BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …… Roll No.: ……..

Branch: …… Signature of Invigilator: ……

Semester: IVth Date: 28/04/2022 (MORNING)

Subject with Code: **CH208 PHYSICAL CHEMISTRY-IV; ELECTROCHEMISTRY**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSC **SEMESTER: IV**
BRANCH: Chemistry **SESSION: SP/22**

SUBJECT: CH208 Physical Chemistry IV **FULL MARKS: 50**
TIME:2H

INSTRUCTIONS:
1. The question paper contains two sections A & B Section A contains 15 MCQ having 2 marks each section B contains 5 questions for 4 marks each.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4.* Before attempting the question paper, be sure that you have got the correct question paper.**

1. Three elements A, B and C have reduction potentials of -1.5, -0.05 and +1.50. The correct order of their reducing power is
   (a) A>B>C (b) B>A>C (c) C>B>A (d) B>C>A
2. Saturated solution of KNO_3 is used to make a 'salt bridge' because
   (a) Velocity of K^+ is greater than that of NO_3^-
   (b) Velocity of NO_3^- is greater than that of K^+
   (c) Velocities of K^+ and NO_3^- both are about the same
   (d) None of the above
3. For a cell reaction involving $2e^-$ change, the standard emf of the cell is found to be 0.295V at 25ºC. The equilibrium constant of the reaction will be
   (a) 2.95×10^2 (b) 10 (c) 1×10^{10} (d) 1×10^{-10}
4. For an overall reaction
   $$Cu^{2+}(C_1aq) + Zn(s) \rightarrow Zn^{2+}(C_2aq) + Cu(s)$$
   of an electrochemical cell, the change in the free energy ΔG at a given temperature is a function of
   (a) ln C_1 (b) ln (C_2/C_1) (c) ln C_2 (d) ln (C_1+C_2)
5. If the standard electrode potential of Cu^{2+}/Cu electrode is 0.34V, what is the electrode potential of 0.01M concentration of Cu^{2+} (T=25ºC)
   (a) 0.399V (b) 0.281V (c) 0.222V (d) 0.176V
6. The hydrogen electrode is dipped in a solution of pH=3 at 25ºC. The potential of the cell would be
   (a) 0.177V (b) 0.087V (c) -0.177V (d) 0.059V

7. Specific conductance of a decimolar solution of Potassium chloride at 18^0C in 1.12 sm^{-1} the resistance of conductivity cell containing the solution at 18^0C was found to be 55 ohrm. What is cell constant? (2)

   a.$61.6cm^{-1}$ b.$61.6\ ^{m-1}$ c. 0.616 d. None of them
8. Ionic mobility is
   a. extremely small as compared to the speed of gaseous molecules.
   b. Not extremely small as compared to the speed of gaseous molecules.
   c. More as compared to the speed of gaseous molecules.
   d. Choice b and c is correct.
   e.
9. If the transport no. of Ag+ion is 0.4 then transport no. of $NO3^-$ ion is
   a. 0.6 b. 0.4 c.1.4 d. None of theme

10. The Degree of dissociation of an electrotype.
    a. increases with increase in temperature
    b. decreases with increase in temperature
    c. increases with decrease in temp.
    d. none of Them

11. In the case of strong electrolytes

    a. There is no equilibrium between unionized molecules and their ions.

    b. There in equilibrium between unionized molecules and their ions.

    c. There in not complete ionization.

    d. None of Them

12. In the case of verification of Onsager's equation.
    a. Plot of λm vs $C^{1/2}$ is straight line.

    b. Plot of λm vs $C^{1/2}$ is sprot line.

    c. Plot of λm vs $C^{1/2}$ is not straight line.

    d. None of These.

13. In the equation $\lambda m = \lambda^{o}m - b\,C^{1/2}$, The constant 'b' depends upon.
    a. $C^{1/2}$

    b. Stoichiometry of the electrolyte.

    c. Resistance

    d. Conductivity

14. Clausius mossotti equation.
    a. Is not obeyed by HCl
    b. Is obeyed by HCl
    c. Is not obeyed by CH4
    d. Is not obeyed by CCl4

15. For a gaseous molecules AB_2 the refraction index is 1.00518 and dielectronic constant is 1.001.
    a. Molecule AB_2 is a linear molecule.
    b. Molecule AB_2 is a bent molecule.
    c. Molecule AB_2 must be poler.
    d. None of Them.

Section:B

1. A cell is made up of the following half-cell reactions:

$$Mg \rightarrow Mg^{2+}(0.01M) + 2e^{-} \;\; E^{0} = +2.34V$$
$$Sn^{2+}(0.1M) + 2e^{-} \rightarrow Sn \;\; E^{0} = -0.136V$$

Calculate the emf of the above cell at 25ºC. (4)

2. What is ‘liquid junction potential’? Discuss its expression. How can it be minimized or eliminated? (4)
3. Explain graphically the variation of molar conductance with dilution for strong and weak electrolytes. Write a note on Asymmetry effect. (4)
4. Write down the working principle & Advantages of conductometric titration and explain the titration of a strong acid with a strong base. (4)
5. What are different types of polarization of a molecule derive Clausius-mossotti equation. (4)