Measurement:	Measurement is the collection of quantitative data. Measurement involves comparison of the quantity of interest with a standard called a unit. The comparison is never perfect.	As a result, measurements always include error. 25.7 ±.5 cm
absolute error. absolute uncertainty. Compare with relative error.	The uncertainty in a measurement, expressed with appropriate units. Absolute error is also used to express inaccuracies; Note that when absolute errors are associated with indeterminate errors, they are preceded with "±"; when they are associated with determinate errors, they are preceded by their sign.	For example, if three replicate weights for an object are 1.00 g, 1.05 g, and 0.95 g, the absolute error can be expressed as ± 0.05 g. if the "true value" is 1.11 g and the measured value is 1.00 g, the absolute error could be written as 1.00 g - 1.11 g = -0.11 g.
absolute temperature.	Temperature measured on the Kelvin scale that sets absolute zero as zero	
absolute zero	This is the point where no more heat can be removed from a system, according to the absolute or thermodynamic temperature scale. In classical kinetic theory, there should be no movement of individual molecules at absolute zero, but experimental evidences shows this isn't the case.	Absolute zero is zero on the Kelvin scale, -273.15°C on the Celsius scale, and -459.67°F on the Fahrenheit scale.
ampere.	The SI unit of electric current = to flow of 1 coulomb of charge per second. An ampere is the amount of current necessary to produce a force of 0.2 micronewtons per meter between two arbitrarily long, arbitrarily thin wires, placed parallel in a vacuum and exactly 1 m apart. Named for 19th century physicist André Marie Ampère.	1 A = 1 C/s
Angstrom.	A non-SI unit of length used to express wavelengths of light, bond lengths, and molecular sizes	1 Å = 10^{-10} m = 10^{-8} cm.
atto-	Prefix used in the SI system meaning "multiply by 10^{-18} "	3 am = 3× 10^{-18} meters.
base unit.	Base units are units that are fundamental building blocks in a system of measurement. There are seven base units in the SI system.	meter, kilogram, second, ampere, kelvin, mole, candela
Celsius. (°C) temperature scale;	A common but non-SI unit of temperature.	0°C is the freezing point of water 100°C is the boiling points of water,
Centi-	Prefix used in the SI system meaning "one hundredth of".	1 cm means "one hundredth of a meter"; 2.3 cg could also be written "2.3 × 10^{-2} g" or "0.023 g".
cgs	An older metric system of units that uses centimeters, grams, and seconds as base units.	
conversion factor	A conversion factor is a fraction that relates one unit to another. Multiplying a measurement by a conversion factor changes the units but not the value 1 in=2.54 cm	convert 10 inches to centimeters $\frac{2.54\ \text{cm}}{1\ \text{in}}$ $*\frac{10\ \text{in}}{1} = 25.4\ \text{cm}$
coulomb	The SI unit of electric charge, equal to the amount of charge delivered by a current of 1 ampere running for 1 second. One mole of electrons has a charge of about 96487 C.	One electron carries a charge of -1.6 x 10^{-19} coulombs.
density. (ℙ,d) Compare with specific gravity.	Mass of a substance per unit volume	"the density of mercury is 13.55 g/cm^3 " is the same as saying "the mass of exactly 1 cm^3 of mercury is 13.55 g".
derived unit	Derived units are units constructed from the SI system's base units.	the SI unit for density is kg/m^3, derived from the base units kg and m.

