The Great Big Chemistry Vocabulary List

following is a fairly comprehensive list of vocabulary terms useful in preparing for the Regents Exam in Chemistry… Good luck!

- **acid**: This is anything that gives off H^+ ions in water. Acids have a pH less than 7 and are good at dissolving metals. They turn litmus paper red and in them, phenolphthalein remains colorless.
- **activation energy**: The minimum amount of energy needed for a chemical reaction to take place. For some reactions this is very small (it only takes a spark to make gasoline burn). For others, it's very high (when you burn magnesium, you need to hold it over a Bunsen burner for a minute or so).
- **activity series**: This is when elements are arranged in the order of how chemically active each is (how much they tend to react with water and acids).
- **actual yield**: The amount of product that you actually get in a chemical reaction; it is usually less than the theoretical yield, for a variety of reasons, but it can never be *more* than the theoretical yield.
- **addition reaction**: A reaction where atoms are added to a carbon-carbon multiple bond.
- **alcohol**: An organic molecule containing an -OH group
- **aldehyde**: An organic molecule containing a -CHO group
- **alkali metals**: Group I on the periodic table.
- **alkaline earth metals**: Group II on the periodic table.
- **alkane**: An organic molecule which contains only single carbon-carbon bonds.
- **alkene**: An organic molecule containing at least one C=C bond
- **alkyne**: An organic molecule containing at least one C≡C triple bond.
- **alloy**: A mixture of two metals. Usually, you add very small amounts of a different element to make the metal stronger and harder.
- **alpha particle**: A positively-charged radioactive particle equivalent to a helium nucleus (2 protons, 2 neutrons)
- **amine**: An organic molecule derived from an ammonia molecule where one or more of the hydrogen atoms has been replaced by organic groups.
- **amino acid**: The basic building blocks of proteins. They're called "amino acids" because they're both amines (they contain nitrogen) and acids (carboxylic acids, to be precise)
- **amphiprotic**: When a substance is both an acid and a base. Like water, for example.
- **amphoteric**: Another term for when a substance is both an acid and a base.
- **anode**: The electrode where oxidation occurs. In other words, this is where electrons are lost by a substance.
- **aqueous**: dissolved in water

- **atomic mass unit (a.m.u.)**: This is the smallest unit of mass we use in chemistry, and is equivalent to 1/12 the mass of carbon-12. For all intents and purposes, protons and neutrons weigh 1 a.m.u.

- **atomic radius**: This is one half the distance between two bonded nuclei. We can't just measure the distance from the nucleus to the outside of the atom – atoms don't have a well-defined outer boundary, making this impossible to measure.

- **Aufbau principle**: When protons are added together to form a nucleus and to build up the elements, electrons are added into orbitals from lower energy to higher energy.

- **Avogadro's Law**: If you've got two gases under the same conditions of temperature, pressure, and volume, they've got the same number of particles (atoms or molecules). This law works best for ideal gases, none of which actually exist.

- **base**: A compound that gives off OH^- ions in water. They are slippery and bitter and have a pH greater than 7.

- **battery**: This is when a bunch of voltaic (electrochemical) cells are stuck together, to be a source of electrical energy.

- **beta particle**: A negatively-charged radioactive particle equivalent to an electron.

- **binary compound**: A compound containing only two elements

- **boiling**: changing a liquid to a gas at its boiling temperature – the pressure of the vapor above the liquid is equal to atmospheric pressure

- **bond length**: The average distance between the nuclei of two bonded atoms.

- **Boyle's Law**: The volume of a gas at constant temperature varies inversely with pressure. In other words, if you put big pressure a gas, its volume shrinks.

- **Bronsted-Lowry acid**: Acids donate protons [H+ ions] and bases grab them

- **calorimetry**: The study of heat flow. Calorimetry if useful, for example, in finding the heat of combustion of a compound or the heat of reaction of two compounds.

- **catalyst**: A substance that speeds up a chemical reaction without being used up by the reaction. Enzymes are organic catalysts because they allow the reactions that take place in the body to occur fast enough that we can live.

- **cathode**: The electrode in which reduction occurs. Reduction is when a compound gains electrons.

- **chain reaction**: A reaction in which the products from one step provide the reagents for the next one. This is frequently referred to in nuclear fission (when large nuclei break apart to form smaller ones) and in free-radical reactions.

