School of Chemistry and Biochemistry, TIET, Patiala

Applied Chemistry (UCB008)

Solutions _Tutorial Sheet-I (General)

Q1. What do you mean by primary and secondary standards in volumetric analysis?

Ans: Primary Standard: A compound whose solution with exact known concentration can be prepared. e.g sodium carbonate, ferrous ammonium sulphate etc

Secondary Standard: A compound whose solution with exact known concentration can't be prepared due to certain limitations. e.g. $KMnO_4$, HCl, NaOH

Q2. What is meant by the term indicator? Give example.

Ans: Indicator is a compound which is added to analyte solution to visually detect the end point. It usually undergoes a color change at the end point, thereby indicating the titration end. The indicator undergoes color change (caused by change in structure) due to change in pH, potential etc. The common examples of indicators are phenolphthalein, methyl orange, etc.

Q3. What is the difference between volumetric and conductometric titrations?

Ans: Volumetric titrations require an indicator to determine the end point whereas in conductometric titrations we don't really need an indicator, we monitor conductance of solution a titration proceeds with the help of conductometer (conductivity meter). The equivalence point is determined via plotting graph.

Q4. If 49 g of H_2SO_4 is dissolved in water to get a 500 mL of the solution, calculate the normality and molarity of the solution.

Ans: Molar wt. of H_2SO_4 = 98g Eq. wt. of H_2SO_4 = 98/2 = 49 g/eq.

Normality = (49/49)/(500/1000) = 2 N

Molarity = (49/98)/(500/1000) = 1 M

Q5. Name different types of titrations.

Ans: **Based on physical property:**

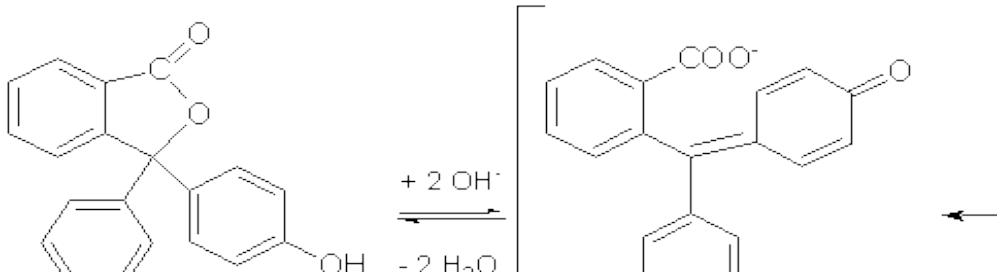
1. Volumetric Titrations
2. Conductometric Titrations
3. Potentiometric Titrations
4. pH metric titrations

Based on reaction type:

1. Acid-base titrations
2. Complexometric titrations
3. Redox titrations
4. Precipitation titrations

Q6. What happens at the molecular level when indicator color changes?

Ans: When indicator color changes, it is accompanied by change in conjugation which leads to formation of new chromophore. e.g. given below are the two structures of phenolphthalein at different pH:



Colorless in Acidic pH **Pink in Basic pH**

Q7. Differentiate between end point and equivalence point.

Ans: End point is the point where indicator changes its color whereas equivalence point is the point where reaction between two chemicals come to an end. At the equivalence point, the two chemicals have reacted with each other as per the stoichiometry of the reaction.

Equivalence point is more accurate as it refers to point where chemicals would react stoichiometrically whereas end point is where indicator changes color.

Q8. Comment whether all these are same of different?

Element, ion, compound and mixture

Ans: All these are different chemically.

Element: Element is a pure substance which can't be broken down by simple process. e.g. carbon, hydrogen etc

Ion: ionized form (once electron are gained or lost) from element (or molecule) is called ion.

e.g. Na^+

Compound: Where different element combine in a fixed proportion and don't retain their identity. A new molecule formed is called the compound. e.g. $C_6H_{12}O_6$

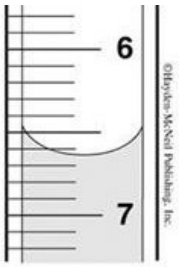
Mixture: When different compounds are mixed and they don't react chemically and retain their identity. Its simply a physical mixture. e.g. mixture of glucose and sucrose

Q9. Why does any solution (or compound) appears colorless or colored?

Ans.: If it is colored, that means it is absorbing radiation from the visible range (400 nm-800 nm).

If is colorless, either its absorbing radiation in UV range or doesn't absorb at all.

Q10. Write down the burette reading.



(*Meniscus represents the level of solution, initial reading was at 0.0mL)*

Ans: Reading = 6.6 mL

Q11. If you need to transfer 50 mL solution, which glassware would you prefer and why? The possible choice are: conical flask, beaker, graduated cylinder

Ans.: Graduated cylinder should be preferred as its more exact. Accuracy of volume will be high with graduated cylinder. Beaker and conical flask are not that exact.

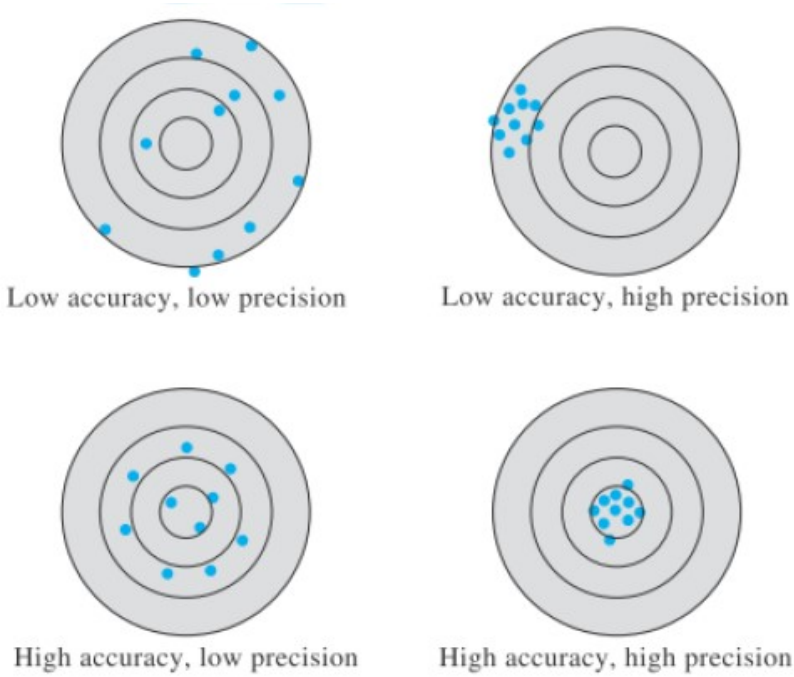
Q12. Which meniscus level is used to record burette reading for colored and colorless solutions?

Ans: Colorless solution: lower meniscus level

Colored solution: upper meniscus level

Q13. Pictorially, differentiate between accuracy and precision.

Ans.:



Q14. In a volumetric titration, at the end point color change occurs. Would you add more solution from burette to further intensify the color? Comment.

Ans.: No, further addition of solution from burette should be avoided completely. Further continuing with titration will lead to inaccurate results. The titration should be stopped where the color change is observed. Further addition to intensify the color is not needed as the indicator has done its job already.

Q15. When 0.1 M HCl is titrated conductometrically against 0.1 M NaOH, what is the pH at equivalence point?

Ans: The pH at equivalence point is 7.

Q16. When 0.1 M HCl is titrated against 0.1 M NaOH using phenolphthalein as an indicator (volumetric titration), what is the pH at end point?

Ans: The pH at end point is >7 (~8.2)
