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PA—03—2024

FACULTY OF SCIENCE

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

MARCH/APRIL, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper XV

(Physical and Inorganic Chemistry)

(Thursday, 04-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Use logarithmic table and non-scientific calculator is allowed.

1. Answer any *three* of the following : 3×5=15

(*a*) Discuss the structure of myoglobin and haemoglobin.

(*b*) What is nitrogen fixation ? Explain biological nitrogen fixation.

(*c*) Define borane. Give its classification.

(*d*) Define carborane. Give the synthesis of dodecaborane.

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

P.T.O.

2. Answer any *three* of the following : 3×5=15

(*a*) Derive Nernst equation for single electrode potential.

(*b*) Calculate reduction potential of half-cell consisting of Mg electrode in 0.01 M Mg^{+2} ions solution at 25°C ($E^0_{red} = -2.52\,V$).

(*c*) Derive Gibbs-Helmholtz equation.

(*d*) Derive law of mass action thermodynamically.

(*e*) Describe the determination of molecular weight of a solute from relative lowering of vapour pressure.

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

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

(*b*) Derive equation for chemical potential of ideal gas.

(*c*) Derive Clausius–Clayperon equation.

(*d*) Define Ebullioscopic constant :

Acetone boils at 58.88 °C and a solution of 1.41 gm of organic soild in 20 g of acetone boils at 56.88 °C. If K for acetone per 1000 g is 1.67, calculate the mass of one mole of organic solid.