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Y—32—2019

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2019

(CBCS Pattern)

CHEMISTRY

Paper XV

(Physical and Inorganic Chemistry)

(Monday, 14-10-2019) **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 calculator is allowed.

(Section–A Physical Chemistry)

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

(*i*) Explain the construction and working of glass electrode.

(*ii*) Calculate the standard electrode potential of Ni^{2+}/Ni electrode, if the cell potential of the cell

$Ni/Ni^{2+}_{(0.01M)}||Cu^{2+}_{(0.1M)}|Cu$ is 0.59 V.

(*iii*) State and explain Nernst heat theorem.

(*iv*) Derive Gibbs'-Helmholtz equation.

(*v*) Define Gibbs' free energy. Give relation between G and A.

(*vi*) What are ferromagnetic substances ? Give its examples.

(*vii*) Explain effect of temperature on paramagnetic substances.

(*viii*) Explain paramagnetic substances with suitable examples.

P.T.O.

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

(*a*) Give the rules for conventional representation of electrochemical cells with suitable examples.

(*b*) Derive Gibbs-Duhem equation.

(*c*) Define Magnetic susceptibility. Explain Gouy's method for magnetic susceptibility.

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

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

Or

(*b*) (*i*) Derive law of mass action thermodynamically.

(*ii*) The equilibrium constant of a reaction increases three times on raising temperature from 27°C to 47°C. Find heat of reaction. ($R = 8.314\ JK^{-1}mole^{-1}$)

(Section–B Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) What is the action of H_2O, HCl and CO on B_2H_6 ?

(*b*) Give preparation of metalloboranes.

(*c*) Describe the structure of $[C_2B_9H_{11}]^{2-}$ ion in metallocarboranes.

(*d*) Explain the role of Fe^{++} in biological system.

(*e*) What is the porphyrin molecule ? Give any *two* names of metalloporphyrins.

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

(*a*) What are carboranes ? How are they prepared ?

(*b*) What are Wade's rules ?

(*c*) "Diborane is an electron deficient compound". Explain.

(*d*) Write a note on "Nitrogen Fixation".