[4]

(b) Explain the shape of the following using VSEPR theory :

XeF_4 and $Ag(CN)_2$
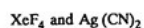
(c) Write the conjugated acid and base of the following :

NH_3, HCOOH and HCl
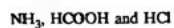
(d) Make the sketch of Lithosphere.

(e) 10 cc of 0·1 M NaOH solution added to 50 cc of 1·1 M acetic acid. What is the pH of solution ?

CY–101   100

CY–101

B. E./B. Tech. (First Semester)
EXAMINATION, 2008

CHEMISTRY – I

Time : Three Hours]   [*Maximum Marks : 100*

Note : Attempt any *five* questions.

1. (a) What are the different theories of metal bonding ? On the basis of Band theory, differentiate between conductor, insulator and semiconductor.   20

   (b) Which one is more stable band in metal lattice and why ?

   Li, Mg, Al.

2. (a) Calculate hydronium and hydroxyl ion concentration in 0·001 M HNO_3, 0·0001 M KOH and 0·1 M HCOOH (10% ionic).   10

   (b) What is the pH of buffer, having 0·1 M CH_3COOH + 0·1 M CH_3COONa/litre ? If 1 ml N HCl is mixed in one litre then what is the pH change ($K_a = 1·8 \times 10^{-5}$) ?   10

3. (a) Show that for first order reaction the time required for 99·9% reaction to take place is 10 times of the time required for completion of half of reaction.   10

   (b) Explain the both theories of catalysis.   10

P. T. O.

4. (a) A water sample on analysis, gave the following data : 10

$$MgCO_3 = 84 \text{ ppm}$$
$$CaCO_3 = 40 \text{ ppm}$$
$$CaCl_2 = 5 \cdot 5 \text{ ppm}$$
$$Mg(NO_3)_2 = 37 \text{ ppm}$$
$$KCl = 20 \text{ ppm}$$

Calculate the amount of lime (86% pure) and soda (83% pure) needed for treatment of 80000 litre of water. Given :

$$(Mg = 24, Ca = 40, K = 39, N = 14, Cl = 35 \cdot 5,$$
$$O = 16, C = 12)$$

(b) What are the different problems in Boiler feed water and how these can be minimize ? 10

5. (a) Give the details of Bomb calorie meter to determine GCV and NCV. 10

A coal has the following composition :

$$C = 93\%, H = 6\% \text{ and ash} = 1\%$$

The latent heat of steam = 580 cal/g.

The following data were obtained when the above coal was tested in bomb calorimeter :

Wt. of coal = 0·92 g

Wt. of water = 550 g

Water equivalent of calorimeter = 2200 g

Rise in temperature = 2·42°C

Fuse wire correction = 10·0 cal.

Acid correction = 50·0 cal.

Calculate GCV and NCV.

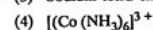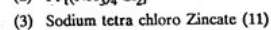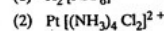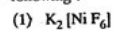(b) Explain the NMR technique of instrumentation. Draw the structure of a compound with each of the following molecular formula that will show only one peak in its NMR spectrum : 10
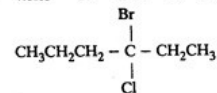
(i) $C_3H_6Cl_2$

(ii) C_5H_{12}

(iii) C_2H_6O

(iv) C_4H_6
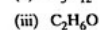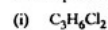
6. Write short notes on any *four* of the following : 5 each

(i) Born-Harber Cycle

(ii) (a) Write the IUPAC names/formula of the following :

(1) $K_2[Ni F_6]$

(2) $Pt[(NH_3)_4 Cl_2]^{2+}$

(3) Sodium tetra chloro Zincate (11)

(4) $[(Co(NH_3)_6]^{3+}$

(5) $K_4[Fe(CN)_6]$
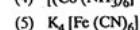
(b) Write R and S configuration of

$$CH_3CH_2CH_2 - \overset{\overset{\displaystyle Br}{|}}{\underset{\underset{\displaystyle Cl}{|}}{C}} - CH_2CH_3$$
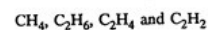
(iii) Theories of Catalysis.

(iv) Chemistry of formation and depletion of Ozone layer.

(v) Classical and Photochemical Smog.

7. Answer the following : 4 each

(a) Which one is more acidic and why ?

$$CH_4, C_2H_6, C_2H_4 \text{ and } C_2H_2$$

P. T. O.