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Chemical & Electroplating Terms

Abrasive - A hard substance, with sharp edges and comers, used for grinding and polishing.

Absolute Temperature - The Centigrade temperature plus 273.

Absolute Zero - 273 °C = 0 °A At this temperature all molecular motion ceases.

Acid - (1) A substance which furnishes hydrogen ions in solutions. (2) A substance which turns blue litmus red and contains hydrogen which can be replaced by a metal. (3) An acid yields protons.

Acid Anhydride - The oxide of a non-metal that reacts with water to form an acid.

Acid Salt Amorphous - A substance without crystalline structure. The atoms are not arranged in a definite pattern.

Activated Charcoal - Charcoal that has been treated to increase its adsorptive capacity. Use to eliminate organic contamination in a plating solution.

Adsorption - A process in which molecules of a gas or liquid condense, as a film, on the surface of a solid. The process is largely physical in nature.

Alcohol - (1) A compound derived from a hydrocarbon, containing one or more hydroxyl groups. (2) An organic hydroxide.

Aldehyde - A compound, derived from a hydrocarbon, containing one HCO group.

Alkali - An alkali is a strong water soluble base.

Allotropy - The property shown by certain elements capable of existing in more than one form. This is due to the arrangement of the atoms or molecules.

Alloy - An alloy is made of tow or more metals. It may be a solution, an intimate mixture or a definite compound of the constituents.

Alpha Particles - Helium atoms that have lost two electrons. They are produced by radioactive disintegration.

Amalgam - An alloy containing mercury.

Ammonium Ion, (NH+) - A cation produced by the ionization of an ammonium salt.

Ammonium Radical (NH_4) - A group of atoms which plays the role of a metal in certain salts, (e.g. NH_4Cl)

Ampere - An ampere is one coulomb of electricity per second. That current which deposits 0.001118 grams of silver per second.

Amphoteric Substance - A substance which has both acidic and basic properties.

Angstrom Unit(A) - An Angstrom unit equals 10^{-8} cm.

Anhydrous Substance - A substance free from water.

Anion - A negatively charged ion which is attracted to the anode (positive electrode) during electrolysis.

Atmosphere - (1) The gaseous envelope surrounding the earth. (2) The unit of pressure. The average pressure of the atmosphere at sea 760 mm. of mercury).

Atom - An atom is the smallest unit of an element that can take part in the formation of a compound. It has a positively charged nucleus surrounded by electrons.

Atomic Number - (1) The net positive charge on the nucleus of an atom. (2) The ordinal number of an atom in the periodic table.

Atomic Weigh - The weight of an atom referred to the oxygen atom as 16.000.

Base - (1) An oxide or hydroxide of a metal. (2) A substance which gives hydroxyl ions in solution. (3) A substa

Base Forming Element - An element that is easily oxidized.

Basic Anhydride - The oxide of a metal which reacts with water to form a base.

Basic Salt - A salt containing replaceable oxygen or hydroxyl groups.

Binary Compound - A compound containing two elements per molecule.

Boiling Point - The temperature at which the vapor pressure of a liquid reaches atmospheric pressure.

British Thermal Unit (BTU) - The quantity of heat necessary to raise the temperature of one pound of water 1 °F.

Buffer - A suitable mixture of salt and acid (or salt and base) that regulate or stabilizes the pH of a solution. A salt containing replaceable hydrogen.

Calorie - A unit of heat. The heat required to raise the temperature of 1 gram of water 1 °C

Calorimeter - An apparatus for measuring the quantity of heat liberated or absorbed during a reaction.

Catalysis - The change in the rate of a reaction by the presence of a substance which is unchanged at the end of the reaction.

Catalytic Agent - A substance which alters the rate of a chemical change and which remains unchanged at the end of the reaction, e.g., manganese dioxide in the preparation of oxygen.

Cathode - The negative electrode of an electrolytic cell at which reduction of an ion takes place.

