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SEAT No. _____

No. of Pages: 3

SARDAR PATEL UNIVERSITY
M. Sc. FOURTH SEMESTER Examination 2019
Saturday, 23rd March 2019
Time: 2.00 p.m. to 5.00 p.m.

PS04CPHC23
ELECTRO ANALYTICAL METHODS

Total Marks: 70

N.B. Figures to the right indicate marks.

Q-1 Choose appropriate answers. (only code)

(8)

- 1 Unit of emf is.....
(a) Volt (b) Ampere
(c) Coulomb (d) Siemens
- 2 The PH value of a solution is 5.4. What is the H⁺ concentration?
(a) 3.69×10^{-6} (b) 3.49×10^{-6}
(c) 3.74×10^{-6} (d) 3.98×10^{-6}
- 3 In voltametry.....
(a) $I = f(T)$ (b) $I = f(Q)$
(c) $I = f(E)$ (d) $I = f(V)$
- 4 Ohms law is.....
(a) $I \times R = E$ (b) $E \times R = I$
(c) $I = R/E$ (d) $I = E$
- 5 For concentrated solutions PH equals to.....
(a) $-\log [H^+]$ (b) $-\log a_{H^+}$
(c) $-\log f$ (d) $-\log H^+$
- 6 The value of ΔG is.....
(a) nEF (b) $-nEF$
(c) $-nE^0F$ (d) nE^0F
- 7 Ilkovic equation is.....
(a) $i_d = 607nDcm^{2/3}t^{1/6}$ (b) $i_d = 607nDcm^{2t^{1/6}}$
(c) $i_d = 607nDcm^{1/6}t^{1/6}$ (d) $i_d = 607nD^{1/2}cm^{2/3}t^{1/6}$
- 8 For monobasic weak acids P^H equals to.....
(a) $\log K_a$ (b) $< \log K_a$
(c) $> \log K_a$ (d) $-\log K_a$

④

(P.T.O)

Q-2 Answer any seven of the following

(14)

- 1 State benefits of using electrochemical reactions.
- 2 Calculate P^H of 1.0×10^{-4} M HCl and 0.04M HNO_3 solutions.
- 3 Give advantages and disadvantages of hydrogen electrode?
- 4 State errors observed in glass electrode.
- 5 Explain potentiometric titrations.
- 6 Explain wein effect.
- 7 Write a note on polarographic maxima or hump.
- 8 Give relationships between electroanalytical methods.
- 9 Why dropping mercury electrode is used in polarography.

Q-3 (a) Discuss factors affecting P^H measurements with glass electrode. Why calibration of Glass Electrode is needed? (6)

Q-3 (b) (i) State advantages of antimony electrode. (6)
(ii) Why electrochemistry held central position in the field of chemistry.

OR

Q-3 (b) Calculate P^H of a solution made by mixing 50 ml of 0.1M NH_3 solution and 50 ml 0.04 M HCl solution. ($K_b = 1.8 \times 10^{-5}$) (6)

Q-4 (a) Discuss First kind, second kind and third kind of electrodes used in potentiometric titrations. (6)

Q-4 (b) Discuss electrode concentration cell reversible to anion and cation. (6)

OR

Q-4 (b) Deduce: (i) $H = nF[(dE/dT)_p] - E$ (6)
(ii) $E = RT/nF \ln K_h$
(iii) $E^0 = RT/nF \ln K$

Q-5 (a) Explain various factors affecting the conductance. (6)

Q-5 (b) State Kohlrausch's law of independent migration of ions. Discuss its applications. (6)

OR

Q-5 (b) Differentiate high frequency and low frequency conductometry. State advantages and disadvantages of high frequency conductometry (6)

Q-6(a) Discuss current variation with DME containing polarogram of 1M HCl and 5×10^{-4} M Cd^{+2} (in 1M HCl). Also discuss limiting current, Diffusion current and polarographic current. (6)

Q-6 (b) Discuss advantages of Amperometry and explain nature of plots in Amperometry. (6)

OR

Q-6 (b) An organic compound undergoes a two electrons reduction at DME. A diffusion of current of 10.1 μA was produced by 9.6×10^{-4} M solution of a compound. Calculate the diffusion coefficient of the compound. (Flow rate = 0.982 mg/sec, $t = 6.53$ second) (6)

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(8)

