V—28—2017

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2017

CHEMISTRY

Paper XV (CH-304)

(Physical Chemistry and Inorganic Chemistry)

(Tuesday, 10-10-2017)   **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours   *Maximum Marks—40*

N.B. :— (i) *All* questions are compulsory.

     (ii) Use of logarithmic table and scientific calculator is allowed.

     (iii) Use one answer-book for both Sections.
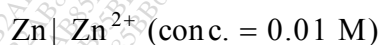
Section A

(Physical Chemistry)

1. Answer any *five* of the following :   2×5=10

     (*a*) Define :

         (i) Standard electrode potential

         (ii) Emf of cell.

     (*b*) Calculate the electrode potential of the following electrode at 25ºC.

$$Zn \mid Zn^{2+} \ (conc. = 0.01 \ M)$$

     Given that :

$$E^0_{Zn, ^{2+}Zn} = -0.76 \ V .$$

     (*c*) Show that decrease in free energy gives useful work.

     (*d*) State and explain Nernst Heat Theorem.

P.T.O.

(e) Derive Gibbs-Helmholtz equation.

(f) Define specific susceptibility. Give its unit.

(g) What are diamagnetic substances ? Give *two* examples.

2. Answer any *two* of the following : 2×5=10

(a) What are ferromagnetic substances ? Explain effect of temperature on it.

(b) (i) Explain variation chemical potential with temperature.

  (ii) The equilibrium constant of reaction is doubled, if the temperature of the reaction is increased from 35ºC to 45ºC. Calculate heat of reaction. (R = 8.314 JK^{-1} Mole^{-1})

(c) Explain Nernst Theory of electrode-potential. State Nernst equation for single electrode potential.

3. Answer any *one* of the following : 7

(a) What are concentration cells ? Derive the equation for emf of concentration cell with transport.

Or

(b) Derive law of mass action thermodynamically.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 9

(a) Describe Hydrogen bridge structure of diborane with experimental evidences.

(b) Give any *one* preparation of dicarbaclosododeca carborane.

    (c) Explain icosahedral structure of $B_{12}H_{12}^{2-}$ metalloborane.

    (d) Explain the role of Fe^{++}, Cu^{++} and Co^{++} in biological system.

    (e) Describe the function of haemoglobin in living system.

5. Solve any *two* of the following : 2×2=4

    (a) Describe 'three centred electron pair bond' in diborane.

    (b) What are metallocarborane ? Give any *one* preparation of it.

    (c) What is Wade's rule ? Calculate the total number of electrons in $B_{12}H_{12}^{2-}$.

    (d) What is porphin molecule ? Give any *two* name of metalloporphyrins.