- **Charles's Law**: The volume of a gas at constant pressure is directly proportional to the temperature. In other words, if you heat a gas up, its volumes gets bigger.

- **chemical equation**: The recipe that describes what you need to do to make a reaction take place.

- **chemical properties**: Properties that can only be described by making a chemical change (by making or breaking bonds). For example, color isn't a chemical property because you don't need to change something chemically to see what color it is. Flammability, on the

other hand, is a chemical property, because you can't tell if something burns unless you actually try to burn it (a chemical change).

- **circuit**: The closed path in a circuit through which electrons flow.
- **colligative property**: Any property of a solution that changes when the concentration changes. Examples are color, flavor, boiling point, melting point, and osmotic pressure.
- **combustion**: When a compound combines with oxygen gas to form water, carbon dioxide, and a whole 'lotta heat
- **concentration**: A measurement of the amount of stuff (solute) dissolved in a liquid (solvent). The most common concentration unit is molarity (M), which is equal to the number of moles of solute divided by the number of liters of solution.
- **condensation**: When a vapor reforms into a liquid. This is what happens on your bathroom mirror when you take a shower.
- **conjugate acid**: The compound formed when a base gains a proton (hydrogen ion).
- **conjugate base**: The compound formed when an acid loses a proton (hydrogen ion).
- **continuous spectrum**: A spectrum that gives off all the colors of light, like a rainbow. This is caused by blackbody emission.
- **covalent bond**: A chemical bond formed when two atoms share two electrons.
- **critical mass**: The minimum amount of radioactive material needed to undergo a nuclear chain reaction.
- **crystal lattice**: see "lattice"
- **crystal**: A large chunk of an ionic solid.
- **Dalton's law of partial pressures**: The total pressure in a mixture of gases is equal to the sums of the partial pressures of all the gases put together (the whole is equal to the sum of its parts).
- **decomposition**: When a big molecule breaks apart to make two or more smaller ones.
- **delocalization**: This is when electrons can move around all over a molecule. This happens when you have double bonds on adjacent atoms in a molecule, like in graphite or benzene
- **diffusion**: When particles move from areas of high concentration to areas of low concentration. For example, if you open a bottle of ammonia on one end of the room, the concentration of ammonia molecules in the air is very high on that side of the room. As a result, they tend to migrate across the room, which explains why you can smell it after a little while. Be careful not to mix this up with effusion (see definition)
- **dilution**: When you add more solvent to a solution to make it less concentrated.
- **dipole moment**: When a molecule has some charge separation (usually because the molecule is polar), it's said to have a dipole moment.
- **dipole-dipole force**: When the positive end of a polar molecule becomes attracted to the negative end of another (neighboring) polar molecule.
- **dissociation**: When a compound breaks apart into its component ions as it dissolves in water.

- **distillation**: This is when you separate a mixture of liquids by heating it up. The one with the lowest boiling point evaporates first, followed by the one with the next lowest boiling point, *etc*.

- **double replacement reaction)**: When the cations (+ ions) of two ionic compounds switch places (the ions "swap partners").

- **effusion**: When a gas moves through an opening into a chamber that contains no pressure. Effusion is much faster than diffusion because there are no other gas molecules to get in the way.

- **electrolysis**: When electricity is used to break apart a chemical compound.

- **electrolyte**: An ionic compound that dissociates in water to conduct electricity. Strong electrolytes break apart completely in water; weak electrolytes only fall apart a little bit.

- **electron affinity**: The energy change that accompanies the addition of an electron to an atom in the gas phase.

- **electronegativity**: A measurement of how much an atom tends to steal electrons from atoms that it's bonded to. Elements at the top right of the periodic table (excluding the noble gases) are very electronegative while atoms in the bottom left are not very electronegative (a.k.a. "electropositive")

- **empirical formula**: A reduced molecular formula. If you have a molecular formula and you can reduce all of the subscripts by some whole number, the result is the empirical formula (the "lowest, whole-number ratio").

- **endothermic**: When a process absorbs energy from its surroundings

- **energy level**: A possible level of energy that an electron can have in an atom.

- **enthalpy**: A measurement of the energy content of a system; in nature, the tendency is for enthalpy to be minimized whenever possible.

- **entropy**: A measurement of the randomness in a system; in nature, the tendency is for entropy to be maximized whenever possible.

