

U.G. 2nd Semester Examination - 2022**CHEMISTRY****[HONOURS]****Course Code : BCEMCCHC 201****Course Title: Inorganic Chemistry-I**

Full Marks : 30

Time : 2 Hours

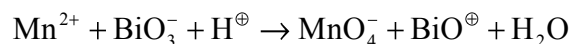
*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **ten** questions: 1×10=10
- What are the limitations of Bohr's theory?
 - Write down the Nernst equation.
 - Find out the pH of 10^{-8} (M) HCl solution.
 - Why atomic radii of Zirconium and hafnium are almost same?
 - What do you mean by Electron affinity?
 - What is formal potential?
 - Note down the Lux-Flood concept of acids and bases with suitable example.

- What is van-der Waal's radius?
- What is the equivalent weight of $K_2Cr_2O_7$ and $KMnO_4$ in acid medium.
- Can $SiCl_4$ and $SnCl_4$ function as Lewis acid?
- The first Bohr radius of hydrogen atom is 0.529 \AA , find the same for He^+ ion.
- Why the electron affinity value of Cl is greater than F?
- What are super acids? Give example.
- Arrange these oxides in order of their acidic nature:
 N_2O_5 , As_2O_3 , Na_2O , MgO
- First ionization potential of 'Be' is higher than its next member 'B'—Comment on this.

2. Answer any **five** questions: 2×5=10
- What is Zimmermann-Reinhardt solution? What is the role of that solution?
 - The pH of a 10^{-3} (M) aqueous solution of weak acid was found to be 4.0 at 25°C . Find the degree of dissociation.
 - " H_2O is called Amphiprotic"—Justify your answer with proper example.

- d) The fourth ionisation potential of Boron is abnormally high compared to other three – Explain.
- e) What do you mean by Buffer solution? Give one example.
- f) The principal quantum number, the azimuthal quantum number and the magnetic quantum number, respectively signify size, shape and orientation of orbitals in an atom–Comment.
- g) A buffer solution contains 0.01mole of CH_3COOH and 0.10 mole CH_3COO^- per litre. Calculate the pH of the buffer.
- h) Balance the following equation by ion electron method:

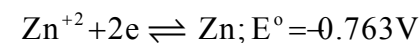
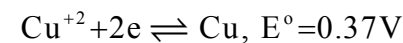


3. Answer any **two** questions: $5 \times 2 = 10$
- a) i) Explain the concept of electronegativity. State its usefulness in predicting the bond types, polarity of molecules and molecular association. $1 + 1 \frac{1}{2}$
- ii) Calculate the pauling electronegativity of chlorine from the following data: bond energies (kcal/mole) for $\text{H}_2(104)$,

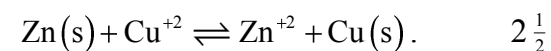
$\text{Cl}_2(57)$, $\text{HCl}(102)$ and pauling electronegativity of hydrogen (2.1).

$2 \frac{1}{2}$

- b) i) Consider the following potentials:



and ascertain whether the following reaction will go to completion:



- ii) The $\text{Hg}^{+2}/\text{Hg}_2^{+2}$ couple ($E^{\circ} = 1.92\text{V}$) is more oxidizing than the $\text{Fe}^{+3}/\text{Fe}^{+2}$ couple ($E^{\circ} = 0.77\text{V}$). Yet Hg_2^{+2} reduces Fe^{+3} to Fe^{+2} in presence of theocyanite ion–Comment. $2 \frac{1}{2}$

- c) i) For a general case of an electron moving in an orbit around a nucleus of charge Ze ,

show that
$$E = -\frac{2\pi^2 m Z^2 e^4}{n^2 h^2}.$$

- ii) Explain the extraordinary difference in radii of the H atom (0.37 \AA) and H^+ ion.

$3 + 2$