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SARDAR PATEL UNIVERSITY

M. Sc. FOURTH SEMESTER Examination 2017

Saturday, 15th April 2017,

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

PS04CANC02,

ELECTRO ANALYTICAL METHODS

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

Q-1 Choose appropriate answers. **(only code)** **[08]**

1. To minimize the electro stating force one of the following is added into the solution
(a) Carpenter Glue (b) Fevicole
(c) salt (d) Inactive electrolyte

2. Which one of the following is a weak acid,
(a) HNO_3 (b)HI
(c) HBr (d) HF

3. The half reaction that occurs at the anode during electrolysis of molten NaBr is

(a) $2Br^- \rightarrow Br_2 + 2e$ (b) $Br_2 + 2e \rightarrow 2Br^-$

(c) $Na^+ + e \rightarrow Na$ (d) $2H_2O + 2e \rightarrow 2OH^- + H_2$

4. Unit of electrical conductance is

(a) Volt (b) Ampere (c) Coulomb (d) Siemens

5. If K_w is 2.9×10^{-15} at 10°C.What is the P^H of pure water at 10°C
(a) 6.72 (b)7.00
(c) 7.27 (d) 7.53

6. The P^{OH} of a solution of NaOH is 11.30. What is the $[H^+]$ for this solution
(a) 2.0×10^{-3} (b) 2.5×10^{-3}
(c) 5.9×10^{-3} (d) 2.9×10^{-3}

7. In a sample of pure water which one is always true at all temperature and pressure?

(a) $P^H = 7$ (b) $P^{OH} = 7$ (c) $[H3O^+] = 1 \times 10^{-7}$ (d) $[H3O^+] = [OH^-]$

8. For monobasic weak acids P^H equals to

(a) log Ka (b) < log Ka (c) > log Ka (4) — log Ka

Q-2 Answer **any seven** of the following **[14]**

1. Calculate equilibrium constant for the reaction:
   $Cu_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Cu^{+2} + 2Ag_{(s)}$
   (Given : ($E^{0}_{cell} = 0.46$ v and $E_{cell} = 0.0$ v)
2. Calculate the P^{H} of N/100 H_2SO_4 solution and N/10 NaOH solution.
3. State relationships of electro analytical methods.
4. State sources of emf observed in glass electrode.
5. Why aqueous solutions are generally used in electro analytical methods.
6. State applications of P^{H} measurements.
7. Derive $E^{0} = RT / nF \ln K$.
8. How basicity of an acid is determined by conductometry measurement.
9. Write down Ilkovic equation. Explain terms involved in it.

Q-3

(a) Differentiate between working and reference electrodes. Discuss Quinhydrone electrodes. **[06]**

(b) (i) State advantages and disadvantages of antimony electrode. **[03]**

(ii)write a note on solid state sensors and precipitate electrodes. **[03]**

OR

(b) (i) Calculate P^{H} of a solution after mixing 0.1M acetic acid with 2.0 ml 0.1M NaOH. ($K_a = 1.8 \times 10^{-5}$) **[03]**

(ii) Write down errors with glass electrodes in P^{H} measurement. **[03]**

Q-4

(a) Discuss First kind, second kind and third kind of electrodes in potentiometry. **[06]**

(b) (i)Explain chemical cell without transference. **[03]**

(ii)Write a note on amalgam electrodes. **[03]**

OR

(b) For the cell,

$Pt / Cl_{2(g)}$ (1bar) /HCl (a=1) /$AgCl_{(s)}$ /Ag

Calculate E^{0} for Ag/AgCl /Cl electrode.($E_{cell} = -1.1369$V, $E^{0}_{Cl/Cl^{-}} = 1.35$V **[06]**

Q-5

(a) Calculate the equivalent conductance of acetic acid at infinite dilution at 25 °C. (H^+ = 349.8, Na^+ = 50.11, Cl^- =26.34 and $CH3COO^-$ = 40.9) **[06]**

(b) Compare between low frequency and high frequency conductance techniques. **[06]**

OR

(b) The equivalent conductance of 0.1 N solution of $MgCl_2$ is 97.1 ohm^{-1} cm^2/eq. at 25 °C. A cell with electrodes that are 150 cm^2 in area and 0.5 cm apart filled with 0.10N $MgCl_2$. How much current will flow when the potential difference between electrodes is 5 Volt? **[06]**

Q-6

(a) **(i)** Write down the advantages and disadvantages of dropping mercury electrode. **[03]**

(ii) What do you mean by Polarographic hump? How this hump can be removed? **[03]**

(b) Discuss current sampled and pulse polarography. **[06]**

OR

(b) How much is the transition time of Cd^{+2} increases if solution of 1 x 10^{-4} M Cd^{+2} is added to 1.00 x 10^{-4} M Pb^{+2} solution? **[06]**

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