dyne	The unit of force in the obsolete cgs system of unit the force required to accelerate a 1 g mass by 1 cm/s per second.	$\frac{1\ g\ cm}{s^2}$= 0.00001 newton.
femto- (f)	Prefix used in the SI system meaning "multiply by 10^{-15}	For example 22 fg means 22×10^{-15} g.
gram	A metric unit of mass, equal to 1/1000 of a kilogram. Kilograms are the base SI units for mass, not grams.	1000 g = 1 kg
gross error. Compare with systematic error, random error and mistake.	Gross errors are undetected mistakes that cause a measurement to be very much farther from the mean measurement than other measurements.	
hydrometer	An instrument that measures the specific gravity of liquids. A hydrometer is a weight with a vertical scale attached. When placed into a liquid, the hydrometer bobs upright, and sinks to a certain level.	The specific gravity or solution composition can be read from the liquid level on the vertical scale. Hydrometers are often calibrated in degrees Baumé.
kelvin (K) capital	The SI base unit of temperature, defined by assigning 273.16 K to the temperature at which steam, ice, and water are at equilibrium (called the triple point of water).	The absolute freezing point of water is 0° K or -273 ° C or −459.67° F
kilo- (k) small case	Prefix used in the SI system meaning "one thousand of "	1 km = "one thousand meters"; 2.8 kg =2.8×10^3 g = 2800 g.
limit of quantitation. (LOD) quantitative detection limit; limit of determination.	The smallest detectable concentration an analytical instrument can determine at a given confidence level	IUPAC defines the quantitative detection limit as C_{ld} = ks/m, where k is 10, s is the standard deviation of instrument readings taken on a "blank" (a solution with zero concentration of analyte), and m is the slope of a plot of instrument response vs. concentration, as calculated by linear regression.
mass. (m) Compare with weight	Mass is a measure of the tendency of an object to resist acceleration. It's harder to roll a tractor trailer than a roller skate; the tractor trailer has a far greater mass.	mass times gravity equals weight
mega- (M) mega.	SI prefix meaning multiply by 10^6 , million	For example, 3.2 MJ is 3200000 J.
meter (m)	The meter is the basic unit of length in the SI system of units, defined as the distance light travels through a vacuum in exactly 1/299792458 seconds	1 m = 39.37 inches. Meters are abbreviated as "m" in measurements.
micro- (μ) micro.	Prefix used in the SI system meaning "one millionth of	For example 1 μm means "one millionth of a meter"; 3.1 μL means "3.1×10^{-6} L".
milli- (m)	Prefix in the SI system meaning "one thousandth of".	1 mL means one thousandth of a liter
nano-. (n)	Prefix used in the SI system meaning "multiply by 10^{-9}	1 nm means "0.000000001 m"; 2.8 ng also written as 2.8×10^{-9} g
pico-. (p)	Prefix used in the SI system meaning "multiply by 10^{-12}	3 pm means 3×10^{-12} meters.
power	The rate at which energy is supplied	Power has [SI] units of Joules/second, sometimes called "Watts" (W).
precision reproducibility. Compare with accuracy.	Precision is reproducibility.	"These measurements are precise" is the same as, "The same measurement was repeated several times, and the measurements were all very close to one another". Don't confuse precision with accuracy

random error. indeterminate error. Compare with systematic error, gross error and	Random errors are errors that affect the precision of a set of measurements.	Random error scatters measurements above and below the mean, with small random errors being more likely than large ones.
relative error. relative uncertainty. Compare with absolute error.	The uncertainty in a measurement compared to the size of the measurement	if three replicate weights for an object are 2.00 g, 2.05 g, and 1.95 g, the absolute error can be expressed as ± 0.05 g and the relative error is ± 0.05 g / 2.00 g = 0.025 = 2.5%.
relative standard deviation. (RSD) Compare with standard deviation.	The relative standard deviation is a measure of precision.	divide the standard deviation for a series of measurements by the average measurement and multiply by 100
second (s)	The second (s) is the base unit of time in the SI system of units, defined as the duration of 9,192,631,770 cycles of the radiation associated with a certain color of light emitted by the cesium atom.	5'35" is five minutes, thirty-five seconds. There are 60 seconds in one minute.
significant figure. significant digit; significant.	Measurements are rounded so contain only the digits up to and including the first uncertain digit, when the number is written in scientific notation.	2.59134 ~2.59 has 3 significant figures and "9" is the uncertain digit which could have been rounded from 2.586
SI. Systeme Internationale; International System.	Le Systéme Internationale (SI) is a system of units introduced to remove barriers to international trade, based on the older metric system	cgs, centimeter, gram, second; and mks or meter, kilogram, second
specific gravity. specific gravities. Compare with density.	The mass of a unit volume of a substance relative to the mass of a unit volume of water. Temperature must be specified when reporting specific gravities, since the density of the substance and of water change with temperature.	Specific gravities are often reported relative to water at 4°C; at that temperature, water has a density of 1.00000 g/mL and the specific gravity of a substance is equal to its density in g/mL.
specific volume. Compare with density.	The volume of a unit mass of substance Specific volume is the reciprocal of density.	the specific volume of water at 4°C is 1.00000 mL/g.
standard deviation. (s,BESD,σ) $s = \sqrt{\frac{\sum(x_i-\bar{x})^2}{N-1}}$	A statistical measure of precision. Work out the Mean (the simple average of the numbers) Then for each number: subtract the Mean and square the result - the *squared difference*). Then average the squared differences.	the **square root** of the **Variance (distance from the average value)** **web example**
$s = \sqrt{\frac{\sum(x_i-\bar{x})^2}{N-1}}$	x_i is the measurement from the i-th run, x-bar is the mean of all the measurements, and *N*=number of measurements. For very large data sets, the s is the root-mean-square deviation from the true mean, and is usually written as σto distinguish it from the best estimate standard deviation *s* used for small data sets.	
systematic error; determinate error. Compare with random error, gross error and mistake.	Systematic errors have an identifiable cause and affect the accuracy of results.	
trueness. Compare with accuracy.	Trueness is the closeness of an average measurement to a "true" value, while accuracy is the closeness of a single measurement to the true value.	
unit	A standard for comparison in measurements	the meter is a standard length which may be compared to any object to describe its length.

