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Unit II

Electro analytical Techniques

Q1. Electrolytic cell is capable of converting

- a. Electrical energy into chemical energy
- b. Thermal energy into chemical energy
- c. Electrical energy into thermal energy
- d. Chemical energy into Electrical energy

Ans: a

Q. 2. Galvanic cell is capable of converting

- a. Electrical energy into chemical energy
- b. Thermal energy into chemical energy
- c. Electrical energy into thermal energy
- d. Chemical energy into Electrical energy

Ans: d

Q. 3 For spontaneous cell reaction $\Delta G^0 = -nFE^0$ where ΔG^0 must be

- a. Zero
- b. Negative
- c. Positive
- d. half

Ans: b

Q. 4 ----- is a primary reference electrode.

- a. Calomel electrode
- b. Standard Hydrogen electrode
- c. Ag-AgCl electrode
- d. Glass electrode

Ans: b

Q. 5 Reference electrode is the electrode with -----.

- a. potential 1V
- b. known and constant EMF
- c. zero current
- d. equal resistance

Ans: b

Q. 6 The half cell reaction of calomel is represented by

- a. $\text{Pt} | \text{H}_2, \text{H}^+ (a=1)$
- b. $\text{Hg} | \text{Hg}_2\text{Cl}_2, \text{KCl}_{(\text{saturated})}$
- c. $\text{Ag} | \text{AgCl}, \text{KCl}_{(\text{saturated})}$
- d. $\text{Mg} | \text{MgCl}_2, \text{KCl}_{(\text{saturated})}$

Ans: b

Q. 7 The half cell reaction of Standard Hydrogen electrode is represented by

- a. $\text{Pt} | \text{H}_2, \text{H}^+ (a=1)$
- b. $\text{Hg} | \text{Hg}_2\text{Cl}_2, \text{KCl}_{(\text{saturated})}$
- c. $\text{Ag} | \text{AgCl}, \text{KCl}_{(\text{saturated})}$
- d. $\text{Mg} | \text{MgCl}_2, \text{KCl}_{(\text{saturated})}$

Ans: a

Q. 8 Calomel electrode is -----

- a. Primary reference electrode
- b. Secondary reference electrode
- c. indicator electrode
- d. standard electrode

Ans: b

Q. 9 Glass electrode is -----

- a. primary reference electrode
- b. secondary reference electrode

- c. indicator electrode
- d. standard electrode

Ans: c

Q. 10 The Glass electrode comprise of the thin walled bulb of -----
- responsive glass at the bottom.

- a. anion
- b. cation
- c. electron
- d. nucleus

Ans: b

Q. 11 Conductance of strong acid-strong base titration increases because of conductivity of-----.

- a. excess of OH^- ions
- b. neutralized H^+ ions
- c. heavy alkali metal
- d. heavy halide ions

Ans: a

Q. 12. Buffer solution is one that resist the change in ---.

- a. pH
- b. volume
- c. pressure
- d. temperature

Ans: a

Q. 13 Acidic buffer is a mixture of ---

- a. Strong acid and its salt with weak base.
- b. Weak acid and its salt with strong base.
- c. Strong base and its salt with weak acid.
- d. Weak base and its salt with strong acid.

Ans: b

Q. 14 Basic buffer is a mixture of ---

- a. Strong acid and its salt with weak base.
- b. Weak acid and its salt with strong base.
- c. Strong base and its salt with weak acid.
- d. Weak base and its salt with strong acid.

Ans: d

Q. 15 The equivalent conductance of an electrolyte is equal to the sum of the conductivities of constituent cation Λ^+ and anion Λ^- . is the statement of -----

- a. Lambert's law
- b. Beer's law
- c. Kohlrausch law
- d. Beer's - Lambert's law

Ans: c

Q. 16 The product of specific conductance of the solution and its measured conductance is known as ---

- a. Specific resistance
- b. Cell constant
- c. Conductance
- d. Equivalent conductance

Ans: b

Q. 17 In electrolytic cell electrode at which oxidation takes place is known as -----

- a. Anode
- b. Cathode
- c. Auxillary electrode
- d. None of the above

Ans: a

Q. 18 In electrolytic cell electrode at which reduction takes place is known as -----

- a. Anode
- b. Cathode
- c. Auxillary
- d. None of the above

Ans: b

Q. 19 Unit of Equivalent conductance is -----.

- a. mhos cm⁻¹
- b. S cm⁻¹
- c. mhos
- d. None of the above

Ans: c

Q. 20 The metal with half cell reactions which gives negatives E⁰ value with respect to SHE is -----

- a. Powerful reducing agent than H₂
- b. Powerful Oxidising agent than H₂
- c. Mild reducing agent than H₂
- d. None of the above

