Printed Pages—4 NAS102

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

PAPER ID : 3511 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. I) ODD SEMESTER THEORY EXAMINATION 2013-14

ENGINEERING CHEMISTRY

Time : 3 Hours *Total Marks : 100*

Note :— Attempt **all** questions. Each question carries **equal** marks.

SECTION—A

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

   (a) Draw the stereo regular and stereo irregular forms of polystyrene.

   (b) Giving a brief explanation, arrange R-Cl, R-I, R-F and R-Br in order of their increasing leaving ability.

   (c) Write down the structure of ferrocene and zeise's salt.

   (d) Calculate the degree of freedom at triple point in water system.

   (e) Arrange the following molecules/ions in order of their increasing bond length : N_2, N_2^- and N_2^{-2}.

   (f) How many NMR signals are found in $CH_3CHOHCH_2CH_3$?

   (g) Write the chemical composition of Portland cement.

   (h) Explain why Teflon is highly chemical resistant ?

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(i) A sample of hard water has hardness 500 ppm. Express the hardness in ^{0}French and ^{0}Clark.

(j) What is metallic luster ?

SECTION—B

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

(a) (i) On the basis of molecular orbital theory explain why N_2 is diamagnetic and O_2 is paramagnetic ?

(ii) What is Atropisomerism ? Giving examples, discuss the conditions under which the compound would exhibit atropisomerism.

(b) (i) Calculate the GCV and NCV of coal having the following compositions : C = 85%, H = 7%, S = 1%, N = 2%, ash = 4% and heat capacity of steam = 2458 J/g.

(ii) With the help of neat diagram describe the structure of Graphite. Also give at least five applications of graphite.

(c) (i) Giving suitable examples distinguish between thermoplastic and thermosetting polymers.

(ii) Calculate temporary and total hardness of water sample of water containing $Mg(HCO_3)_2$ = 9.3 mg/l, $Ca(HCO_3)_2$ = 17.4 mg/l, $MgCl_2$ = 8.7 mg/l and $CaSO_4$ = 12.6 mg/l.

(d) (i) What is electrochemical corrosion ? Write down the mechanisms involved in electrochemical corrosion.

(ii) What is shielding and deshielding ?

(e) (i) Giving suitable examples distinguish between chain growth and step growth polymerization process.

(ii) What is lubricant ? Giving suitable examples classify them and explain the mechanism of lubrication.

SECTION—C

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

3. Attempt any **one** part of the following :

(a) What is Portland cement ? Give the chemical reactions involved during setting and hardening of cement.

(b) What is organometallic compound ? Explain various methods of preparation of Grignard reagent and also write at least five applications of Grignard reagent.

4. Attempt any **one** part of the following :

(a) What is finger print region ? Two isomers A and B of the molecular formula C_3H_6O gives an IR absorption at 1650 cm^{-1} and 1710 cm^{-1} respectively. Assign structural formula to A and B isomers.

(b) What is hardness of water ? Describe ion exchange process for making soft water from hard water.

5. Attempt any **one** part of the following :

(a) What is Gibbs' phase rule ? Define the term; phase, component and degree of freedom. Draw a phase diagram of sulphur system and also give the significance of triple point.

(b) What is coal ? On what basis the coal should be classified ? 3.25 g of coal was kjeldahlized and NH_3 gas thus evolved was absorbed in 45 ml of 0.1 N H_2SO_4. To neutralize excess of acid, 11.5 ml of 0.1 N NaOH was required. Calculate the % of N in the coal sample.

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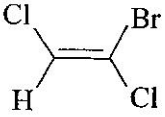
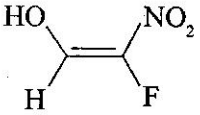
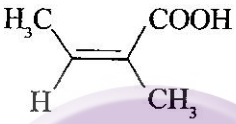
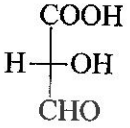
6. Attempt any **one** part of the following :

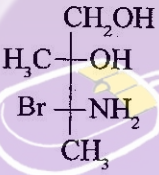
(a) Explain absolute configuration of compound with all sequence rule. Assign R/S or E/Z whichever is applicable to the following compounds :

(i) 

(ii) 

(iii) 

(iv) 

(v) 

(b) Show how does SN_2 reaction gives rise to inverted product ? Explain the role of nucleophile and solvent in substitution reaction.

7. Attempt any **one** part of the following :

(a) What are crystal imperfections ? Explain the one and two dimensional imperfections in solid.

(b) (i) How much rust ($Fe_2O_3 \cdot 3H_2O$) will be formed when 100 kg of iron have rusted away ?

(ii) Draw the different conformers of n-butane.