weight. (W)=mg Compare with mass.	Weight is the force exerted by an object in a gravitational field. The weight of an object (W) arises from its mass (m):	m = 200 kg; weight = mg or 200 kg (9.8 m/s^2) 1960 kg m/s^2= 1060 N is the weight

Matter

absorption. absorb; absorbent. Compare with adsorption and sorption.	**1.** Penetration of molecules into the bulk of a solid or liquid, forming either a solution or compound. An absorbent captures another material and distributes it throughout; an adsorbent captures another material and distributes it on its surface only.	It can be a chemical process (a strong solution of NaOH absorbs CO_2 from the air) or a physical process (palladium absorbs hydrogen gas). **2.** Capture and transformation of energy by a substance; for example, copper looks reddish because it absorbs blue light.
adsorbent. Compare with absorbent.	A substance that collects molecules of another substance on its surface	water filters of activated charcoal granules are an adsorbent that adsorb gases that make water taste bad.
aeration. aerate.	Preparation of a saturated solution of air gases by either spraying the solution in air or by bubbling air through it.	
aerosol. Compare with colloid	A colloid in which solid particles or liquid droplets are suspended in a gas.	Smoke is an example of a solid aerosol; fog is an example of a liquid aerosol.
alkali metal. (alkaline earth metal) alkali metal element	The Group 1 elements react with cold water for form strongly alkaline hydroxide solutions, and are referred to as "alkali metals". Hydrogen is *not* considered an alkali metal, despite its position on some periodic tables.	lithium (Li), sodium (Na), potassium (K), rubidium (Rb), cesium (Cs), and francium (Fr)
alkaline earth	An oxide of an alkaline earth metal, which produces an alkaline solution in reaction with water.	Calcium rather reactive. $2Ca(s) + O_2(g) \rightarrow 2CaO(s)$
alkaline earth metal. (alkali metal)	The Group 2 elements,	beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba), and radium (Ra)
allotrope. allotropy; allotropic; allotropism. Compare with isotope and polymorph.	Some elements occur in several distinct forms called allotropes. Allotropes have different chemical and physical properties	For example, graphite and diamond are allotropes of carbon.
alloy	A mixture containing mostly metals	brass is an alloy of copper and zinc. Steel contains iron and other metals, but also carbon.
amalgam.	An alloy that contains mercury.	
atom. Compare with molecule and ion	the smallest particle of an element that retains the chemical properties of the element. Atoms are electrically neutral, with a positively charged nucleus that binds one or more electrons in motion around it.	A hydrogen "atom" is one proton and one electron. A molecule of hydrogen gas istwo atoms of hydrogen, H2
boiling	Conversion of liquid intogas. Boiling begins at the temperature where the vapor pressure of a liquid is equal to the external pressure on the liquid.	bubbles of gas form within the liquid
boiling point (bp)	The temperature at which the vapor pressure of a liquid is equal to the external pressure on the liquid. The standard boiling point is the temperature at which the vapor pressure of a liquid equals standard pressure.	Boiling point of water is 100 degrees Celsius at which temp it becomes water vapor
chemical change	A chemical change is a dissociation, recombination, or rearrangement of atoms.	
chemical property chemical	Measurement of a chemical property involves a chemical	Determining the flammability of gasoline involves