Cathode Rays - A stream of electrons shot out from a cathode ray tube.

Cation - A positively charged ion which is attracted to the cathode during electrolysis.

Celsius, C - Synonomous with Centigrade. The temperature scale on which the freezing point of water is 0 and the boiling point is 100.

Chemical Change – A change in which the chemical composition of a substance is altered. The new substance or substances have new and different properties.

Chemical Equation - A qualitative and quantitative expression of a chemical change.

Chemistry - The science that investigates the properties of matter, the changes taking place, the amounts and kinds of energy necessary for the changes and the laws which govern them.

Colloids - Extremely small particles, .000001 mm. in magnitude, suspended in a fluid upon which surface forces are extremely important factors in determining the properties.

Combining weight - The gram-weight of an element that will combine with or replace 1.008 grams of hydrogen or 8 grams of oxygen.

Combustion - A chemical change producing heat and light.

Components - One of a minimum number of substances in a composite system.

Compound - Two or more elements chemically united in definite proportions by weight. It is homogenous and its constituents can only be separated by chemical means.

Concentration - The amount of a substance (weight, moles, equivalents) per unit volume.

Covalent Molecule - A molecule in which the bond between two atoms is a shared electron pair, such as H:Cl H:H Cl:C

Critical Pressure - The pressure of a system at its critical temperature.

Critical Temperature -The highest temperature at which a liquid and its vapor can co-exist as separate phases.

Crystal - A solid in which atoms, ions or molecules are arranged in a definite pattern.

Decomposition (of a Compound) - The process of breaking down a substance into simpler substances.

Dehydrating Agent - A substance which extracts moisture from another substance, e.g., sulfuric acid.

Deliquescent Salt - A salt capable of absorbing moisture from the air and dissolving in it, e.g., fused calcium chloride.

Density - Mass per unit volume, e.g., grams per cubic centimeter.

Destructive Distillation - A process in which a substance (usually organic) is heated in the absence of air until decomposition takes place. The products of decomposition (volatile matter) are condensed and collected.

Deuterium - An isotope of hydrogen of mass 2.

Dibasic Acid - An acid containing two replaceable hydrogen atoms per molecule.

Distillate - A substance that has been vaporized and then condensed in a separate vessel.

Distillation - A process in which a liquid is vaporized and then condensed.

Double Salt - Salt in which two metal atoms are combined with one acid radical or one metal is combined with two acid radicals, e.g., nickel ammonium sulfate.

Ductility - That property of a substance which permits its being drawn into wire.

Dyne - A unit of force. The force necessary to give to a mass of one gram an acceleration of one centimeter per second.

Effervescence - The escape of gas from a liquid due to a decrease in pressure or an increase in temperature.

Efflorescent Substance - One which loses water of crystallization (water of hydration) on exposure to air, e.g., $NiSO_4 \cdot 7H_20$

Electrolytic dissociation - The breaking up of molecules of electrolytes (acids, bases, salts) in solution to form positive and negative ions.

Electron - The unit of negative electricity. Its mass is 1/1845 of the hydrogen atom.

Electron Volt - That quantity of energy which is equal to the kinetic energy of an electron accelerated by a potential difference of 1 volt.

Electronegative Element - An element which has a tendency to take up electrons.

Electroplating - A process by which metal ions are deposited on a negative electrode as metal atoms by a direct current during electrolysis of an aqueous solution.

Electropositive Element - An element which has a tendency to give away electrons.

Electrovalent Substance - One which is made up of ions. For example, the nickel chloride crystal consists of positive nickel ions surrounded by negative chloride ions. In turn the chloride ions are surrounded by nickel ions.

Emulsion - One liquid dispersed in another liquid, e.g., kerosene in water.

Energy - Work. The ability to do work.

Equilibrium (Chemical) - A state in which a chemical reaction and the reverse reaction are taking place at the same time rate. The concentrations (at Equilibrium) of all substances remain constant.

