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What are primary standard and secondary standard

Primary standards are made to the highest metrological quality and are the definitive definition or realization of their unit of measure. The third level of standard, a standard which is periodically calibrated against a secondary standard, is known as a working standard. What are the three standards of measurements? The three standard systems of measurements are the International System of Units (SI) units, the British Imperial System, and the US Customary System. Of these, the International System of Units(SI) units are prominently used.

Primary Standard VS Secondary Standard
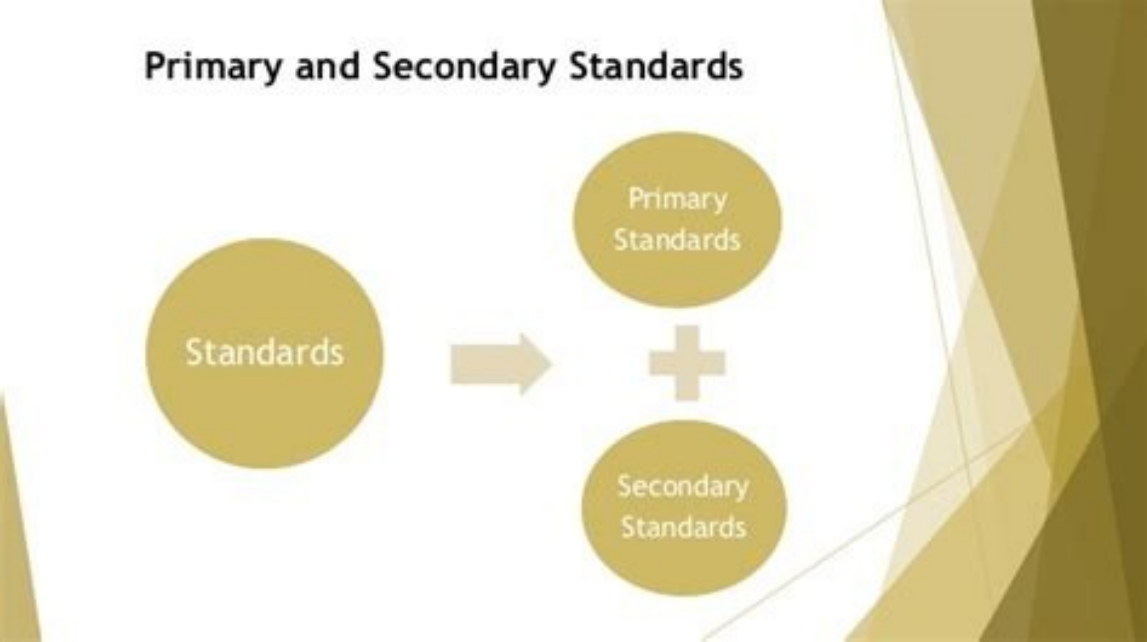
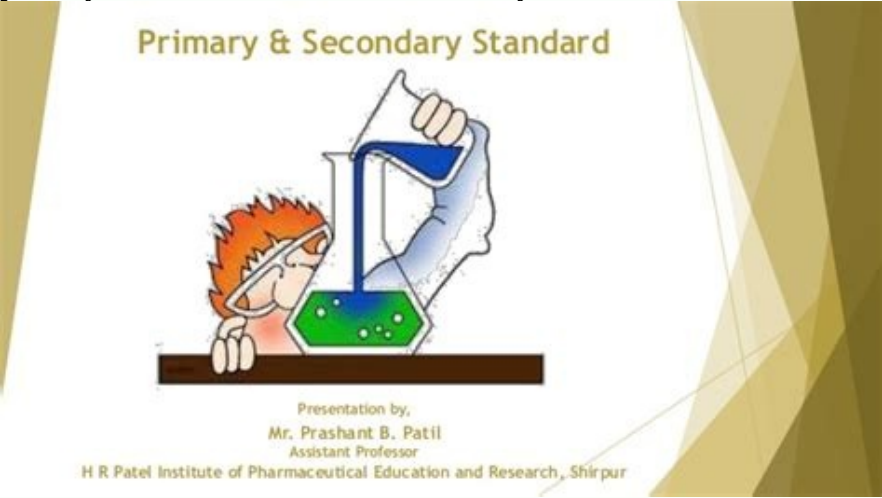| Sr #	Primary Standard	Secondary Standard
1.	Primary standard are the compounds having reagent(analyte) of high purity and can directly used for perpration of standard solutions	Secondary Standard solutions are analysed against primary standard solutions. Basically these are perpared in laboratory for specific analysis.
2.	Example:- Nacl is primary standard for AgNO3 NaOH is primary standard for HCl	For example, NaOH, H2SO4, etc
3.	Primary stadards also used to prepare the solutions which are necessay for the calibration of analytical instruments.	Generally volumetric solutions are known as secondary standards
4.	It is usually standardized against a primary standard.	It is usually standardized against a primary standard.
5.	A primary standard is a reagent that is extremely pure, stable, it not a hydrate/has no water of hydration, and has a high molecular weight.	

