 (2H, doublet) and δ 7.12 (5H, singlet). Giving reasons, assign the structure to the compound which is consistent with the above data.

(b) Describe the Lime Soda process of water softening. A sample of water on analysis was found to contain the following (in ppm) : $Ca(HCO_3)_2$ = 10.5; $Mg(HCO_3)_2$ = 12.5; $CaSO_4$ = 7.5; $CaCl_2$ = 8.2; $MgSO_4$ = 2.6. Calculate the temporary and permanent hardness.

7 Attempt any one part of the following :

(a) (i) What is the basic requirement for a compound to be IR active? Write the principle of IR Spectroscopy and explain the significance of Finger print region.

(ii) What is an electrochemical series? Describe its applications with appropriate examples.

(b) Deduce the kinetic equation for a second order reaction when both the reactants are same. The half - life for a first order reaction is 5×10^4 s. What percentage of the initial reactant will react in 2 hours?