PHARMACEUTICAL ANALYSIS- BP102T

UNIT: 1 **(Pharmaceutical analysis, its definition and scope, methods expressing techniques)**

CLASS:3

TOPIC: PRIMARY AND SECONDARY STANDARDS

Standards

In Pharmaceutical Analysis, the word standard means a material containing a substance of our interest with a known concentration. We can express this with definite numbers with proper units.

Functions

To provide a reference using which we can determine the unknown concentration of the solution

To the standardization of volumetric solutions

Preparation of secondary standard

PRIMARY STANDARD:

The primary standard is a reagent that is generally representative of the number of substances contained and easily weighed.

A Primary standard is a reagent that's stable, it's not a hydrate /has no water of hydration, and has a high molecular weight.

Primary standards are typically used in titration to determine an unknown concentration and in other analytical techniques.

High level of purity, low reactivity (high stability), high equivalent weight (to reduce error from mass measurements)

Not hygroscopic (to reduce changes in mass in humid versus dry environments), non-toxic, inexpensive, and readily available

T.PRIYANKA
ASSISTANT PROFESSOR

It should have a high relative molecular weight so that weighing errors may be negligible. The substance should be readily soluble under the conditions in which it is employed.

The substance commonly employed as a primary standard is mentioned below:

Acid- base reactions: sodium carbonate Na2CO3 , sodium tetraborate Na2B4O7 , potassium hydrogenphthalate KH(C8H4O4), potassium hydrogeniodate KH(IO3)2.

Complex formation reactions: pure metals (zinc, copper, magnesium, and manganese) and salts, depending upon the reaction used.

Precipitation reactions: silver, silver nitrate, sodium chloride, potassium chloride and potassium bromide.

Oxidation-reduction reaction: potassium dichromate (K2Cr2O7), potassium bromate (KBr), potassium iodate (KIO3), sodium oxalate Na2C2O4 and pure iron.

A **primary standard** is a substance that is:

- Highly pure, stable, non-hygroscopic (doesn't absorb moisture easily).
- Has a high molecular weight → reduces weighing error.
- Reacts completely and in a known stoichiometry.
- Easily available and inexpensive.
- Soluble in the solvent used (usually water).

Used to prepare a standard solution directly by accurately weighing the substance.

Examples:

- Sodium carbonate (**Na_2CO_3**) – for acidimetry.
- Potassium hydrogen phthalate (**KHP**, $C_8H_5KO_4$).
- Oxalic acid dihydrate (**$H_2C_2O_4 \cdot 2H_2O$**).
- Potassium dichromate (**$K_2Cr_2O_7$**) – for redox titrations.
- Pure copper (Cu) – for redox titrations.

SECONDARY STANDARD:

Secondary standard

A secondary standard is a chemical that has been standardized against a primary standard for use in a specific analysis. Secondary standards are commonly used to calibrate analytical methods.

A secondary standard is a substance that may be used for standardization

A secondary standard is a standard that is prepared in the laboratory for a specific analysis. It is usually standardized against a primary standard.

It follows that a secondary standard solution is a solution in which the concentration of dissolved solute has not been determined from the weight of the compound dissolved but by reaction (titration) of a volume of the solution against a measured volume of a primary standard solution.

A secondary standard is a chemical or reagent which has certain properties such as….

• It has less purity than the primary standard

• Less stable and more reactive than the primary standard, but its solution remains stable for a long time

• Titrated against primary standard

A **secondary standard** is a solution whose concentration is not known precisely but is determined by titration against a primary standard.

- Less pure, unstable, or hygroscopic.
- Concentration changes over time (due to reaction with CO_2, O_2, moisture, light, etc.).
- Cannot be weighed directly to prepare an exact concentration.

Used in routine titrations after standardization.

Examples:

- Hydrochloric acid (**HCl**) – reacts with CO_2 in air.

- Sulphuric acid (**H_2SO_4**).
- Sodium hydroxide (**NaOH**) – absorbs CO_2 and moisture.
- Potassium permanganate (**$KMnO_4$**) – decomposes in light.
- Silver nitrate (**$AgNO_3$**) – sensitive to light.

Summary Table

Feature	**Primary Standard**	**Secondary Standard**
Purity	Very high (≥99.9%)	Lower, less stable
Stability	Stable	May decompose/react
Hygroscopic nature	Non-hygroscopic	Often hygroscopic
Direct preparation	Yes (by weighing)	No (must standardize)
Examples	Na_2CO_3, KHP, $K_2Cr_2O_7$	HCl, NaOH, $KMnO_4$