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AG—287—2018

FACULTY OF SCIENCE

M.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2018

(CBCS Pattern)

PHYSICAL CHEMISTRY

Paper CH-544/3A

(Electrochemistry)

(Tuesday, 4-12-2018)

Time : 2.00 p.m. to 5.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :— (i) Attempt All questions.

(ii) Use of log-table and calculator is allowed.

1. Solve any *three* of the following : 15

- (a) Explain in detail migration of ions.
- (b) Explain quantitative test of Debye Huckel limiting equation.
- (c) Discuss the characteristics of working cells.
- (d) Explain in detail formation of complex ion.
- (e) Explain various factors affecting on electrode potential.

2. Answer any *three* out of five : 15

- (a) Derive the expression :

$$\Delta G = -RT \ln K_p.$$

- (b) Explain application of EMF measurement.
- (c) Explain in detail reversible and irreversible cells.
- (d) Explain in detail Debye Huckel limiting law.
- (e) Write a note on Electrical double layer.

P.T.O.

3. Solve the following :

(A)
$$\frac{F(x)}{\Lambda} = \frac{1}{K \cdot \Lambda_0^2} \cdot \frac{\Lambda_c f_{\pm}^2}{f(x)} + \frac{1}{\Lambda_0}.$$
 7

(B) What is corrosion ? Explain thermodynamic and kinetics of corrosion. 8

Or

(A) Derive $\log f_{\pm} = -AZ + Z - \sqrt{\mu}$. 7

(B) Calculate the potential of pentane-oxygen fuel cell given that the standard free energy of formation at 298 K are -8.2 , -237.2 and -394.9 for pentane, $H_2O_{(l)}$ and $CO_{2(g)}$ respectively. 8

4. Answer the following :

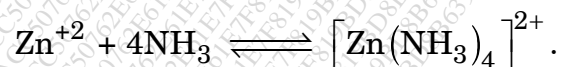
(A) Explain in detail : 7

(i) Asymmetric effect

(ii) Wien effect

(iii) Electrophoretic effect.

(B) Calculate stability constant of the complex $[Zn(NH_3)_4]^{2+}$ formed in the reaction : 8



Or

(A) What is meant by oxidation-reduction system ? Explain various types of oxidation-reduction system. 7

(B) Define activity and activity coefficient. Derive $a = [\gamma \pm m]^2$. 8

5. (A) Select the *correct* alternative from the following : 5

(i) Which of the following metals will not dissolve in HCl under standard condition ?

(a) Zinc

(b) Aluminium

(c) Copper

(d) Magnesium

- (ii) Which of the following is *incorrect* about transport number ?
- (a) It decreases with increase in concentration
 - (b) It may increase or decrease with increase in temperature
 - (c) It is never zero
 - (d) It is different for Cl^\ominus ion in 0.1 M HCl and 0.1 M NaCl solution
- (iii) The ionic strength of 0.01 M K_2SO_4 is :
- (a) 0.01
 - (b) 0.02
 - (c) 0.03
 - (d) 0.04
- (iv) Select *incorrect* statement about chemical activity at electrodes during electrolysis :
- (a) Anions give up electrons
 - (b) Cation take up electrons
 - (c) Oxidation occur at anode
 - (d) Proton transfer occur in reaction
- (v) With rise in temperature, the conductance of a solution of an electrolyte generally :
- (a) Decreases
 - (b) Increases
 - (c) Remains constant
 - (d) None of the above

(B) Write short notes on any *two* :

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- (i) Polarisation
- (ii) Electrode potential and solubility product
- (iii) Equilibria in Electrolytes.