Ans: a

Q. 21 The analytical technique in which two identical inert electrodes are used along with electrolyte is -----.

- a. Potentiometry
- b. Conductometry
- c. pH metry
- d. None of the above

Ans: b

Q. 22 The traditional instrument used for measuring electrolytic conductance is -----

- a. Potentiometer
- b. Conductometer
- c. pH meter
- d. None of the above

Ans: b

Q. 23 The conductance of volume of solution containing one gram equivalent of electrolyte as-----.

- a. molar conductance
- b. equivalent conductance
- c. specific conductance
- d. molecular conductance

Ans: b

Q. 24 The conductance of a conductor, one meter long with cross sectional area of 1m² is called -----.

- a. molar conductance
- b. equivalent conductance
- c. specific conductance
- d. molecular conductance

Ans: c

Q. 25 Conductance of solution depends upon -----.

- a. Concentration of solution.
- b. Temperature.
- c. Mobility of ions
- d. All above

Ans: d

Q. 26 Hg | HgCl₂ | KCl (saturated) is

- a. Calomel electrode
- b. Standard Hydrogen electrode
- c. Ag-AgCl electrode
- d. Glass electrode

Ans:a

Q. 27 Degree of selectivity and order of selectivity of ions in ion selective electrode can be changed with an appropriate adjustment in ----.

- a. Internal solution
- b. Composition of membrane
- c. External solution
- d. None of the above

Ans:b

Q. 28 The glass electrode comprise of thin bulb of ----- glass.

- a. Anion responsive
- b. High resistivity
- c. Cation responsive
- d. High conductivity

Ans: c

Q. 29 of glass electrode is determined by ion-exchange process gel layer of the glass membrane which produces.

- a. Electro potential
- b. Phase boundary potential
- c. Phase difference
- d. None of the above

Ans: b

Q. 30 The part of glass electrode that directly participate in the equilibrium is

- a. Internal reference electrode
- b. The gel layer of the glass
- c. External reference electrode
- d. None of the above

Ans: b

Q. 31 In pH-metric titration concentration ratio changes rapidly at..... .

- a. Intermediate state
- b. At initial stage
- c. At equivalence point
- d. None of the above

Ans: c

Q. 32 The measurement of conductance is based on the principal -----.

- a. closed end circuit
- b. Wheatstone bridge circuit
- c. open end circuit
- d. None of the above

Ans: b

Q. 33 The potential developed across the ion selective membrane is related to-----.

- a. H^+ ion concentration of solution only
- b. Activities of ion of interest in the internal gel and sample solution
- c. Concentration of ion of interest in sample solution only
- d. H^+ ion and ion of interest in sample solution of only

Ans: b

Q. 34 An acidic buffer can be prepared by mixing-----.

- a. ammonium acetate in acetic acid
- b. ammonium chloride in ammonium hydroxide
- c. sodium acetate in acetic acid
- d. sodium chloride in Hydrochloric acid

Ans: c

Q. 35 pH of acidic buffer is related to pKa as-----.

- a. $\text{pH} = \text{pKa} + \log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$
- b. $\text{pH} = \text{pKa} + \log \left(\frac{[\text{acid}]}{[\text{salt}]} \right)$
- c. $\text{pH} = \frac{1}{2} \text{pKa} - \log \left(\frac{[\text{acid}]}{[\text{salt}]} \right)$
- d. $\text{pH} = \log \text{pKa} + \log \left(\frac{[\text{acid}]}{[\text{salt}]} \right)$

Ans: a

Q. 36 pH of basic buffer is related to pKa as-----.

- a. $\text{pH} = \text{pKb} + \log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$
- b. $\text{pH} = 14 - \text{pKb} - \log \left(\frac{[\text{salt}]}{[\text{base}]} \right)$
- c. $\text{pH} = \frac{1}{2} \text{pKb} - \log \left(\frac{[\text{base}]}{[\text{salt}]} \right)$
- d. $\text{pH} = \log \text{pKb} + \log \left(\frac{[\text{base}]}{[\text{salt}]} \right)$

Ans: b

Q. 37 Addition of small amount of either base or acid to a buffer solution causes only small changes in pH because buffer solution -----

- a. Doesn't contain H_3O^+ or OH^-
- b. Contains large amount of both H_3O^+ or OH^-
- c. Reacts with added acid or base
- d. contains strong base and salt of strong base

Ans: c

Q. 38 In buffer solution prepared by mixing sodium formate to formic acid pH of the solution becomes equal to pKa value of formic acid if-----

