SARDAR PATEL UNIVERSITY
M. Sc. (Semester – IV) (CBCS) Examination
Friday, 26th October 2018
2:00 p.m. to 5:00 p.m.
PS04CANC02 : Electro-analytical Methods

Total Marks : 70

Note : Figures to the right indicate full marks.

Q.1 Select the correct answer from the alternatives given below to the each questions; (08)

[i] Role of salt bridge in Galvanic cell is to ;
(a) reduce electric resistance in the cell
(b) maintain charge neutrality in the cell
(c) separate cathode solution from anode solution
(d) None of the above

[ii] Which one of the following electrode is not selective towards H^+ ions?
(a) Hydrogen gas electrode   (b) Glass electrode
(c) Quinhydron electrode   (d) Calomal electrode

[iii] For conductivity cell, the unit of cell constant is _____.
(a) unit less quantity   (b) cm^2
(c) cm^{-1} (d) cm^3

[iv] In polarography, which of the following is used as supporting electrolyte ?
(a) KCl   (b) AgCl
(c) H_2SO_4 (d) K_2SO_4

[v] EMF is generated when the activities of ;
(a) reference electrode is greater than anode
(b) cathode and anode are same
(c) cathode and anode are different
(d) there is an equilibrium between concentration at electrode surface and in bulk solution

[vi] At what temperature, the Nernst equation,
$E = E° - 0.0591/n \log [Product]/[Reactant]$ is valid ;
(a) 25 °C   (b) 35 °C
(c) 15 °C   (d) 5 °C

[vii] As per the first law of Faraday for electrolysis, $W =$ _____ ;
(where E = electrochemical equivalent, C = current, t = time)
(a) E C   (c) C t
(b) E C t   (d) E t

[viii] The ions discharged at anode by the electrolysis of very dilute H_2SO_4 solution are ;
(a) H^+ (b) HSO_4^-
(c) OH^- (d) SO_4^{2-}

[P. T. O.]

(1)

Q.2 Answer the following in short; (ANY SEVEN) (14)

[a] For weak acid, $ACOOH_{(aq)} \rightleftharpoons H^+ + ACOO^-_{(aq)}$
Derive: $pH = pK_a + \log [ACOO^-]/[H^+]$

[b] Define: Liquid junction potential, cell constant.

[c] Why DME is used in polarography ?

[d] Write a note on asymmetric effect.

[e] Discuss Hydrogen-Oxygen coulometer.

[f] Deduce the equation: $[H^+] = \frac{E - const}{0.0591}$.

[g] State advantages and disadvantages of glass electrode.

[h] Write a note on "Relaxation Time".

[i] Classify electroanalytical methods.

Q.3 [a] Write a note on Hydrogen gas electrode. Enlist its advantages and disadvantages. (06)

[b] [i] Discuss Galvanic and electrolytic cell. (03)

[ii] Why precipitation titration is more preferable through potentiometry? (03)

OR

[b] [i] Discuss acid – base titration using pH-metry method. (03)

[ii] Calculate pH of 0.01 M acetic acid. ($K_a = 1.8 \times 10^{-5}$). (03)

Q.4 [a] [i] What is electrogravimetric method? Discuss its applications. (03)

[ii] Write a note on working principle of coulometry. (03)

[b] [i] Discuss precipitation titration using potentiometry. (03)

[ii] Discuss constant potential electrolysis. (03)

OR

[b] [i] Define concentration cell? Give its detail classification. (03)

[ii] Discuss how potential is useful for determination of pH of the solution. (03)

Q.5 [a] How one can measure the solubility of sparingly soluble salt and basicity of an acid? (06)

[b] [i] Discuss factors affecting conductivity of an electrolyte. (03)

[ii] Discuss advantages of High frequency conductometry titrations. (03)

OR

[b] Discuss various types of conductometric titrations. (06)

Q.6 [a] State advantages and disadvantages of dropping mercury electrode. Discuss about polarography maxima. (06)

[b] [i] Write a note on "Migration current". (03)

[ii] Enlist advantages and disadvantages of amperometric titration. (03)

OR

[b] Discuss Ilkovic equation for polarography. What are the factors affecting diffusion limiting current. (06)

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