

Write the mechanism of the Cannizzaro reaction.

(b) Discuss the titrimetric analysis of :

(i) Strong base against weak acid

(ii) $K_2Cr_2O_7$ (in acidic medium) against ferrous ammonium sulphate.

7. Attempt any one part of the following :

(a) What are the characteristics of a good fuel ?

A sample of coal containing 92% C, 5% H and 3% ash. When this coal was tested in the laboratory for its calorific value in a bomb calorimeter, the following data were obtained :

Weight of coal burnt = 0.95 g

Weight of water taken = 700 g

Water equivalent of calorimeter = 2000 g

Rise in temperature = $2.48^\circ C$

Cooling correction = $0.02^\circ C$

Fuse wire correction = 10 cal

Acid correction = 60 cal

Calculate the Net and Gross calorific values of the coal in cal/g (Assume the latent heat of condensation of steam as 580 cal/g).

(b) State necessary conditions for a compound to show optical isomerism. Illustrate your answer with examples. Write five examples of organic compounds showing optical isomerism without chirality.

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

PAPER ID : 9603

Roll No.

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B. Tech.

(SEM. I) THEORY EXAMINATION 2011-12

ENGINEERING CHEMISTRY—I

Time : 3 Hours

Total Marks : 100

SECTION—A

1. Attempt all ten parts. Each part carries equal marks. ($10 \times 2 = 20$)

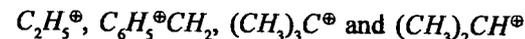
(i) Provide any two examples of optically active compounds without chiral centre.

(ii) H_2O is liquid but H_2S is a gas.

(iii) Acetone is more volatile than alcohol.

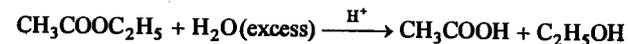
(iv) Explain why p-nitro phenol is more soluble than o-nitro phenol in water.

(v) Arrange in increasing order of Stability :



(vi) 3.25 grams 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 acid, 11.5 ml of 0.1 N NaOH was required. Determine the percentage of Nitrogen in the coal sample.

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



(viii) Name different forms of coal and arrange them in ascending order of % of carbon.

- (ix) Write any two examples of acid-base titration.
 (x) Write down the structure of Zeiglet-Nata Catalyst.

SECTION—B

2. Attempt any **three** parts of the following : (3×10=30)
- (a) (i) On the basis of molecular orbital theory explain why F_2 is diamagnetic while O_2 is paramagnetic.
 (ii) Derive Bragg's Equation for diffraction of X-rays by crystals.
- (b) (i) Show, how does SN^2 reactions give rise to inverted product.
 (ii) Describe the different conformations of n-butane with energy diagram.
- (c) (i) What is optical activity ? Give the stereoisomers of tartaric acid.
 (ii) Derive the equation for half life of first order reaction.
- (d) (i) A first order reaction takes 69.3 minutes for 50% completion. How much time will be needed for 80% completion ?
 (ii) Explain the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion.
- (e) (i) Explain why a pure metal rod half immersed vertically in water starts corroding at the bottom.
 (ii) What is 'Shielding' and 'Deshielding' ?

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 are nucleophiles ? Explain the mechanism of SN^1 and SN^2 organic reactions with suitable examples.

- (b) Differentiate between temporary and permanent hardness. Calculate temporary and permanent hardness of a water sample which analyzed as : $Ca(HCO_3)_2 = 21.0$ mg/lit, $Mg(HCO_3)_2 = 25$ mg/lit, $CaCl_2 = 16.4$ mg/lit and $MgCl_2 = 5.2$ mg/lit.

4. Attempt any **one** part of the following :
- (a) Define the terms : Phase, Components and Degree of Freedom. Write the number of components and number of phases and calculate the degree of freedom for the following reaction :
- $$N_2O_4(g) \leftrightarrow 2NO_2(g)$$
- (b) Define the term organometallic compounds. Write their preparation and applications with suitable examples. Calculate the density of silver which crystallizes in a face center cubic lattice with unit cell length of 0.4086 nm (Atomic weight of Ag = 107.88).
5. Attempt any **one** part of the following :
- (a) Define chemical shift. What is its significance in the determination of the structure of molecules ? Two isomers A and B of the molecular formula C_3H_6O gives an IR absorption band at 1650 cm^{-1} and 1710 cm^{-1} respectively. Assign structural formulas to A and B isomers.
- (b) What are biodegradable polymers ? Discuss their applications. How do you prepare the following polymers ?
- (i) Bakelite
 (ii) Perspex.
6. Attempt any **one** part of the following :
- (a) Complete the following reactions :
- (i) $CH_2 = CH - CH = CH_2 + CH_2 = CH_2 \xrightarrow{\text{Benzene}} ?$