properties. Compare with physical property.	change.	burning it, producing carbon dioxide and water.
chromatography.	A method for separating mixtures based on differences in the speed at which they migrate over or through a stationary phase.	
colloid	A heterogeneous mixture composed of tiny particles suspended in another material. The particles are larger than molecules but less than 1 μm in diameter. Particles this small do not settle out and pass right through filter paper	Milk is a colloid. The particles can be solid, tiny droplets of liquid, or tiny bubbles of gas; the suspending medium can be a solid, liquid, or gas (although gas-gas colloids aren't possible).
compound Compare with element and mixture.	A compound is a material formed from elements chemically combined in definite proportions by mass.	water is formed from chemically bound hydrogen and oxygen. Any pure water sample contains 2 g of hydrogen for every 16 g of oxygen.
concentration. Compare with dilution.	**1.** the amount of substance present in a unit amount of mixture. The amounts expressed as moles, masses, or volumes. **2.** The process of increasing the amount of substance in a given amount of mixture.	1 g NaCl in 18 g H_2O (by mass)
condensation	**1.** The conversion of a gas into a liquid is called condensation. Condensation usually occurs when a gas is cooled below its boiling point. **2.** A reaction that involves linking of two molecules with the elimination of water (or another small molecule).	Water vapor to water
congener	**1.** Elements belonging to the same group on the periodic table. **2.** Compounds produced by identical synthesis reactions and procedures.	For example, sodium and potassium are congeners.
crystallization. fractional crystallization; crystallisation.	The process of forming pure crystals by freezing a liquid, evaporating a solution, or precipitating a solid from solution. Impurities remain in the liquid, so crystallization is often to purify solid substances.	ice, salt, alum are examples of solids becoming solid through crystallization
dialysis	Dialysis is the separation of components in a mixture by passing them across a semipermeable membrane.	
diffusion. diffuse. Compare with effusion.	The mixing of two substances caused by random molecular motions. Gases diffuse very quickly; liquids diffuse much more slowly, and solids diffuse at very slow (but often measurable) rates. Molecular collisions make diffusion slower in liquids and solids.	
dilution	Adding solvent to a solution to lower the concentration of the solute.	
distillation.	A technique for separating components of a mixture on the basis of differing boiling points. The mixture is heated, vaporizing some of the components. The vapor is collected and condensed to isolate the components with the lowest boiling points.	Separate Hydrogen from water by evaporating hydrogen and then condensing it elsewhere.
ductile; Compare with malleable.	Capable of being drawn into wire.	Metals are typically ductile materials.

electrolysis	The process of driving a redox reaction in the reverse direction by passage of an electric current through the reaction mixture.	An electric current is passed between a sample of the impure metal and a cathode when both are immersed in a solution that contains cations of the metal. Metal is stripped off the impure sample and deposited in pure form on the cathode.
element Compare with compound	An element is a substance composed of atoms with identical atomic number. The older definition of element (*an element is a pure substance that can't be decomposed chemically*) was made obsolete by the discovery of isotopes	
emulsion. Compare with colloid.	A colloid formed from tiny liquid droplets suspended in another, immiscible liquid	Milk is an example of an emulsion.
evaporation, vaporization.	Conversion of a liquid into a gas.	
extensive property. extensive; extensive properties. Compare with intensive property.	A property that changes when the amount of matter in a sample changes.	Examples are mass, volume, length, and charge.
extraction.	A technique for separating components in a mixture that have different solubilities	For example, caffeine can be separated from coffee beans by washing the beans with supercritical fluid carbon dioxide; the caffeine dissolves in the carbon dioxide but flavor compounds do not. Vanillin can be extracted from vanilla beans by shaking the beans with an organic solvent, like ethanol.
foam. Compare with colloid.	A colloid in which bubbles of gas are suspended in a solid or liquid.	Aerogel (solid smoke) and Styrofoam are examples of solid foams; whipped cream is an example of a liquid foam.
fractional distillation. Compare with distillation.	A technique for separation of liquid mixtures by distillation that uses a tower attached to a flask containing the mixture to perform multiple distillations.	Vapor moving up the column condenses on packing material inside the column, trickles down the column, and again vaporizes. The more volatile component can then be drawn off at the top of the component, while the less volatile component remains at the bottom.
gas. gases; vapor.	Matter in a form that has low density, is easily compressible and expandable, and expands spontaneously when placed in a larger container. Molecules in a gas move freely and are relatively far apart. "Vapor" often refers to a gas made of a substance that is usually encountered as a liquid or solid	for example, gaseous H_2O is called "water vapor".
gel. Compare with colloid.	A gel is a sol in which the solid particles fuse or entangle to produce a rigid or semirigid mixture.	For example, gelatin dissolved in water produces a sol of protein molecules. When the gelatin is cooked, the protein chains entangle and crosslink, forming a gel which is a mesh of solid protein with trapped pockets of liquid inside. Fruit jellies are also gels
group	**1.** A substructure that imparts characteristic chemical behaviors to a molecule, **2.** A vertical column on the periodic table. Elements that belong to the same group usually show chemical similarities, although the element at the top of the group is usually atypical.	**1.** for example, a carboxylic acid group. (also: functional group). 2. for example, the halogens.
heterogeneous mixture. heterogeneous. Compare with homogeneous mixture, and compound.	A sample of matter consisting of more than one pure substance and more than one phase	Blood, protoplasm, milk, chocolate, smoke, and chicken soup are examples of heterogeneous mixtures.

