SARDAR PATEL UNIVERSITY
M. Sc. (IV SEMESTER) EXAMINATION 2018
16th APRIL 2018, MONDAY
2.00 p.m. TO 5.00 p.m.
ELECTRO ANALYTICAL METHODS (PS04CPHC03)

N. B.   Figures to the right indicate marks.   Total marks:70

Q. 1   Select the correct answer : (only code)   (08)

[1]   PH value of N/10 N NaOH ($Kw = 10^{-14}$) is...............

    (a) 11.0   (b)13.0   (c) 9.0   (d) 1.0

[2]   In dynamic methods................

    (a) $i > 0$ (b) $i \leq 0$ (c) $i < 0$ (d) $i \geq 0$

[3]   The change in free energy ΔG is.............

    (a) $\Delta E - T\Delta S$ (b)) $\Delta H - T\Delta S$

    (c)) $\Delta E + T\Delta S$ (d) $\Delta H + T\Delta S$

[4]   log Ksp is given as...........

    (a) Ecell/0.0591   (b) Ecell/0.591

    (c) E^0cell/0.0591   (d) E^0cell/0.591

[5]   Effect of temperature on conductance is given by...................

    (a) $\Lambda\alpha\,(t) = \Lambda\alpha\,(25)\,[1 + (t-25)]$ (b) $\Lambda\alpha\,(t) = \Lambda\alpha\,(25)\,[1 + x(t-25)]$

    (c) $\Lambda\alpha\,(t) = \Lambda\alpha\,(25) - x(t-25)]$ (d) $\overline{\Lambda\alpha\,(t)} = 1 + x(t-25)$

[6]   At 90^0c, pure water has $H_3O^+ = 10^{-6}$ moles/lit. The value of Kw at 90^0c is..............

    (a) 10^{-6} (b) 10^{-14}

    (c) 10^{-12} (d) 10^{-8}

[7]   The current due to supporting electrolyte is called as..................

    (a) Residual current   (b) Diffusion current

    (c) Limiting current   (d) None

[8]   According to Ohm's law I =..................

    (a) E/R   (b) ER

    (c) R/E   (d) 1/ER

(P.T.O)

Q. 2 Answer any seven of the following.

[1] State advantages of electro chemical methods.
[2] Give relationship of electro analytical methods.
[3] Discuss effect of dehydration and temperature on pH.
[4] State advantages of antimony electrode.
[5] State faraday's laws of electrolysis.
[6] Differentiate between direct potentiometry and potentiometric titration.
[7] Why calibration of glass electrode is needed?
[8] Discuss silver and iodine coulometers.
[9] How long would it take to deposit 100 gm of all from an electrolyte cell containing Al_2O_3 using a current of 125 Amp. (Given: Wt. of Al = 27)

(6)

Q. 3 (a) Answer the following.
(1) State the sources of emf observed in glass electrode.
(2) Determination of dissociation constant for monobasic weak acid.

(6)

Q. 3 (b) Answer the following.
(1) Write the advantages of glass electrode.
(2) Derive: $\Delta G = -nFE_{cell}$

OR

(6)

Q. 3 (b) Answer the following.
(1) Calculate pH of a solution made by mixing of 100 ml 0.1 M HCL and 100 ml 0.01 M H_2SO_4.
(2) For the cell in which following reaction takes place,
$Mg_{(s)} + 2Ag^{+2}(0.0001\ M) \rightarrow Mg^{+2}(0.130\ M) + 2Ag_{(s)}$
Calculate E_{cell}. (Given: $E^0_{cell} = 3.17\ V$)

(6)

Q. 4 (a) Answer the following.
(1) Derive : $\Delta H = nF\ [\ T\ (\partial E/\partial T)_p - E]$
(2) Write the types of electrode in potentiometry. Discuss metal-metal ion electrode and amalgam electrode.

Q. 4 (b) Answer the following.
(1) Write the application of coulometric titration.
(2) Write the methods of end point location.

(6)

OR

Q. 4 (b) Answer the following.

(6)

(1) A 0.180 gm of a purified organic acid was titrated coulometrically with OH^- ions produced in 5 min. by constant current of 0.514 Amp. Calculate the molar mass of the acid if n =1.

(2) For the cell, Pt / $Cl_{2\ (g)}$ (1 bar.) / HCl (a=1) /Agcl $_{(s)}$ / Ag
 (i) Write half cell reactions. (oxidation and reduction reactions)
 (ii) Calculate E^0 for Ag/Agcl/Cl$^-$ electrode.
  (Given: $E^0_{cell} = 1.35\ V$ & $E_{cell} = -1.13\ V$)

Q. 5 (a) How low frequency & high frequency conductance methods are different from each other? (6)

Q. 5 (b) Answer the following. (6)
    (1) Write Kohlarausch's law. Discuss ionic mobility of ions & absolute velocity of ions.
    (2) Write advantages & disadvantages of conductometric titration.

<div align="center">OR</div>

Q. 5 (b) Answer the following. (6)
    (1) The specific conductance of N/50 solution of a cell of KCl at 25° C is 0.002765 ohm^{-1} cm^{-1} of a resistance of a cell containing this solution 400 ohm. Find out cell constant.
    (2) The resistance of a 0.1 N solution of a salt occupying a volume between two platinum electrode i.e. 1.8 cm apart & 5.4 cm^2 in area was found to be 32 ohm, Calculate the specific & equivalent conductance of the solution.

Q. 6 (a) Write the advantages and disadvantages of Amperometric titration. (6)

Q. 6 (b) Answer the following. (6)
    (1) Write the advantages and disadvantages of DME.
    (2) Write applications of polarography.

<div align="center">OR</div>

Q. 6 (b) Answer the following. (6)
    (1) An organic compound P-amino benzoic acid, present in 0.488 mM concentration and having an applied current of 29.0 μA, had a transition time of 76.8 seconds. What is the electrone change involved if the electrode had a surface area of 1.72 cm^2 & D = 0.92 x 10^{-5}.
    (2) The following data were collected for 2 dropping electrode. Complete the data for electrode A.

DME	A	B
Flow rate, mg/sec	0.892	3.53
Drop time, sec	5.93	2.13
i$_d$/C, μA/m.mole	?	3.96

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<div align="center">3</div>