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 CH_3COOH (b) Na_2CO_3 vs *HCl*.

[Turn Over]

(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 affixity of gold in 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 Layman and Paschan series in the atomic spectra of hydrogen.

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

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

$E^o_{MnO_4^-/Mn^{2+}} = 1.51\,V$ and $E^o_{Cl_2/2Cl^-} = 1.36\,V$

What is Zimmermann-Reinhardt solution ? Where it is used and why ? 2½+1+1½

(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 4*s* orbital before going to the 3*d* orbitals. But when a transition metal ionises, the 4*s* 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}(Crystal) = 3.14 Å]. 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. (i) Calculate the E values at the point when

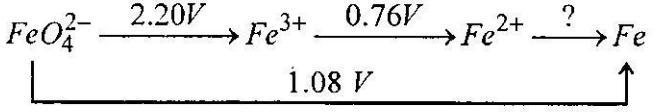
   (a) addition of 90 mL $KMnO_4$

   (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 $E^\circ_{Fe^{2+}/Fe^{+}}$



5+5