high performance liquid chromatography. HPLC.	An efficient form of column chromatography that pumps a liquid solution of the sample at very high pressure through a column packed with a stationary phase made of very tiny particles. The high pressure pumps required make HPLC an expensive technique.	
homogeneous mixture. solution. Compare with heterogeneous mixture, element and compound.	A sample of matter consisting of more than one pure substance with properties that do not vary within the sample.	air
intensive property. intensive; intensive properties. Compare with extensive property.	A property that does not change when the amount of sample changes	density, pressure, temperature, color.
ion exchange. ion exchange resin; ion exchanger.	Ion exchange is a method of separating ions from a solution by reversibly binding them onto a resin that has charged sites on its surface.	Ion exchangers are used to remove metal ions from drinking water.
kinetic energy. Compare with potential energy.	The energy an object possesses by virtue of its motion	An object of mass *m* moving at velocity *v* has a kinetic energy of $\frac{1}{2}mv^2$.
lanthanide. Compare with actinide and inner transition metals.	Elements 57-70 are called lanthanides. Electrons added during the Aufbau construction of lanthanide atoms go into the *4f* subshell.	
law of conservation of mass.	There is no change in total mass during a chemical change.	
law of definite proportions.	When two pure substances react to form a compound, they do so in a definite proportion by mass	when water is formed from the reaction between hydrogen and oxygen, the 'definite proportion' is 2 g of H for every 8 g of O.
law of multiple proportions.	When one element can combine with another to form more than one compound, the mass ratios of the elements in the compounds are simple whole-number ratios of each other	in CO and in CO_2, the oxygen-to-carbon ratios are 16:12 and 32:12. - that the second ratio is twice the first, because there are exactly twice as many oxygens in CO_2 per carbon as there are in CO.
liquid.	A state of matter that has a high density and is incompressible compared to a gas. Liquids take the shape of their container but do not expand to fill the container as gases do. Liquids diffuse much more slowly than gases.	alcohol, water, vinegar
malleable. malleability. Compare with ductile.	Capable of being hammered into sheets.	Metals are typically malleable materials.
mass. (m) Compare with weight.	Mass is a measure of the tendency of an object to resist acceleration	It's harder to roll a tractor trailer than a roller skate; the tractor trailer has a far greater mass
matter	Matter is anything that has mass	Air, water, coffee, fire, human beings, and stars are matter. Light, X-rays, photons, gravitons, information, and love aren't matter.
metal. metallic. Compare with nonmetal and metalloid.	A metal is a substance that conducts heat and electricity, is shiny and reflects many colors of light, and can be hammered into sheets or drawn into wire. Metal atoms lose electrons easily to become cations.	About 80% of the known chemical elements are metals. Ex: copper, iron
molecule. Compare with atom and ion.	The smallest particle of an element or compound that retains the chemical properties of the element or compound. A	chemically bound atoms with characteristic composition and structure: Cu, H_2 O
nonparticulate.	Not composed of distinct particles.	pure gas