- **equilibrium**: When the forward rate of a chemical reaction is the same as the reverse rate. This only takes place in reversible reactions because these are the only type of reaction in which the forward and backward reactions can both take place.

- **ester**: An organic molecule with R-COO-R' functionality.

- **excited state**: A higher energy level that electrons can jump to when energy is added.

- **exothermic**: When a process gives off energy to its surroundings.

- **family**: The same thing as a "group" (see above)

- **fission**: A nuclear reaction where a big atom breaks up into smaller ones. This is what happens in nuclear power plants.

- **functional group**: A generic term for a group of atoms that cause a molecule to react in a specific way. It's really common to talk about this in organic chemistry, where you have aldehydes, carboxylic acids, amines and so on.

- **gamma ray**: High energy radiation given off during a nuclear process. When a nucleus gives off this radiation, it goes to a lower energy state, making it more stable.

- **ground state**: The lowest energy state possible for an electron.
- **group**: A vertical column on the periodic table. Elements in the same group tend to have the same properties. These are also called "families."
- **half-life**: The time required for half of the radioactive atoms in a sample to decay (and therefore become more stable).
- **half-reaction**: The oxidation or reduction part of a redox reaction.
- **halogen**: The elements in group 17. They're really reactive (they vigorously gain electrons to complete the octet).
- **heat of reaction**: The amount of heat absorbed or released in a reaction. Also called the "enthalpy of reaction"
- **heat**: The kinetic energy of the particles in a system. The faster the particles move, the higher the heat content.
- **heterogeneous mixture**: A mixture where the substances aren't equally distributed.
- **homogeneous mixture**: A mixture that is very consistent because everything is mixed up really evenly.
- **Hund's rule**: The most stable arrangement of electrons occurs when they're all unpaired. Sometimes also referred to as “The Schoolbus Rule.”
- **hydration**: When a molecule has water molecules attached to it.
- **hydrocarbon**: A molecule containing (only) carbon and hydrogen.
- **hydrogen bond**: The tendency of the hydrogen atom stuck to a highly electronegative atom (fluorine, oxygen or nitrogen) to become attracted to the lone pair electrons on another electronegative atom. It's a pretty strong intermolecular force, which explains why water has such a high melting and boiling point. Sometimes also called “FON Bonds.”
- **hydrogenation**: When hydrogen is added to a carbon-carbon multiple bond.
- **hydronium ion**: The H^+ ion, made famous by acids.
- **hydroxide ion**: The OH^- ion, made famous by bases.
- **ideal gas**: A gas in which the particles are infinitely small, have a kinetic energy directly proportional to the temperature, travel in random straight lines, and don't attract or repel each other. Needless to say, there's no such thing as an ideal gas in the real world. However, we use ideal gases anyway because they make the math work out well for equations that describe how gases behave.
- **immiscible**: When two substances don't dissolve in each other to any large degree. Think of oil and water. They're immiscible. Organic compounds and water are frequently immiscible in each other.
- **indicator**: A compound that turns different colors at different pH values. Common examples are swimming pool and aquarium pH testing kits.
- **insoluble**: When something doesn't dissolve in solution to any large degree.

- **intermolecular force**: A force that exists between two different (neighboring) molecules. Examples are hydrogen bonding (which is strong), dipole-dipole forces (which are kind of weak), and London dispersion forces (a.k.a. Van der Waal forces), which are very weak.
- **ionic bond**: A bond formed when oppositely charged particles stick together – electrons are transferred from one atom to the other atom due to a big difference in their electronegativity values.
- **ionization energy**: The amount of energy required to pull an electron off of a neutral, gaseous atom.
- **isotope**: When an element has more than one possibility for the number of neutrons, these are called isotopes. All known elements possess isotopes. For the record, the word "isotope" in itself doesn't imply that something is radioactive. TV told you that, and TV is stupid.
- **Kelvin:** A unit used to measure temperature. One Kelvin is equal in size to one degree Celsius. To convert between degrees Celsius and Kelvins, simply add 273 to the temperature in degrees Celsius to get Kelvins.
- **ketone**: A molecule containing a R-CO-R' functional group. Acetone (dimethyl ketone) is a common one.
- **kinetic energy**: The energy due to the movement of an object. The more rapidly something moves, the more kinetic energy it has.
- **lattice**: The three-dimensional arrangement of atoms or ions in a crystal.
- **law of conservation of energy**: The total amount of energy in the universe never changes, ever. It just changes from one form to another.
- **law of conservation of mass**: The amount of stuff after a chemical reaction takes place is the same as the amount of stuff you started with – matter is neither created nor destroyed during a reaction.
- **Le Châtelier's Principle**: When you disturb an equilibrium (by adding more chemical, by heating it up, *etc*.), it will eventually go back into equilibrium under a different set of conditions – the system will tend to counteract what the disturbance was.
- **Lewis structure**: A structural formula that shows all of the atoms and valence electrons in a molecule.
- **line spectrum**: A spectrum showing only certain (discrete) wavelengths.
- **main-block elements**: Groups 1, 2, and 13-18 on the periodic table. They're called main block elements because the outermost electron is in the *s*- or *p*- orbitals.
- **mass**: The amount of matter in an object. The more mass, the more stuff is present.
- **molar mass**: The mass of one mole of particles of a given substance.
- **molar volume**: The volume of one mole of a substance at STP. If you believe that everything is an ideal gas, this is always 22.4 liters (when the temperature is 0 ºC and the pressure is 1 atm… otherwise you must use PV=nRT!).
- **molarity**: A unit of concentration equal to moles of solute divided by liters of solution.
- **mole fraction**: The ratio of moles of one compound in a mixture from compared against the total number of moles (from all the compounds) in the mixture