Only Chemistry Discussion

What are different standards of measurement? There are two types of standards namely (i) basic or fundamental standards, and (ii) derived standards. Basic or fundamental standards – In the SI system, there are seven basic measurement units from which all other units are derived. All of the units except one are defined in terms of their unitary value. What is reference standard in metrology? A reference standard for a unit of measurement is an artifact that embodies the quantity of interest in a way that ties its value to the reference base. At the highest level, a primary reference standard is assigned a value by direct comparison with the reference base. What is secondary standard and examples? e.g. HCL, H2SO4, NaOH, KOH, KMnO4, etc. are the Secondary Standard Substance. A secondary standard is a standard that is arranged in the laboratory for a definite analysis. Example: The foundation Sodium hydroxide (NaOH) is an example of a secondary standard. What is difference between primary standard and secondary standard? A primary standard is a substance of known high purity (99.9% pure) which may be dissolved in a known volume of solvent to give a primary standard solution. A secondary standard is a substance whose active agent contents have been found by comparison against a primary standard. What are secondary standards? A secondary standard is a substance whose active agent contents have been found by comparison against a primary standard.
This means it is usually standardized against a primary standard.

Secondary standard solutions are used to calibrate analytical equipment and analytical techniques. What is standard measuring equipment? Standard Units of Measurement A ruler is a foot long and usually has inch and centimeter marks. A meter stick is a meter long and usually has foot, inches, and centimeter marks. Scales (depending on what type they are) use pounds, kilograms, ounces, or the like. Measuring cups are normally marked in cups and ounces. What are primary and secondary standards in chemistry? Primary standards are reagents that can involve in chemical reactions. These compounds are often used to determine the unknown concentration of a solution that can undergo a chemical reaction with the primary standard. A secondary standard solution is a solution that is made specifically for a certain analysis. What is the difference between line standard and end standard? When the length being measured is expressed as the distance between two lines, this is known as line standard. Line standards are not as accurate as end standards and cannot be used for close tolerance measurement. How are secondary standards similar to primary standards? Secondary Standards (Calibration Standards): The secondary standard is more or less similar to the primary standard. They are nearly close in accuracy with primary standards. The secondary standard is compared at regular intervals with primary Stands and records their deviation. Which is less accurate secondary or tertiary standard? Secondary Standard • The value of the secondary standard quantity is less accurate than primary standard one. It is obtained by comparing with primary standard. • These are close copies of primary standards w.r.t design, material & length. 18. Tertiary Standard • Maintained in National Physics Laboratories (NPL). Which is an example of a secondary reference standard?

Secondary reference standards are very close approximations of primary reference standards. For example, major national measuring laboratories such as the US's National Institute of Standards and Technology (NIST) will hold several "national standard" kilograms, which are periodically calibrated against the IPK and each other. Is the master standard the same as the primary standard? Primary Standards (Master Standards): The primary standard is also known as Master Standard, and is preserved under the most careful conditions. These standards are not commonly in use. They are used only after long internals. They solely used for comparing the secondary standards. A chemical with known concentration is termed standard in chemistry. Primary standards are taken as reference chemicals for finding concentrations of analytes. They are pure, high molecular weighed, stable, and non-toxic substances used to prepare solutions with exactly known concentrations known as primary standard solutions. Furthermore, with the help of only a standard, any analytical instruments can be calibrated for analysis. Pre-requisite concepts Basic analytical chemistry Titration-Types of titrations Standard solutions can be categorized into primary and secondary standards. Primary Standard Primary standards are certain chemical substances that are frequently used for defined concentrations as a reference. They are pure reagents i.e. they have reliable compositions that do not alter on exposure to different atmospheres. Primary standards have relatively high molecular weights from which the standard solution can be prepared by direct weighing of its quantity. A good primary standard has the following characteristics: Low reactivity A primary standard must have low reactivity. Reactive substances cause deviations in the results of chemical analysis, for which they are not used as primary standards.