nonmetal	A nonmetal is a substance that conducts heat and electricity poorly, is brittle or waxy or gaseous, and cannot be hammered into sheets or drawn into wire. Nonmetals gain electrons easily to form anions	About 20% of the known chemical elements are nonmetals.
nonpolar.	Having a relatively even or symmetrical distribution of charge.	
nonpolar molecule.	A molecule in which the center of positive charge and the center of negative charge coincide.	Examples are CCl_4 and CO_2; counterexamples are $CHCl_3$ and H_2O.
particulate.	Composed of distinct particles.	Smoke is particulate; pure gases are not.
periodic table.	An arrangement of the elements according to increasing atomic number that shows relationships between element properties.	
period	Rows in the periodic table are called periods. All elements currently known fall in the first seven periods.	For example, all of the elements in the second row are referred to as 'second period elements'.
phase. in phase; out of phase; wave phase.	**1.**A phase is a part of a sample of matter that is in contact with other parts but is separate from them. Properties within a phase are homogeneous (uniform	1. oil and vinegar salad dressing contains two phases: an oil-rich liquid, and a vinegar-rich liquid. Shaking the bottle breaks the phases up into tiny droplets, but there are still two distinct phases.
phase boundary.	A phase boundary is a surface where two samples of matter with different properties are in contact	The surface of a gas bubble in water or the surface of a crystal are examples of phase boundaries.
physical change. Compare with chemical change.	A change which does not transform one substance into another.	freezing water is a physical change because both water and ice are H_2O. However, electrolysis of water would not be a physical change because passing a strong electric current through water can decompose it into H_2 and O_2.
physical property. physical properties. Compare with chemical property.	Measurement of a physical property may change the arrangement but not the structure of the molecules of a material.	density, color, boiling point, volume, temperature, and mass
polymorph. polymorphism; polymorphic. Compare with isotope and allotrope.	Solid substances that occur in several distinct forms. Polymorphs have different chemical and physical properties. allotropes are polymorphs of elements.	Boron is a metalloid, intermediate between metals and non-metals. It exists in many polymorphs (different crystal lattice structures), some more metallic than others.
potential energy. Compare with kinetic energy.	energy an object possesses by virtue of its position.	A roller coaster car at rest at the top has all potential energy and no kinetic.
precipitate. (↓) ppt.	An insoluble substance that has been formed from substances dissolved in a solution.	For example, mixing silver nitrate and sodium chloride solutions produces a precipitate, insoluble silver chloride (along with soluble sodium nitrate.
precipitation.	Precipitation is the conversion of a dissolved substance into insoluble form by chemical or physical means.	
pure substance. substance.	A sample of matter that cannot be separated into simpler components without chemical change. Physical changes can alter the state of matter but not the chemical identity of a pure substance. Pure substances have fixed, characteristic elemental compositions and properties.	Cu is copper in pure form
qualitative analysis. Compare with quantitative analysis.	A chemical analysis that detects the presence of a substance in a sample.	

quantitative analysis. Compare with qualitative analysis.	A chemical analysis that determines the concentration of a substance in a sample.	
sedimentation.	Separation of a dense material (usually a solid) from a less dense material (usually a liquid) by allowing the denser material to settle out of the mixture.	River deltas are formed from sedimentation, after a flooding, or spring thaws move soil from mountains.
semipermeable membrane.	A membrane that allows some but not all of the components in a mixture to pass through it. Semipermeable membranes are used in dialysis.	
sol	A colloid with solid particles suspended in a liquid.	Examples are protoplasm, starch in water, and gels.
solid	A solid is a relatively dense, rigid state of matter, with a definite volume and shape. Molecules in solids are often packed close together in regularly repeating patterns, and vibrate around fixed positions.	
soluble. Compare with insoluble.	Capable of being dissolved in a solvent (usually water).	
soluble salt.	An ionic compound that dissolves in a solvent (usually water).	$NaCl + H_2O$
solution. homogeneous mixture. Compare with heterogeneous mixture.	A sample of matter consisting of more than one pure substance with properties that do not vary within the sample. Also called a homogeneous mixture.	
solvent.	The most abundant component in a solution.	
solvent extraction	A method for separating mixtures by exploiting differences in the solubilities of the components. The sample is shaken or mixed with solvent (or with two immiscible solvents) to effect the separation. The "like dissolves like" is a useful guide for selecting solvents to use in the extraction. Nonpolar substances are usually successfully extracted into nonpolar solvents like hexane or methylene chloride	For example, a coffee machine extracts the soluble components of ground coffee with water, and leaves the insoluble components behind. Polar and ionic substances are often extracted with water.
state of matter.	There are three common states of matter which differ in the way the molecules are arranged at the molecular level, but not in the structure of the molecules themselves.	gases, liquids, and solids
stationary phase.	A stationary phase is a substance that shows different affinities for different components in a sample mixture in a separation of the mixture by chromatography. The mobile phase (a solution containing the sample) flows over or through the stationary phase to effect the separation.	
stoichiometry.	**1.** Ratios of atoms in a compound or of moles of compounds in a reaction. **2.** A branch of chemistry that quantitatively relates amounts of elements and compounds involved in chemical reactions, based on the law of conservation of mass and the law of definite proportions.	
stripping	Stripping is a technique for removing volatile components in a mixture by bubbling a stream of an chemically unreactive gas (like nitrogen) through the sample, and then 'scrubbing' the nitrogen through a solution or solid adsorbent that can recover the volatile materials.	
sublimation; sublimating.	Conversion of a solid to a gas, without first melting to a liquid.	Ice cube evaporating without becoming liquid water

