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Practice Volumetric Chemical Analysis

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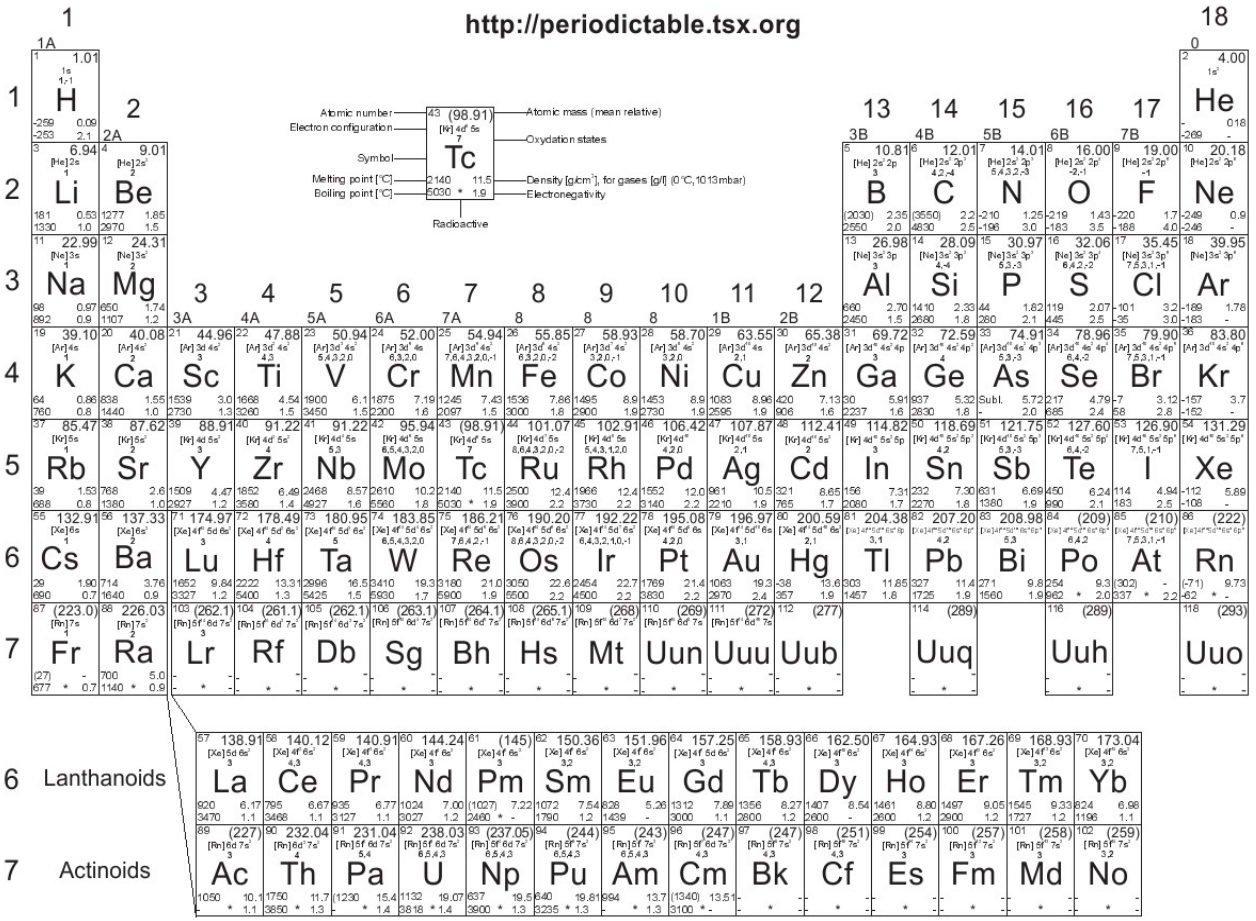
ChemGlobe - Periodic table of elements

http://periodictable.tsx.org



Rules for the handing of reagents and solutions:-

1. Select the best available grade of chemical for analytical work.

2. Replace the top of every container immediately after the removal of reagent, do not rely on someone else to do this.

3. Hold stoppers of reagent bottles between the fingers, stoppers should never be set on the desk top.

4. Unless specifically directed to the country, never return any excess reagent or solution to a bottle. The minor saving represented by the return of an excess is overshadowed by the risk of contaminating the entire bottle.

5. Again, unless specifically directed otherwise, do not insert spoons, spatulas, or knives into a bottle containing a solid chemical. Instead, shake the capped these are used wherever possible in analytical work. Some suppliers label their products with the maximum limits of impurity allowed by these specifications, other print the actual results of analyses for the various impurities.

Quantitative Analysis:-

The quantitative chemical analysis is a scientific method to determine the absolute or relative abundance of a chemical substance in a sample.