High stability A primary standard should be highly stable.
Less stable substances do not work uninterrupted, which makes them reactive and unable to be used as standards. High purity Primary standards are highly pure. High purity is certain when all calculations are based upon a single species. Moreover, the standardization process will be much easier and reliable if the standard is pure. Cheap in cost, Readily available Usually, primary standards are used in large quantities. It will be difficult to use expensive standards. It must also be available easily. Non-Hygroscopic (stable under open atmosphere) The substance should be unaltered in the air i.e. during weighing.

This implies that it should not be hygroscopic, oxidized by air, or affected by carbon dioxide. A primary standard should maintain an unchanged composition even during storage. Non-toxic The standard should be a non-toxic chemical. The excessive use of these chemicals makes the possibility of spillage high, endangering the workers, so it must not affect human skin, table sheets, plastic wares, etc either directly or indirectly. High molecular weight A primary standard should have a high relative molecular weight so that, the weighing errors may be minimized. The precision in weighing is ordinarily 0.1-0.2 mg. For accuracy of 1 part in 1000, it is necessary to employ samples weighing at least 0.2 g. Related Topics Secondary Standard Primary standards are often used indirectly to standardize any chemical species or a chemical analysis instrument. This implies the use of a third-party chemical species called secondary standard. The secondary standard solution is a solution, in which the concentration of dissolved solute has not been determined, from the weight of the compound but by titration against a primary standard. For example Sodium hydroxide (NaOH) is a secondary standard used to standardize acids like hydrochloric acid (HCl) but NaOH needs a prior standardization against a primary standard acid e.g. Oxalic acid (COOH)2. How to make standard Solutions Calculations are done to find the approximate weight of the primary standard chemical needed to make up the known volume of the standard solution. The primary standard is carefully weighed out on an electronic balance. The solid is then transferred into the rinsed volumetric flask. It is made sure that the solid is dissolved completely. A volume of the distilled water is added to the flask to make up the required volume.

The prepared solutions are then labeled for further usage. Primary standards in the wet analysis Different primary standards are used for the standardization of different substances. Standardization of silver nitrate Sodium chloride is used as the primary standard for this purpose. It has a relative molecular weight of 58.44 g/mol. To be exact, 1.4516 g of salt is weighed to form 0.1000 M solution in 250 ml of solution. Salt is added to the volumetric flask and dissolved in a few ml then diluted up to the 250 ml mark. This solution is employed for the standardization of silver nitrate solution. AgNO3 + NaCl → AgCl ↓ + NaNO3 Standardization of EDTA Zinc powder is used for standardizing EDTA. Zn2+ (aq) + EDTA4- (aq) → Zn(EDTA)2-(aq) Standardization of perchloric acid KPH (Potassium hydrogen phthalate) is used for standardizing the perchloric acid. KHPhthalate + KOH → K2Phthalate + H2O Calibration of instruments by primary standards Calibration of HPLC The standard used for the standardization of HPLC (High pressure liquid chromatography) is caffeine. 1,3,7-trimethylxanthine (caffeine) a central nervous stimulant is used in standardization processes due to its high purity and stability. Its solution in water is usually applied as a standard for HPLC and is run just like a sample.
High R2 values indicate the correct working of HPLC.

Calibration of ICP-AES The calibration of ICP-AES (Inductively coupled plasma atomic emission spectroscopy) also known as ICP-OES is done through osmium metal for the detection and analysis of osmium metal in pharmaceutical products.

This calibration enables ICP-AES to detect such metals, quantitatively measure the concentrations, and run trace level analysis. Concepts berg What is a primary standard in chemistry? The primary standard is a very pure reagent. It should be weighable with a compatible formula that should not change on unmasking to the atmosphere. It has a high molar mass. Primary standard Solutions are used to find the accurate calculations of acid-base titrations, redox titrations, precipitation titrations, and complexometric titrations. Examples of primary standards: Sodium carbonate (Na2CO3) Sodium oxalate (NaC2O4) Sodium tetraborate (Na2 B407) Potassium dichromate (K2Cr2O7) Potassium bromate (KBrO3) Potassium iodate (KIO3) Potassium hydrogen iodate (KH(IO3)2) etc. Why are primary standards used? Primary standards are used for the standardization of solutions because they have high purity, are cheap, hygroscopic, and nontoxic.
Generally, they are used in titrations like, Acid-base titration. Redox titrations. Precipitation titrations. Complexometric titrations.

