

B.Sc. Semester-II Examination, 2023**CHEMISTRY [Honours]**

Course ID : 21411 Course Code : SH/CHEM/201/C-3

Course Title : Inorganic Chemistry I

[OLD SYLLABUS]

Time : 1 Hour 15 Minutes

Full Marks : 25

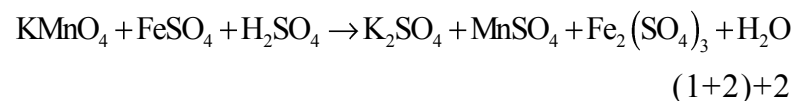
*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **five** questions: 1×5=5
- Why $3d_{x^2-y^2}$ has zero electron density in XZ plane?
 - Work out the ground state term symbols of Co(III) ion.
 - Arrange BF_3 , BCl_3 , BBr_3 and BI_3 in increasing order of Lewis acidity.
 - Find out the equivalent weight KMnO_4 in acid medium. (M. Wt. of $\text{KMnO}_4 \equiv M$)
 - Why noble gases possess zero electron affinity?

- Why Zr and Hf have same atomic radii?
- Give the expression of electronegativity in Pauling scale.
- Why the acidity of HF decreases in presence of NaF?

2. Answer any **two** questions: 5×2=10

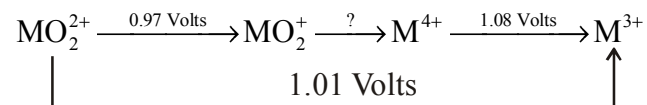
- What is Frost diagram? What is its utility?
 - Balance the following equation in ion-electron method:



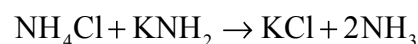
- What designation is given to an orbital having: $n = 4, l = 3$ and $n = 3, l = 2$.
 - Calculate the wave number of third line in Balmer series of Be^{3+} ion. [$R_{\text{H}} = 109677 \text{ cm}^{-1}$]
 - Define van der Waals radii. 1+3+1
- Write down the composition of Zimmermann Reinhardt solution. Explain why this solution is used during redox titration of Fe(II) ion by KMnO_4 solution in HCl medium.

[Turn Over]

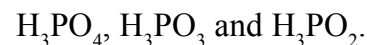
- ii) Calculate the E_0 value of $\text{MO}_2^+/\text{M}^{4+}$ couple in 1M acid medium from the following diagram: 4+1



- d) i) How can you explain the following reaction as acid-base reaction?



- ii) With proper reasons arrange the following acids in decreasing order of acidity:



2+3

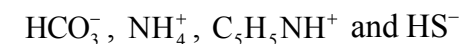
3. Answer any **one** question: 10×1=10

- a) i) With proper example mention the effect of complexation on redox potential.
- ii) 'AgI₂⁻ is more stable than AgF₂²⁻' – Comment.
- iii) The first ionisation potential of rubidium is 96.4 kcal/mole. What will be the lowest frequency of light that can ionise a rubidium atom?

- iv) State the equation(s) what happens when H₂S gas is passed through an acidified aqueous solutions of CuSO₄ and ZnSO₄.

2+3+3+2

- b) i) Write down the conjugate acids and bases of the following:



- ii) The standard oxidation potentials of the electrodes Hg/Hg₂²⁺ and Hg/Hg²⁺ are 0.80 and -0.85 volts respectively at 25°C. Find the equilibrium constant of the reaction, $\text{Hg} + \text{Hg}^{2+} \rightarrow \text{Hg}_2^{2+}$.
- iii) Draw the radial probability distribution curves for 2p and 3d electrons.
- iv) 'Azide ion is a borderline base although N is a hard centre' – Comment. 2+4+2+2