- **mole ratio**: The ratio of moles of what you've been given in a reaction to what you want to find; it's the "recipe" of how substances combine in a reaction. Handy in stoichiometry.
- **mole**: 6.02×10^{23} things; the standard counting amount in chemistry (like the dozen is the standard counting amount in baking *etc.*)
- **molecular compound**: A compound held together by covalent bonds.
- **molecular formula**: A formula that shows the correct quantity of all of the atoms in a molecule.
- **monatomic ion**: An ion (particle with a nonzero charge) that has only one atom, like the chloride ion.
- **neutralization reaction**: The reaction of an acid with a base to form water and an ionic salt.
- **nonpolar covalent bond**: A covalent bond where the electrons are shared equally between the two atoms.
- **normal boiling point**: The boiling temperature of a substance when the pressure is 1.00 atm.
- **normal melting point**: The melting temperature of a substance when the pressure is 1.00 atm.
- **nuclear fusion**: When many small atoms combine to form a larger one. This occurs during a thermonuclear reaction.
- **nuclear fission**: This is when the nucleus of an atom breaks into many, smaller parts.
- **nuclear reaction:** Any reaction that involves a change in the nucleus of an atom. Nuclear reactions produce loads of energy, which is why you don't see them much around the lab.
- **nucleon**: A particle (such as proton or neutron) that's in the nucleus of an atom.
- **octet rule**: All atoms want to be like the nearest noble gas. (Well, they all want to have the same number of valence electrons, anyway). To do this, they either gain or lose electrons (to form ionic compounds) or share electrons (to form covalent compounds) until they have eight electrons in the outermost energy level (hence, *octet* rule).
- **orbital**: This is where the electrons in an atom live – regions of high *probability* of finding electrons.
- **organic compound**: A compound that contains carbon (except carbon dioxide, carbon monoxide, and carbonates)
- **oxidation number**: The apparent charge on an atom when it's in a compound.
- **oxidation**: When a substance loses electrons during a chemical reaction.
- **partial pressure**: The pressure of one gas in a mixture. For example, if you had a 60:40 mix of helium and hydrogen gases and the total pressure was 2 atm, the partial pressure of hydrogen would be 0.8 atm. (40% of 2.0 atm)
- **percent yield**: The actual yield divided by the theoretical yield, times 100.
- **period**: A horizontal row in the periodic table; properties slowly change from left to right, in a *periodic*, repetitious way… hence the name *periodic* table
- **periodic law**: The properties of elements change with increasing atomic number in a periodic way. That's why you can stick the elements into a big chart and have the elements line up in nice families.