--

- a. $[\text{HCOOH}] < [\text{HCOO}^-]$
- b. $[\text{HCOOH}] = [\text{HCOO}^-]$
- c. $[\text{HCOOH}] > [\text{HCOO}^-]$
- d. None of the above

Ans: b

Q. 39 Cell constant \times Observed conductance =-----

- a. Specific conductance
- b. Molar conductance
- c. Equivalent conductance
- d. None of the above

Ans: a

Q. 40 Ion selective electrode measured -----

- a. Activity rather than potential
- b. Concentration rather than Activity
- c. Potential rather than activity
- d. Activity rather than concentration

Ans: d

Q. 41 Unit of Specific conductance is -----.

- a. mhos cm^{-1}
- b. S cm^{-1}
- c. mhos
- d. None of the

Ans: a

Q. 42 Unit of Molar conductance is - -----.

- a. mhos cm^{-1}
- b. S cm^{-1}
- c. mhos
- d. None of the above

Ans: c

Q. 43 Unit of Cell constant is -----.

- a. mhos cm^{-1}
- b. S cm^{-1}
- c. mhos
- d. None of the above

Ans: d

Q. 44. Which of the following is not the characteristic of ion selective electrodes?

- a) It is fragile
- b) Easy to use
- c) Available in different sizes and shapes
- d) It is insensitive to many ions

Answer: a

Q. 45. In glass membrane electrode, the glass containing 11% Na_2O , 18% Al_2O_3 , 71% SiO_2 is highly sensitive to which of the following ions?

- a) Sodium
- b) Hydrogen
- c) Nitrogen
- d) Chlorine

Answer: a

Q. 46. In liquid membrane electrode, the liquid ion exchanger is held in a porous disc of

- a) Solid material
- b) Semi-permeable membrane
- c) Hydrophobic material
- d) Water absorbing material

Answer: c

Q. 47. In recent liquid membrane electrodes, the porous liquid membrane is replaced with which of the following?

- a) Polyvinyl chloride
- b) Polyacryl chloride
- c) Polyester membrane
- d) Polyacryl amide

Answer: a

Q. 48. In solid state membranes, the body of the electrodes are made of which of the following?

- a) Polyvinyl chloride
- b) Plastic
- c) Polythene
- d) Teflon

Answer: d

Q. 49. Which of the following is not the characteristic of ion selective electrodes?

- a) Simple to use
- b) Inexpensive
- c) Narrow concentration range
- d) Operates in wide range of temperature

Answer: c

Q. 50. Ion selective electrode are unaffected by colour or turbidity of the solution.

- a) True
- b) False

Answer: a

Q. 51. Which of the following is not a problem of ion selective electrodes?

- a) Interference with other ions
- b) Output is influenced by ionic strength
- c) Drift in electrode potential during a sequence of measurements
- d) Can measure only positive ions

Answer: d

Q. 52. Which of the following is the effective concentration measured at the electrode head?

- a) Selectivity co-efficient
- b) Ionic strength
- c) Activity
- d) Activity co-efficient

Answer: c

Q.53. The value of activity co-efficient is always in which of the following ranges?

- a) Zero
- b) Less than zero
- c) Less than 1
- d) Greater than 1

Answer: c

Q.54. Which of the following specifies the relation between ionic strength and activity co-efficient?

- a) Directly proportional
- b) Inversely proportional

- c) Equal
- d) No particular relation

Answer: b

Q. 55. The difference between measured activity and actual concentration becomes higher at higher concentration. Is this statement true or false?

- a) True
- b) False

Answer: a

Q. 56. Given below is the diagram of liquid membrane electrode. Identify the unmarked component.

- a) Solid material
- b) Semi-permeable membrane
- c) Hydrophobic material
- d) Water absorbing material

Answer: c

Q.57. Ion selective electrodes have _____ linear range and _____ detection limit than the pH electrode.

- a) Lower, lower
- b) Lower, higher
- c) Higher, lower
- d) Higher, higher

Answer: b

Q. 58. In Ammonia electrode, diffusion of dissolved ammonia occurs through the membrane until which of the following conditions occur?

- a) Concentration becomes equal on both sides
- b) Activity becomes equal on both sides
- c) Partial pressure becomes equal on both sides
- d) Differential pressure is low

Answer: c

Q. 59. Which of the following causes main interference in Fluoride electrode?

- a) H^+ ions
- b) OH^- ions

- c) Li^+ ions
- d) Cl^- ions

Answer: b

Q. 60. Crystal membrane of ion selective electrode can be regenerated by washing with which of the following?

- a) Alcohol
- b) Iodine solution
- c) Acidic solution
- d) Basic solution

Answer: a