This question paper contains **2** printed pages]

VA—03—2024

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper–XV

(Physical and Inorganic Chemistry)

(Thursday, 28-11-2024)   **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours   *Maximum Marks—40*

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

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

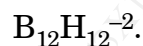1.   Answer any *three* of the following :   3×5=15

(*a*)   Explain the role of Fe^{+2}, Cu^{+2}, CO^{+2} in biological system.

(*b*)   Write a note on nitrogen fixation.

(*c*)   Describe 'three centered two electron bond' in diborane.

(*d*)   What are Metalloborane ? Give any preparation of it.

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

P.T.O.

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

   (a) Explain Nernst theory of electrode potential.

   (b) Give application of emf measurement in determination of pH by using glass electrode.

   (c) Explain variation of chemical potential with pressure.

   (d) The equilibrium constant of reaction triples on raising the temperature from 27°C to 37°C. Calculate $\Delta H°$ for the reaction.

   (R = 8.314 JK^{-1} mol^{-1})

   (e) Obtain the relationship between freezing point depression of a solution containing non-volatile non-electroyte and its molar mass.

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

   (a) Explain construction and working of calomel electrode.

   (b) Derive expression for variation of free energy with temperature and pressure.

   (c) Derive Clausius-Clayperon equation.

   (d) The normal boiling point of ethyl acetate is 77.06°C. A solution of 50 g of a non-volatile solute in 150 g of ethyl acetate boils at 84.27°C. Evaluate the molar mass of solute if K_b for ethyl acetate is 2.77°C kg mol^{-1}.