Equilibrium Constant - An equilibrium constant (K) is the number obtained by dividing the product of the active concentrations of the substances produced in a reaction, by the product of the active concentrations of the reactants, after equilibrium has been reached.

Equivalent Weight - The equivalent weight of a substance represents the weight of the compound or element corresponding to or causing the displacement of an atom of hydrogen. (See also combining weight.)

Erg - The work done by a force of one dyne per centimeter.

Ester – The compound formed by the elimination of water and the bonding of alcohol and an organic acid.

Eutectic - A mixture of two or more substances. The lowest melting point of a mixture.

Fahrenheit Temperature Scale - The temperature scale on which 32 °F is the freezing point of water and 212 °F is the boiling point.

Filtrate - The liquid which passes through a filter.

Fixer (Photographic) - A substance which stops the process of developing a plate (or film) by dissolving the unexposed silver halide. (e.g. sodium thiosulfate)

Fluorescence - The emission of light (not reflected light) by a substance under illumination.

Flux - A substance used to unite with impurities and form a low melting mixture.

Formula - A chemical formula consists of one of a combination of symbols. If more than one atom of a given element is present in the molecule it is shown by a subscript. The formula shows the elements present and the number of atoms of each.

Fractional Distillation - A process of separating, by distillation, two or more liquids having different boiling points. Each fraction, as it comes off, is collected in different vessel.

Fusion - The melting of a substance.

Glass - A super cooled liquid composed of the silicates of sodium, calcium, potassium, etc.

Gram-Atom - The atomic weight in grams of an element.

Gram-Ion - The weight of an ion (obtained by adding the atomic weights of the atoms in the ion) expressed in grams.

Gram Molecule - The molecular weight in grams of a substance.

Halogen - Any of the four very active, non-metallic chemical elements, chlorine iodine, bromine, and fluorine.

Hard Water - Water which does not readily form a lather with soap. This is due to the presence of dissolved calcium and magnesium salts.

Heat - A form of energy.

Heat of Formation - The number of calories of heat absorbed or liberated during the formation of a mole of compound from elements.

Heating of Neutralization - The number of calories liberated in the formation of 18 grams of water from hydrogen and hydroxyl ions.

Heavy water - Water containing deuterium atoms in place of ordinary hydrogen atoms.

Humidity - The amount of water vapor per unit of gas.

Humidity, Relative -The ratio of the actual amount of water vapors in the atmosphere to the amount necessary for saturation at the same temperature.

Hydrate - A compound containing water of hydration, e.g., $CuSO_4 \cdot 5H20$.

Hydrocarbon - A compound containing only hydrogen and carbon.

Hydrolysis - A reaction between a salt and water in which an acid and base are formed, one or both of which is but slightly dissociated.

Hygroscopic - A substance which takes up moisture but does not dissolve in it, e.g., sodium nitrate crystals.
Indicator - A substance which changes color at a definite hydrogen ion (or other specific ion) concentration, e.g., litmus, starch, etc.

Inert Element - An element of the zero group of the periodic table. Elements in this group (argon, neon, etc.) have no chemical properties.

Ion - A charged atom or group of atoms.

Ionization - The splitting up of a molecule into atoms.

Ionization Constant - The product of the concentration of the ions divided by the concentration of the unionized molecules of solute, or electrolyte.

Ionization Potential - The energy necessary to remove an electron from a gaseous atom to form an ion. This energy is expressed in electron volts.

Isobars - Atoms of the same atomic weight but having different atomic numbers. Their chemical properties are different.

Isomers - Molecules having the same number and kinds of atoms but which are arranged differently within the molecule.

Isotopes - Atoms having the same atomic number but different atomic weights. Their chemical properties are identical.

Kindling Temperature - The lowest temperature at which a substance takes fire. This temperature varies with the physical state of the substance.