thin layer chromatography. (TLC) Compare with chromatography.	A technique for separating components in a mixture on the basis of their differing polarities. A spot of sample is placed on a flat sheet coated with silica and then carried along by a solvent that soaks the sheet. Different components will move different distances over the surface.	TLC is a useful screening technique in clinical chemistry; for example, it can be used to detect the presence of drugs in urine.
transition metal. transition element; outer transition element.	An element with an incomplete *d* subshell. Elements which have common cations with incomplete *d* subshells are also considered transition metals. Elements with incomplete *f* subshells are sometimes called "inner transition elements".	Group B, Periods 4-7; 3-12 Groups

Atoms, elements, and ions

allobar.	A form of an element that has isotopic abundances that are different from the naturally occuring form	For example, "depleted" uranium has had most of the uranium-235 removed, and is an allobar of natural uranium.
allotrope. allotropy; allotropic; allotropism. Compare with isotope and polymorph.	Some elements occur in several distinct forms called allotropes. Allotropes have different chemical and physical properties.	For example, graphite and diamond are allotropes of carbon.
alpha particle. Helium nuclei ($^4_2$He)	A particle that is commonly ejected from radioactive nuclei, consisting of two protons and two neutrons	have a mass of 6.644 655 98 × 10^{-27} kg or 4.001 506 1747 atomic mass units
alpha ray. (α-ray) alpha radiation.	A stream of alpha particles. Alpha rays rapidly dissipate their energy as they pass through materials, and are far less penetrating than beta particles and gamma rays.	
anion. Compare with cation.	An anion is a negatively charged ion.	Nonmetals typically form anions.
anode. Compare with cathode.	The electrode at which oxidation occurs in a cell. Anions migrate to the anode.	
atomic mass unit. (amu,u) amu;	A unit of mass equal to 1/12 the mass of a carbon-12 nucleus, which is 1.660 538 73 × 10^{-27} kg ± 0.000 000 13 × 10^{-27} kg Abbreviated as *amu* or	
atomic nucleus. nucleus; nuclei; atomic nuclei.	A tiny, incredibly dense positively charged mass at the heart of the atom. The nucleus is composed of protons and neutrons (and other particles). It contains almost all of the mass of the atom but occupies only a tiny fraction of the atom's volume.	
atomic number. (Z)	The number of protons in an atomic nucleus. The atomic number and the element symbol are two alternate ways to label an element.	In nuclide symbols, the atomic number is a leading subscript; $^{12}_6$C, the "6" is the atomic number.
atomic theory.	An explanation of chemical properties and processes that assumes that tiny particles called atoms are the ultimate building blocks of matter.	
atomic weight. atomic mass.	The average mass of an atom of an element, usually expressed in atomic mass units. The terms mass and weight are used interchangeably in this case. The atomic weight given on the periodic table is a weighted average of isotopic masses found in a typical terrestrial sample of the element.	