Volumetric Analysis (titrimetric analysis):-

Chemical procedure used for determining the concentration of a gas (evaluated or consumed) in some reactions and solution by measured of it is volume A known volume of a solution of unknown concentration is reacted with a known volume of a solution of known concentration (**standard solution**). The standard solution is delivered not usually from a burette so the volume added is known. This technique is known as titration. Often an indicator is used to show when the correct proportions have reacted.

The term 'titrimetric analysis' refers to quantitative chemical analysis carried out by determining the volume of a solution of accurately known concentration which is required to react quantitatively with a measured volume of a solution of the substance to be determined. The solution of accurately known strength is called the **standard solution**, see Section 10.3. The weight of the substance to be determined is calculated from the volume of the standard solution used and the chemical equation and relative molecular masses of the reacting compounds.

The term 'volumetric analysis' was formerly used for this form of quantitative determination but it has now been replaced by **titrimetric analysis**. It is considered that the latter expresses the process of titration rather better, and the former is likely to be confused with measurements of volumes, such as those involving gases. In titrimetric analysis the reagent of known concentration is called the **titrant** and the substance being titrated is termed the **titrand**. The alternative name has not been extended to apparatus used in the various operations; so the terms volumetric glassware and volumetric flasks are still common, but it is better to employ the expressions graduated glassware and graduated flasks and these are used throughout this book.

The standard solution is usually added from a long graduated tube called a burette. The process of adding the standard solution until the reaction is just complete is termed a **titration**, and the substance to be determined is **titrated**. The point at which this occurs is called the **equivalence point** or the **theoretical** (or **stoichiometric**) **end point**. The completion of the titration is detected by some physical change, produced by the standard solution itself (e.g. the faint pink colour formed by potassium permanganate) or, more usually, by the addition of an auxiliary reagent, known as an indicator; alternatively some other physical measurement may be used. After the reaction between the substance and the standard solution is practically complete, the indicator should give a clear visual change (either a colour change or the formation of turbidity) in the liquid being titrated. The point at which this occurs is called the **end point of the titration**. In the ideal titration the visible end point will coincide with the stoichiometric or theoretical end point. In practice, however, a very small difference usually occurs; this represents the titration error. The indicator and the experimental conditions should be so selected that the difference between the visible end point and the equivalence point is as small as possible.

$$\text{mmol standard solution} = \text{mmol unknown solution}$$

$$M_1 * V_1 = M_2 * V_2$$

$$M1 * V1 = \frac{\text{Wt.}}{\text{M.Wt.}} * 1000$$

$$\text{meq standard solution} = \text{meq unknown solution}$$

$$N_1 * V_1 = N_2 * V_2$$

$$N1 * V1 = \frac{Wt.}{Eq.Wt} * 1000$$

Primary standard solutions:-

Primary standard solutions are used in analytical chemistry. Including dissolving, a primary standard is typically a reagent which can be weighed easily, and which is so pure that its weight is truly representative of the number of moles of substance contained. Features of a primary standard include:

1. High purity (more than 99.98%)
2. They have known formula and molecular weight
3. They are non-sensitive to atmospheric oxygen
4. High Stability (low reactivity for temperature, light, and dust)
5. High solubility (if used in titration)
6. High equivalent weight
7. Non-toxicity
8. Ready and cheap available
9. Should have high molecular weight for weighing errors are minimized

Secondary standard solutions:-

Secondary standard solutions are a solution that is not stable in its own form, and must first be standardized before being used. A good example of this is NaOH, sodium hydroxide is a secondary standard because it absorbs the moisture from the air than react with CO_2 in air to form Na_2CO_3 and its concentration wills changes. Features of

Secondary standards include: Influenced by atmosphere/environment

1. Concentration change over time
2. Usually powerful reactants
3. Usually cheap & easy to use

1//Acid–base titration:-It is acid react with base to obtain salt and water:-

An acid-base titration is the determination of the concentration of an acid or base by exactly neutralizing the acid/base with an acid or base of known concentration. This allows for quantitative analysis of the concentration of an unknown acid or base solution. We must be chosen a suitable indicator , the equivalence point of the reaction, the point at which equivalent amounts of the reactants have reacted. The point at which the indicator changes color is called the end point.

		Indicator color	
Indicator	***pH***	***Acidity medium***	***Basics medium***
Methyl orange (M.O)	3.1 – 4.4	Red	Yellow
Bromocresol Green	3.3 – 4.5	Yellow	Blue
Methyl Red (M.R)	4.2 – 6.3	Red	Yellow
Bromo Thymol Blue	6 – 7.6	Yellow	Blue
Phenol Red (P.O)	6 - 8	Yellow	Red
Cresol Indigo	7.4 - 9	Yellow	purple
Phenol Phthalin (Ph. Ph)	8 – 9.8	Colorless	Red
Thymol Blue	8 – 9.8	Yellow	Blue