How has this ambiguous use of the word "primary" developed? Primary means 'first'. It is although a general English word but it is frequently used in chemistry. The purpose of this use is either to locate the functional group-containing atoms in organic chains or to name a chemical used as the purest substance available to standardize any other reagent. What is the primary and secondary standard? The primary standard is a reagent with high purity, high molar mass, and hygroscopic characteristics.
Examples of primary standards are: Sodium carbonate (Na2CO3) Sodium tetraborate (Na2 B407) Potassium dichromate (K2Cr2O7) Potassium bromate (KBrO3) Potassium iodate (KIO3) Potassium hydrogen iodate (KH(IO3)2) etc A secondary standard is a chemical that is standardized against a primary standard, for finding the active agent. They are generally used in calibrating the analytical instrument and techniques.

Examples of secondary standards are: Is Na2CO3 a primary standard? Na2CO3 is used as a primary standard because its concentration in a solution remains constant during reaction or storage. What are standard solutions and their types? The standard is the material (solution), whose concentration is known. This can be taken as a reference for finding the unknown concentration of a substance. With the help of a standard, analytical instruments can be calibrated. What are the requirements of the primary standard? Standard requirements for the primary standards are: Cheap and readily available Nontoxic A high molecular weight High stability Low reactivity High purity Non-Hygroscopicity Is FeSO4 a primary standard? FeSO4 is not a primary standard as it is not stable. It has seven molecules of water of hydration and for being a primary standard, it should not be hygroscopic. Is EDTA a primary standard? EDTA is not a primary standard because it is hygroscopic. It does not fulfill the basic criteria of a good primary standard. A good primary standard is non-hygroscopic and very pure. EDTA catches water from the atmosphere, which affects its weight.
Why KMnO4 is not a primary standard?

KMnO4 is not a good primary standard because it is not present in its pure form. It is difficult to obtain KMnO4 from MnO2 because it deviates from its basic structure. The characteristic property of a primary standard is that it is always presented in a very pure form. Is HCl a primary standard? HCl is not a primary standard because it is in a gaseous state at room temperature. If it dissolved in water (~37%), still not a primary standard, due to the continuous evaporation at room temperature. A good primary standard is nonreactive toward the atmosphere. What are the properties of a primary standard solution? The properties of the primary standard are; Cheap and readily available Nontoxic High molecular weight Highly stable Low reactivity Highly pure Non-hygroscopic. What are some examples of primary standard solutions? Sodium carbonate (Na2CO3) Sodium oxalate (NaC2O4) Sodium tetraborate(Na2 B407) Potassium dichromate (K2Cr2O7) Potassium bromate (KBrO3) Potassium iodate (KIO3) Potassium hydrogen iodate (KH(IO3)2) Arsenic trioxide (As2O3) etc. Which one is the primary standard substance and why, KMnO4 or K2Cr2O7?

Potassium dichromate is a good primary standard as it dissolves in water and does not dissociate in sunlight. Whereas KMnO4 is not a good primary standard because it is not present in its pure form. It is difficult to obtain KMnO4 from MnO2. It dissociates in sunlight, that's why it acts as a secondary standard. Why is Na2CO3 used as a primary standard? Na2CO3 is used as the primary standard because its molarity does not change for a long period of time. A good primary standard does not change its strength over time. Why do we not take NaOH as the primary standard? NaOH is not a primary standard as it is hygroscopic. When NaOH is exposed to the atmosphere, it will take water from air moisture. It will affect the weight of NaOH. A good primary standard is nonhygroscopic and exists in pure form. What are examples of a secondary standard solution Hydrochloric Acid (HCl). Sulfuric Acid (H2SO4). Sodium Hydroxide (NaOH). Potassium Hydroxide (KOH). Potassium Permagnate (KMnO4). How to prepare a 0.1 M HCl solution in 100 ml? The percentage composition of HCl stock solution is approximately 37% and its density is 1.16 g/cm3. Calculating Molarity by percentage composition formula; Molarity = (Percentage purity x Density x 10) / Molar mass of compound Molarity = (37 x 1.16 x 10) / 36.5 Molarity of stock HCl = 11.75M Using dilution formula For stock M1V1 = For Solution M2V2 M1=11.75M V1=? M2=0.1M V2=100 V1=M2V2/M1 V1= 0.1 x 100 / 11.75 V1= 0.851ml So, 0.851 ml of stock HCl is required to prepare a 100ml diluted solution of HCl. Why is NaOH a secondary standard substance? Sodium hydroxide is a secondary standard because it is a hygroscopic material. When it is exposed to open air it captures water, which causes impurity in it.