- **phase diagram**: A chart which shows how the phase of a substance depends on various conditions of both temperature and pressure.
- **phase**: The state of a compound (solid, liquid, or gas)
- **physical property:** A property which can be determined without changing something chemically. If that doesn't make sense, see the definition of "chemical change."
- **polar covalent bond**: A covalent bond where electrons are not shared evenly between the two atoms in the bond. This occurs because the electronegativity values of the two atoms aren't the same.
- **polyatomic**: contains more than one atom; often refers to polyatomic ions.
- **potential energy**: The energy something has because of where it is. Things that are way up high have more potential energy than things that are way down low because they have farther to fall.
- **precision**: A measurement of how repeatable a measurement is. The more significant figures, the more precise (repeatable) the measurement is.
- **pressure**: Force per unit area; for a gas, it comes from all those bajillions of tiny particles constantly slamming into the walls of the container holding the gas
- **product**: The substance(s) created (produced) in a chemical reaction.
- **quantum theory**: The branch of physical chemistry that describes how energy can only exist at certain levels and makes generalizations about how atoms behave from this assumption.
- **radioactive**: When an atom has a nucleus unstable enough that it will likely fall apart (decay), it's referred to as being radioactive.
- **redox reaction**: A reaction that is accompanied by electrons going off one substance (oxidation) and onto another (reduction).
- **reversible reaction**: A reaction in which the products can turn back into the reactants, in addition to the reactants turning into products (as with all reactions).
- **salt**: An ionic compound.
- **saturated**: When the maximum amount of solute is dissolved in a liquid (for a given amount and temperature of the liquid).
- **shielding effect**: The outer electrons aren't pulled very tightly by the nucleus because the inner electrons repel them. This repulsion is called the shielding effect, and can be used to explain lots of neat-o stuff. Sometimes explained as “the movie theater effect.”
- **significant figure**: The number of digits in a number that tell you useful information. For example, when you weigh yourself on a bathroom scale, it says something like 150 pounds rather than 150.32843737 pounds. Why? Because the thing can only weigh accurately to the nearest pound. Any other digits that are on this number don't mean anything, because they would just be guesses anyway. The more sig figs, the more **repeatable** a measurement is presumed to be.
- **single replacement reaction**: When one unbonded element replaces another element that’s already bonded in a compound. These must be redox reactions.
- **solubility**: A measurement of how much of a solute can dissolve in a liquid (for a given amount and temperature of the liquid).

- **solute**: The solid that gets dissolved into a solution.
- **solvent**: The liquid that dissolves the solid in a solution.
- **specific heat capacity**: The amount of heat required to increase the temperature of one gram of a substance by one degree.
- **spectator ions**: The ions in a reaction that don't react (they're the same / unchanged before and after the reaction happens).
- **spontaneous change**: A change that, once it begins, will continue to occur by itself. Not every reaction is spontaneous at every temperature; for example, ice melting is not spontaneous at –20 ºC, but it is at 15 ºC. Remember also that spontaneity tells us nothing about how **fast** a change will occur, but rather only **if** it will occur.
- **standard temperature and pressure**: 273 K (0 ºC) and 101.3 kPa (1 atmosphere).
- **stoichiometry**: The art of figuring how much stuff you'll make in a chemical reaction (in theory) from the amount of each reactant you start with.
- **STP**: See standard temperature and pressure.
- **strong acid**: An acid that fully dissociates in water (the most common ones: HCl, HNO_3, H_2SO_4)
- **structural formula**: See Lewis structure.
- **sublimation**: When a solid changes directly into a gas. Dry ice (solid CO_2) does this.
- **supersaturated**: When more solute is dissolved in a liquid than is theoretically possible for a given amount and temperature of the liquid.
- **synthesis**: When you make a bigger molecule from two or more smaller ones.
- **temperature**: A measurement of the average kinetic energy of the particles in a system.
- **theoretical yield**: The amount of product which should be made in a chemical reaction if everything goes perfectly. For a variety of reasons, your mileage may vary.
- **titration**: When the concentration of an acid or base is determined by neutralizing it.
- **unsaturated**: When you haven't yet dissolved all of the solute that's possible to dissolve in a liquid for a given amount and temperature of the liquid.
- **unshared electron pair**: two electrons that aren't involved in chemical bonding. Also frequently referred to as a "lone pair."
- **valence electrons**: The outermost electrons in an atom.
- **vapor pressure**: The pressure of a substance that's present above its liquid. For example, you can tell that ammonia has a high vapor pressure because the smell of it is very strong above liquid ammonia. The lower the intermolecular attractions, and the higher the temperature, the higher the vapor pressure above a liquid.
- **vaporization**: Changing a liquid to a gas. This happens even when the liquid is below its boiling temperature — **"all liquids vaporize"** .
- **volatile**: A substance with a high vapor pressure (usually due to low intermolecular forces).