Latent Heat - The heat absorbed or liberated in changing a mole of substance from one state to another at a fixed temperature, e.g., converting 18 grams water to water vapor at 100 °C.

Law, Chemical - A general statement of fact based on experimentation.

Malleability - The property of a substance which permits it to be rolled or hammered into sheets.

Mass - The property of a body that determines the acceleration it will acquire when acted upon by a given force.

Mass Action, Law of - The speed of a chemical change is proportional to the concentration of the reacting substances.

Matter - That which occupies space and has mass.

Melting Point - The temperature at which the solid and liquid states of a substance are in equilibrium.

Metal - An element that is a good conductor of heat and electricity; reflects light and has luster and forms hydroxides and oxides that are basic.

Metallurgy - The science of extracting metals from their ores.

Molal Solutions - Solutions which contain one mole of solutes per liter.

Molar Solution - A solution containing one gram-molecular weight of solute per liter.

Mole - Molecular or formula weight of a substance in grams or pounds.

Molecular Volume - The volume occupied by a mole of any gas at 0 and 760 mm. pressure, e.g., 22.4 liters.

Molecular Weight - The sum of the atomic weights of the atoms in a molecule.

Molecule - (1) The smallest physical unit of a substance possessing the properties of a mass of the substance. (2) The smallest unit of a substance capable of independent existence.

Monobasic Acid - An acid having one replaceable hydrogen atom per molecule.

Nascent - The instant an element is liberated from a compound, it is said to be in the nascent state.

Neutralization - (1) The action of an acid and base to give a salt and water. (2) The union of hydrogen ions of an acid with the hydroxyl ions of a base to form water.

Neutron - A particle of unit mass but with no electric charge.

Non-Metal - An element that is a poor conductor of heat and electricity, is brittle and has no characteristic luster. The oxides and hydroxides of non-metals are acidic in character.

Normal Salt - A salt containing neither replaceable hydrogen nor hydroxyl.

Normal Solution - One gram-equivalent weight of a substance per liter of solution.

Nucleus - The center of mass in the atom, composed of neutrons and protons.

Occlusion - The absorption of gases by solids.

Octet - The term applied to a groups of eight electrons in the highest energy level of atoms.

Ore - A source of metal from the earth.

Organic Chemistry - That branch of chemistry dealing with carbon compounds.

Oxidation - (1) A process in which oxygen combines with another substance. (2) The loss of electrons by an atom or group of atoms.

Oxide - A compound of oxygen with another element. Depending upon the valence of the combining element, there can be more than one oxide formed, e.g. CO, $C0_2$, FeO, Fe_20_3, Cu_20, CuO, $S0_2$, $S0_3$, $S0_4$, etc.

Oxidizing Agent - (1) A substance capable of giving oxygen to another substance without demanding an equivalent of another substance in return. (2) A substance which contains an atom or group of atoms that gains electrons.

Paint Base - The particles suspended in the oil of a paint.

Paint Vehicle - A quick drying oil that forms a flexible horn - like film. The paint base is suspended in this oil.

Photon - A unit of light (a particle of light).

Physical Change - A change which does not involve a change in composition of a substance.

Polymorphism - The ability to exist in two or more crystalline forms.

Positron - A unit charge of positive electricity of approximately the same mass as the electron.

Precipitate - An insoluble solid formed by the chemical reactions between solutions, e.g., sodium chloride reacts with silver nitrate to form a white precipitate of silver chloride.

Properties - Characteristics by which a substance is identified, e.g., color, odor, state, taste and solubility.

Proton - Unit charge of positive electricity. The mass is approximately 1.

Radical - A group of atoms which act as a single unit in chemical changes.

Radioactivity - A partial disintegration of atoms. Alpha particles, electrons and X-rays are shot out form the nucleus.

Reaction - Implies a chemical change.

Reducing Agent - (1) A substance which removes oxygen from another substance. (2) A substance which contains an atom that loses one or more electrons.