But the primary standard is a very pure substance with accurate weight. Why is sodium carbonate used to standardize HCl? Sodium carbonate is used to standardize HCl because Na2CO3 is a primary standard with a relatively high molecular weight and is highly stable. Moreover, it is a base so it can be titrated against a specific volume of HCl. Why do we standardize NaOH? NaOH is a secondary standard. It is a hygroscopic reagent (water lover). When sodium hydroxide is exposed to the atmosphere, it interacts with water from the air. In the standardization of NaOH, we can find the exact amount of sodium hydroxide (NaOH) in the solution.

What is the right quality of water for HPLC analysis? HPLC analysis requires ultrapure water for the composition determination of reagents, buffers, mobile phases, and for any sample pre-treatments. Ultra analytic delivers type 1 ultrapure water with, typically, a resistivity of 18.2 MΩ.cm, a very low total organic carbon (TOC) value of less than 2 ppb, and bacteria levels below 0.1 CFU/ml, which is highly recommended. References A primary standard is a highly pure and stable chemical reagent used to prepare standard solutions, usually for titration and making secondary standards and dilutions.In chemistry, a primary standard is a reagent that is very pure, stable, not hygroscopic, and has a high molecular weight. Ideally, it's also non-toxic, inexpensive, and readily available. A primary standard provides a reference to find unknown concentrations in titrations and is used to prepare secondary standards and working solutions.The ideal primary standard meets all of the following criteria.

However, the most important properties are high purity and high stability. Reagent grade chemicals should be used to prepare primary standard solutions.High purityHigh stability/low reactivityHigh equivalent weight (to reduce mass measurement error)Not hygroscopic (to reduce mass changes from water absorption)Non-toxic or low toxicityInexpensiveReadily availableChemicals react according to mole ratios. A titration determines the concentration of an unknown solution based on volume of a solution with known concentration needed to react with the quantity of unknown concentration. But, the accuracy of the calculation relies on truly knowing the concentration of one solution.So, for example, sodium hydroxide (NaOH) reacts in a 1:1 ratio with hydrochloric acid (HCl). But, sodium hydroxide is not a primary standard because it's typically impure. Sodium hydroxide is highly hygroscopic and absorbs carbon dioxide from air, so if you weigh out a sample, some of that mass is actually water and carbon dioxide. That throws off any calculation involving the mole ratio because you really have less sodium hydroxide in the solution than you think. Meanwhile, sodium carbonate (Na2CO3) is a good primary standard for a reaction with hydrochloric acid because it's available at high purity, has a higher molecular weight than sodium hydroxide, and isn't as hygroscopic.Using a primary standard offers a high degree of confidence in the concentration of the unknown solution. Because this solution has been standardized against the primary standard, it can be used as a secondary standard. The degree of confidence in the concentration is slightly lower because of error in the process (for example, overshooting the mark for a titration). But, for some chemicals, this type of standardization is the best way to get reliable concentration value.Primary standards are used to make dilutions for working solutions for exactly the same reason. Because the concentration of the primary standard is known with a high degree of confidence, the concentration of solutions made from it is also known with a high degree of accuracy.There are many primary standards. They are not one-size-fits-all. For example, sodium carbonate is good for standardizing hydrochloric and sulfuric acid, but not acetic acid. So, which primary standard you use depends on the chemical you're reacting it with. Here is a list of some common primary standards:Sodium chloride (NaCl): for silver nitrate (AgNO3) reactionsSodium carbonate (Na2CO3, mol wt. = 105.99 g/mol): for titrating acidsPotassium hydrogen phthalate or KHP (C8H5KO4, mol wt. = 204.23 g/mol): for titrating bases or perchloric acid and an aqueous base in an acetic acid solutionPotassium hydrogen iodate [KH(IO3)2, mol wt. = 389.92 g/mol]: for titrating basesPotassium dichromate (K2Cr2O7, mol wt. = 294.19 g/mol): for redox reactionsTris(hydroxymethyl)aminomethane (TRIS or THAM) [(HOCH2)3CNH2, mol wt. = 121.14 g/mol]: for titrating acidsZinc powder (after dissolving it in hydrochloric acid or sulfuric acid): to standardize EDTA (ethylenediaminetetraacetic acid) solutionsA secondary standard is a reagent that has been standardized against a primary standard. Its stable enough that its concentration remains known for a long time. Sodium hydroxide (NaOH) is a common secondary standard.Hemenway, M. K. (2002) Holt Science & Technology: Physical Science (1st ed.). Holt, Rinehart and Winston. ISBN 78-0030519574Skoog, Douglas A., West, Donald M.;Holler, F. James (1995). Fundamentals of Analytical Chemistry (8th ed.). Harcourt Brace College Publishers. ISBN 0-03-035523-0Related Posts