1. A mixture of 0.1015 g of NaCl and 0.1324 g of KCl is dissolved in water and titrated with 0.15 M of $AgNO_3$ (aq.). What volume of the $AgNO_3$ (aq.) will be needed to reach the endpoint?

Ans: Milli gm equivalent of NaCl = (0.1015/58.46) x 1000 = 1.736

Milli gm equivalent of KCl = (0.1324/74.5)x1000 = 1.777

Total milli gm equivalent of the mixture = 1.736 + 1.777= 3.513

Concentration of $AgNO_3$ = 0.15 M

At equivalent point, total milli gm equivalent of chloride = total milli gm equivalent of $AgNO_3$

Milli gm equivalent of $AgNO_3$ = conc. of $AgNO_3$ x volume of $AgNO_3$

Hence 3.513 = 0.15 x (x ml)

or, x= 3.513/0.15 = 23.42 ml

Normality = gm equivalent of that substance/ volume

2. How many ml of 0.45 M HCl must be added to 25 ml of 1.0 M KOH to make a neutral solution?

3. **What is the cell potential for a Zn/Cu cell when [Zn^{2+}] = 10 M and [Cu^{2+}] = 1 M at 25 °C, where for Cu2+*(aq)* + 2e- → Cu*(s)*, E^o = + 0.34 V and Zn*(s)* → Zn2+*(aq)* + 2e- E^o = + 0.76 V.**

Zn2+ + 2e Zn

E (zn2+/Zn) = E0 – (0.059/2) log 1/10

= -0.76-0.0295 (-1)

=-0.76 + 0.0295

= -0.7305 V

E_{cell} = E(Cu2+/Cu) – E (Zn2+/Zn)

= 0.34 – (-0.7305)

= 0.34 + 0.7305

= 1.0705 V

4. 25 ml of 0.01 M AgNO3 solution is mixed with 25 ml of 0.0005 M aqueous NaCl solution. Whether there will be any precipitate? Given Ksp of AgCl is 1.7×10^{-10} M^2

Ans: [Ag+] = 0.005 M
[Cl-] = 0.00025 M

Ionic product of AgCl = [Ag] [Cl-]

$= 5 \times 10^{-3} \times 2.5 \times 10^{-4}$
$= 12.5 \times 10^{-7}$
$= 1.25 \times 10^{-6}$ M^2

As the ionic product exceeds the solubility product, there will be precipitation of AgCl.

5. 10 ml of 0.1 N NaOH is added to 20 ml of 0.1N H_2SO_4 and the resultant solution is titrated against 0.1 N NaOH solution. What will be the titre value at the end point?

Ans: milli gm Equivalent of NaOH = 0.1 x 10 = 1

milli gm equivalent of H2SO4 = 20 x 0.1 = 2

Net milli gm equivalent of H2SO4 = 2 – 1 = 1

The net milli gm equivalent of NaOH should be 1

Normality of NaOH x volume of NaOH (x) = 1

Thus, 0.1 x x =1
Or, x = 1/0.1 = 10 ml

6. **The molar conductance of CH3COONa, HCl and sodium chloride at infinite dilution are $91x10^{-4}$, $426.16x10^{-4}$ and $126.45x10^{-4}$ Sm2 mol-1, respectively at 25 ^{0}C. What will be the molar conductance value at infinite dilution for acetic acid?**

Ans: $CH_3COONa + HCl \longrightarrow CH_3COOH + NaCl$

$$CH_3COOH = CH_3COONa + HCl - NaCl$$

$$= (91 + 426.16 - 126.45) \times 10^{-4}$$

$$= 390.71 \times 10^{-4} \text{ S m2 mol}^{-1}.$$

7. In determination of mixture of bases by titration method, the amount of Sodium Hydroxide is calculated as---.

a. N x Equivalent mass of Sodium Carbonate / 10

b. N [OH and CO_3^{2-} portion] x Equivalent mass of Sodium Hydroxide and Sodium carbonate / 10

c. N [OH portion] x Equivalent mass of Sodium Hydroxide / 10

d. N [CO_3^{2-} portion] x Equivalent mass of Sodium carbonate /10

8. What is the working principle of conductometry?

a. measurement of potential.

b. measurement of conductivity of solution.

c. measurement of emf.

d. measurements of pH

8. Conductivity cell is made up of…

a. Two silver rods

b. Two parallel sheets of platinum

c. Glass membrane of Ag/AgCl

d. Sb-Sb_2O_3

9. At the same concentration and temperature, dilute aqueous solution of strong acid will conduct electricity….

a. better than dilute aqueous solution of weak acid

b. as much as dilute aqueous solution of weak acid

c. lower than the dilute aqueous solution of weak acid

d. two-fold higher than the weak acid

10. If 2 g of NaOH is dissolved in 100 ml of distilled water, then what is the concentration of the solution?

a. 1 N

b. 2 N

c. 0.5 N

d. 0.05 N

11. Which of the following is the formula for pH calculation?

a) $\log_{10}[H^+]$

b) $-\log_{10}[H^+]$

c) $\log 2[H^+]$

d) $-\log 2[H^+]$

12. The pH meter is a

a) Ammeter

b) Voltmeter

c) Potentiostat

d) Spectrophotometer

13. How we will come to know that a given solution is acidic?

a) If its pH value is less than 7

b) If its pH value is greater than 7

c) If its pH value is less than 5

d) If its pH value is 5

14. A buffer solution is used with pH measuring instruments to

a) protect the equipment

b) standardize the equipment

c) clean the electrodes

d) platinize the reference electrode

15. The pH of a liquid solution is a measure of

a) dissolved salt content

b) hydrogen ion activity

c) hydroxyl ion molarity

d) electrical conductivity

16. Measurement of solution viscosity offers a simple and convenient method for molecular weight determination if

a) Polymer is insoluble in solvent
b) Polymer is soluble in solvent
c) Polymer is sparingly soluble in solvent
d) Polymer is used as neat

17. Which one of the following equations is used to calculate the relative viscosity?

a) $\eta / \eta_0 = t/t_o$
b) $\eta_{sp} = \eta / \eta_0 - 1$
c) $\eta_{red} = \eta_{sp}/C \times 100$
d) $\eta_i = K (M)^a$

18. Viscosity is due to one of the following

a) Potential energy stored in fluid
b) Resistance to fluid motion
c) Roughness of the surface
d) The pressure difference between the two fluids

19. What is the role of chromate ions in chloride estimation?

a. It acts as a reducing agent
b. It acts as a buffer
c. It acts as an indicator
d. It acts as an oxidizing agent

20. What is the pH range in which chloride determination using Mohr's method is conducted?

a. < 3
b. 5
c. > 12 (d) 6 -9

21. Why do we have to standardize $AgNO_3$ solution?

a. To find the normality of NaCl

b. To calculate the normality of AgCl

c. To find the normality of $AgNO_3$

d. To calculate the volume of NaCl

22. All of the following statements are correct regarding potentiometric titration except

a. They are suitable for colored or turbid solutions

b. The EMF of the cell is zero at the equivalence point

c. The results obtained are accurate

d. Acid base titration can also be carried out by potentiometry

23. Hard water + Buffer + EBT ----------□

a. Appearance of wine-red colour
b. Appearance of steel blue colour
c. Formation of weak complex
d. Formation of brown precipitate

24. Hard water + Buffer + EBT + EDTA

a. Appearance of wine-red colour
b. Appearance of steel blue colour
c. Formation of weak complex
d. Formation of brown precipitate