atom. Compare with molecule and ion.	An atom is the smallest particle of an element that retains the chemical properties of the element. Atoms are electrically neutral, with a positively charged nucleus that binds one or more electrons in motion around it.	
beta particle. (β^-)	An electron emitted by an unstable nucleus, when a neutron decays into a proton and an electron. Note that beta particles are created in nuclear decay; they do not exist as independent particles within the nucleus.	In some cases, beta radiation consists of positrons ("antielectrons" which are identical to electrons but carry a +1 charge.")
Brownian motion. Brownian movement.	Small particles suspended in liquid move spontaneously in a random fashion. The motion is caused by unbalanced impacts of molecules on the particle.	Brownian motion provided strong circumstantial evidence for the existence of molecules.
cathode ray	A negatively charged beam that emanates from the cathode of a discharge tube. Cathode rays are streams of electrons.	
cathode. Compare with anode.	The electrode at which reduction occurs. Electrons are gained at the cathode pole	LEO (lose electrons; oxidation) GER (Gain electrons; reduction)
cation. Compare with anion.	A cation is a positively charged ion	Metals typically form cations; Cu^+
compound Compare with element and mixture.	A compound is a material formed from elements chemically combined in definite proportions by mass.	For example, water is formed from chemically bound hydrogen and oxygen. Any pure water sample contains 1 g of hydrogen for every 8 g of oxygen.
deuterium. (D, ^2H)	An isotope of hydrogen that contains one neutron and one proton in its nucleus.	
electric charge	A property used to explain attractions and repulsions between certain objects. Two types of charge are possible: negative and positive. Objects with different charge attract; objects with the same charge repel each other.	
electron. (e^-) Compare with proton and neutron.	A fundamental consituent of matter, having a negative charge of 1.602×10^{-19} coulombs and a mass of 9.109×10^{-31} kg	
heavy water. (D_2O)	Water that contains ^2H (added neutron), rather than ^1H	Heavy water is about 11% denser than ordinary water.
ion	An atom or molecule that has acquired a charge by either gaining or losing electrons. An atom or molecule with missing electrons has a net positive charge and is called a cation; one with extra electrons has a net negative charge and is called an anion.	
isotope. isotopic; isotopy. Compare with isomer, allotrope, isobar	Atoms or ions of an element with different numbers of neutrons in their atomic nucleus. Isotopes have the same atomic number but different mass number. Isotopes have very similar chemical properties but sometimes differ greatly in nuclear stability.	
isotopic mass. isotopic masses.	The mass of a single atom of a given isotope, usually given in daltons.	

IUPAC; International Union of Pure and Applied Chemistry	an organization which sets international standards for chemical nomenclature, atomic weights, and the names of newly discovered elements.	
mass number. (M,A) Compare with atomic number and atomic weight.	The total number of protons and neutrons in an atom or ion. In nuclide symbols the mass number is given as a leading superscript.	In isotope names (e. g. carbon-14, sodium-23) the mass number is the number following the element name.
mass spectrometer.	An instrument that measures the masses and relative abundances of a sample that has been vaporized and ionized.	
metal. metallic. Compare with nonmetal and metalloid.	A metal is a substance that conducts heat and electricity, is shiny and reflects many colors of light, and can be hammered into sheets or drawn into wire. Metals lose electrons easily to form cations. About 80% of the known chemical elements are metals.	
natural abundance. Compare with isotopic abundance.	The average fraction of atoms of a given isotope of an element on Earth.	
neutral.	**1.** having no net electrical charge. Atoms are electrically neutral; ions are not. **2.** A solution containing equal concentrations of H^+ and OH^-.	
neutron. (n, $^1_0$n) Compare with proton and electron.	An elementary particle found the atomic nucleus of all stable atoms except the hydrogen-1 atom. Neutrons have no charge and have a mass of 1.008665 daltons.	
nonmetal. (metal,metalloid) non-metal.	A nonmetal is a substance that conducts heat and electricity poorly, is brittle or waxy or gaseous, and cannot be hammered into sheets or drawn into wire. Nonmetals gain electrons easily to form anions. About 20% of the known chemical elements are nonmetals.	
nucleon. Compare with atomic nucleus.	Nucleus particle	A proton or a neutron in the atomic nucleus.
nuclide symbol. Compare with atomic nucleus, nuclide and element symbol.	A symbol for an nuclide that contains the mass number as a leading superscript and the atomic number as a leading subscript. For ions, the ionic charge is given as a trailing superscript	For example, the nuclide symbol for the most common form of the chloride ion is $^{35}_{17}Cl^-$, where 35 is the mass number, 17 is the atomic number, and the charge on the ion is -1. The atomic number is sometimes omitted from nuclide symbols.
nuclide	An atom or ion with a specified mass number and atomic number	uranium-235 and carbon-14: ($^{14}C_6$)
proton. (p^+) Compare with electron and neutron.	An elementary particle found the atomic nucleus with a positive charge equal and opposite that of the electron. Protons have a mass of 1.007276 daltons.	
radioactivity.	Spontaneous emission of particles or high-energy electromagnetic radiation from the nuclei of unstable atoms.	