

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

$$\Delta G^0 = -nFE^0 \text{ where } \Delta G^0 \text{ must be}$$

- 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 The conductance remains almost constant till equivalence point in conductometric precipitation titration of AgNO_3 Vs NaCl as ionic conductance of ---.

- a. ionic conductance of Ag^+ has high value
- b. ionic conductance of Na^+ has high value
- c. ionic conductance of Ag^+ & Na^+ has almost similar value
- d. ionic conductance of Ag^+ & Na^+ is zero

Ans:c

Q. 13 Buffer solution is one that resist the change in ---.

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

Ans:a

Q. 14 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. 15 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. 16 The equivalent conductance of an electrolyte is equal to the sum of the conductivities of constituent cation Λ^+ and an 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. 17 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. 18 In electrolytic cell electrode at which oxidation takes place is known as -----

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

Ans: a

Q. 19 In electrolytic cell electrode at which reduction takes place is known as -----

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

Ans: b

Q. 20 Oxidation is -----

- a. loss of electron
- b. gain of electron
- c. transfer of electron
- d. excitation of electron

Ans: a

Q. 21 Reduction is -----

- a. loss of electron
- b. gain of electron
- c. transfer of electron
- d. excitation of electron

Ans: b

Q. 22 Unit of Equivalent conductance is -----.

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

Ans: c

Q. 23 The metal with half cell reactions which gives negatives E^0 value with respect to SHE is -----

- a. Powerful reducing agent than H_2
- b. Powerful Oxidising agent than H_2

- c. Mild reducing agent than H_2
- d. None of the above

Ans: a

Q. 24 E^0 value of Cu which is placed below H_2 in ElectroChemicalSeries is observed to be-----

- a. Positive
- b. Negative
- c. Zero
- d. Any one of the above

Ans: a

Q. 25 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. 26 The traditional instrument used for measuring electrolytic conductance is -----

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

Ans:b

Q. 27 An effect accompanied by increase in the intensity of absorption maxima is known as -----.

- a. Hypsochromic shift
- b. Hypochromic shift
- c. Hyperchromic shift
- d. None of the above

Ans: c

Q. 28 An effect accompanied by decrease in the intensity of absorption maxima is known as -----

- a. Hypsochromic shift
- b. Hypochromic shift
- c. Hyperchromic shift
- d. None of the above

Ans: b

Q. 29 An effect due to which absorption maxima is shifted towards shorter wavelength known as -----

- a. Hypsochromic shift
- b. Hypochromic shift
- c. Hyperchromic shift
- d. None of the above

Ans: a

Q. 30 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. 31 The conductance of a conductor, one meter long with cross sectional area of 1m^2 is called -----

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

Ans: c

Q. 32 Conductance of solution depends upon -----.

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

Ans: d

Q. 33 Hg | HgCl₂ | KCl (saturated) is

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

Ans:a

Q. 34 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. 35 The glass electrode comprise of thin bulb of ----- glass.

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

Ans:c

Q. 36 The response 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. 37 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. 38 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. 39 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. 40 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. 41 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. 42 pH of acidic buffer is related to pKa as-----.

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

Ans:a

Q. 43 pH of basic buffer is related to pKa as-----.

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

Ans:b

Q. 44 If pKa of CH_3COOH is 4.74, pH of the buffer solution of 0.1 M CH_3COOH and 0.1 M CH_3COONa is ---

- a. 3.74
- b. 5.74
- c. 6.74
- d. 4.74

Ans:d

Q. 45 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. 46 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. $[HCOOH] < [HCOO^-]$
- b. $[HCOOH] = [HCOO^-]$

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

Ans:b

Q. 47 Which of the following statement hold true for operating electrolytic cell -----

- a. $\Delta G > 0$ and $E_{\text{cell}} < 0$
b. $\Delta G = 0$ and $E_{\text{cell}} < 0$
c. $\Delta G = 0$ and $E_{\text{cell}} = 0$
d. $\Delta G < 0$ and $E_{\text{cell}} > 0$

Ans:b

Q. 48 Cell constant \times Observed conductance =-----

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

Ans:a

Q. 49 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. 50 Unit of Specific conductance is -----.

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

Ans:a

Q. 51 Unit of Molar conductance is - -----.

- a. mhos cm^{-1}
b. S cm^{-1}
c. mhos

- d. None of the above

Ans:c

Q. 52 Unit of Cell constant is -----
-----.

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

Ans: d

53. 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

54. 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

55. Glass electrodes can be used to measure various ions by changing the glass membrane composition.

3. 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

56. 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

57. 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

58. 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

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

- a) True
- b) False

Answer: a

60. 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

61. 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

62. 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

63. 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

64. 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

65. 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

66. 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

67. 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

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

- a) H^+ ions
- b) OH^- ions
- c) Li^+ ions
- d) Cl^- ions

Answer: b

69. 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

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