Reduction - Opposite of oxidation. (1) Removal of oxygen from a compound. (2) A process in which an atom gains one or more electrons.

Replacement Series - The arrangement of the metals in the order of their decreasing chemical activity.

Roasting - Heating an ore in contact with air.

Salt - (1) A compound containing a metal or radical and an acid radical. (2) A compound which furnishes anions and cations when dissolved in water, but not hydrogen or hydroxyl ions.

Saponification - the hydrolysis of fats or oils by an alkali.

Saturated Solution - A solution in which the solute in solution is in equilibrium with undissolved solute.

Science - An organized body of facts which have been coordinated and generalized into a system.

Slag - A by-product of smelting, formed by the action of low melting material (flux) on impurities in the ore. Slags contain calcium and aluminum silicates.

Smelting - A process in which a metal is obtained from its ore by heating in a special furnace with suitable flux.

Soap - The sodium or potassium salts of a fatty acid.

Solubility Product Constant - The product of the concentrations of the ions of slightly soluble salt at saturation.

Solute - The substance dissolved in a solvent.

Solution - A homogeneous body whose composition may be varied within certain limits. Solution may be liquid, solid or gaseous.

Solvent - The constituent of a solution which is present in larger amount, and which does the dissolving.

Specific Gravity (Gases) - The ratio of the weight of one liter of air to the weight of one liter of the gas.

Specific Gravity (Solid or Liquid) - The ratio of the weight of a unit volume of a substance to the weight of the same volume of water.

Specific Heat - The heat required to raise the temperature of one gram of a substance one degree centigrade.

Specific Volume - The volume of one gram of a substance.

Spectrum - Light separated into its component parts with the aid of a prism or grating.

Spontaneous Combustion - Active burning of easily oxidizible substances due to the accumulation of the heat liberated during their oxidation.

Standard Conditions - O °C. and 1 atmosphere pressure (760 mm).

Strong Acid - One which is completely ionized in water solutions.

Sublimation - A process in which a solid is vaporized and condensed to a solid without passing through the liquid state.

Substance - Matter that is homogeneous throughout.

Supersaturated Solution - One in which more solute is in solution than is present in a saturated solution of the same substances at the same temperature and pressure.

Surface Tension - The contractive force of a substance usually measured in dynes/cm^2.

Synthesis - A process of preparing a compound from its constituent elements.

Temperature - That condition which determines whether heat will flow from one body to another.

Tempering - The process of changing the physical properties of a substance (steel) by heat treatments.

Ternary Compound - A compound containing three elements.

Thermoschemistry - That branch of chemistry which deals with the heat changes accompanying chemical reactions.

Tincture - A solution dissolved in alcohol, e.g., tincture of iodine.

Tribasic Acid - An acid containing three replaceable hydrogen atoms per molecule.

Valence - (1) A number which represents the number of atoms of hydrogen (or its equivalent) that will combine with, or replace by the atom in question. (2) Polar valence - The excess of positive or negative charges on the atom or radical. (3) Non-polar valence - The number of electron pairs shared with another atom or atoms.

Vapor Density - The ratio of the weight of a gas to the weight of an equal volume of hydrogen measured under the same conditions.

Vapor Pressure - The (partial) pressure exerted by a vapor.

Vapor Tension - The pressure which a vapor exerts on a liquid when the liquid and vapor are in equilibrium at a given temperature (the maximum vapor pressure for the given temperature).

Viscosity - (1) The resistance to flow of a liquid. (2) The internal friction of a liquid.

Volt - The electrical pressure required to produce a current of one ampere through a resistance of one ohm.

Weak Acid - An acid which is but slightly ionized in water solutions.

Welding - A process of joining two metals together by heat and pressure.

X-Rays - High frequency light waves which come from the bombarding of metals by electrons or from the radioactive disintegration of certain atoms,