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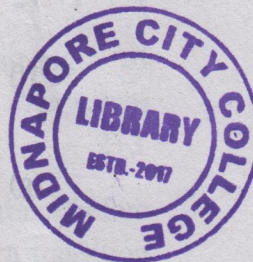
2019

B.Sc.

2nd Semester Examination

CHEMISTRY (Honours)

Paper - C3T



Full Marks : 40

Time : 2 Hours

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers  
in their own words as far as practicable.*

**Group - A**

Answer any five questions.

5×2=10

1. (a) Outline the shapes of the d-orbitals indicating signs of wave functions.
- (b) Explain anomalous configuration of Cr and Cu.
- (c) Give example of one disproportionation and one comproportionation reaction.
- (d) What indicator would you use for the following titration (a) NaOH vs  $\text{CH}_3\text{COOH}$  (b)  $\text{Na}_2\text{CO}_3$  vs HCl.

[ Turn Over ]



( 2 )

- (e) Find  $pH$  of a 0.01 (M)  $CH_3COOH$  solution ( $PKa = 4.74$ ).
- (f) Oxidation of  $Co(II)$  to  $Co(III)$  usually happen in air — why.
- (g) Why always second ionization energy is greater than first ionization energy ?
- (h) Atomic volume of alkali metal is larger than other elements of a period — Explain.
- (i) Give the name of two redox indicator.
- (j) Electron affinity of gold is very high — Explain.

### Group - B

Answer any *four* questions. 4×5

2. (a) State Pauli Exclusion Principle. Calculate the wave length of the first transition in Lyman and Paschen series in the atomic spectra of hydrogen.

$$(R = 1.097373 \times 10^7 \text{ m}^{-1}) \quad 2+3$$

- (b) Explain why  $Cl^-$  is oxidised by  $MnO_4^-$  at low  $pH$  ( $<1.5$ ) but not in neutral medium.

$$E_{MnO_4^-/Mn^{2+}}^0 = 1.51 V \text{ and } E_{Cl_2/2Cl^-}^0 = 1.36 V$$

( 3 )

What is Zimmermann-Reinhardt solution ? Where it is used and why ?  $2\frac{1}{2}+1+1\frac{1}{2}$

- (c) State Pauling's rule regarding strength of oxyacids and hence explain the first  $PKa$  values of  $H_3PO_2$ ,  $H_3PO_3$  and  $HOCl$ . 2+3
- (d) After  $Ca$ , electron enter to the 4s orbital before going to the 3d orbitals. But when a transition metal ionises, the 4s electrons are removed first — why ?
- (e) What do you mean by ionic radius ? Calculate the radii of  $K^+$  and  $Cl^-$  ions using Pauling's methods [ $d_{KCl}(\text{Crystal}) = 3.14 \text{ \AA}$ ]. 2+3
- (f) What is inert pair effect ? How does  $Tl$  form iodide only in +1 oxidation state ? The drop of ionization energy in  $N$  to  $O$  is larger than that for  $P$  to  $S$  — Explain. 5

### Group - C

Answer any *one* questions. 1×10

3. (i) What is the significance of quantum numbers ?
- (ii) State Pauli Exclusion principle.
- (iii) Draw distribution curves for radial wave function of 1s, 2s and 3s orbital. 3+2+5

[ Turn Over ]



( 4 )

4. (i) Calculate the E values at the point when

(a) addition of 90 mL  $KMnO_4$

(b) 50 mL  $KMnO_4$  and

(c) 101 mL  $KMnO_4$  solution is added in a titration of 100 mL of 0.1(N)  $Fe^{2+}$  by 0.1(N)  $KMnO_4$  solution.

(ii) From the following EMF diagram, calculate the values of

$E^\circ_{FeO_4^{2-}/Fe^{2+}}$  and  $E^\circ_{Fe^{2+}/Fe}$

