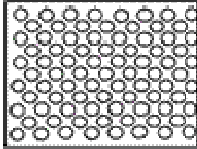
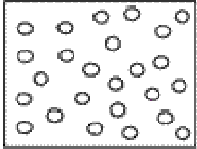
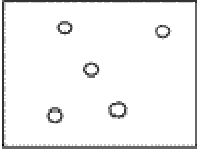


## Chapter 12: Basics of Chemistry

Cosmetologists should study **chemistry** because it gives you the ability to use professional products effectively and safely; helps you to know your products because they all have chemicals in them; lets you troubleshoot and solve common problems when doing chemical services.

*\*Chemistry is the science that deals with the composition, structures, and properties of matter and how matter changes under different conditions.*

- **Organic chemistry**- the study of substances that contain carbon; materials that contain both carbon and hydrogen
- **Inorganic chemistry**- the study of substances that **do not** contain carbon but **do** contain hydrogen
- **Matter**- any substance that occupies space and has mass (weight); all matter is made up of chemicals (everything you can touch and see-with the exception of light and electricity- is matter)
- **Elements**- simplest form of chemical matter; there are 90 naturally occurring elements
- **Atoms**- (particles) the smallest chemical components of an element
- **Molecules**- a chemical combination of two or more atoms (for example, water is made of hydrogen and oxygen atoms)

<b>Observable Properties of Matter: Solids, Liquids, and Gases</b>		
<b>Solids</b>	<b>Liquids</b>	<b>Gases</b>
definite shape	no definite shape	no definite shape
definite volume	definite volume	no definite volume
may shatter	may splatter	may scatter
Atoms are <u>bonded</u> and vibrate <u>less</u> than the same matter in a liquid or gas state.	Atoms are <u>not bonded</u> and vibrate <u>more</u> than solids, but <u>less</u> than gases (for the same matter).	Atoms are <u>not bonded</u> and vibrate <u>more</u> than the same matter in a solid or liquid state
		
solid particles	liquid particles	gas particles

### States of Matter (p. 248)

solids: brush, rollers, clippers

liquids: bleach, shampoo, water

gas: propellant in hairspray, mousse

- **Physical properties**- determined without a chemical reaction: size, weight, hardness, glossiness
- **Chemical properties**- determined by a chemical reaction: wood burns, hair changes color through the use of dye or bleach

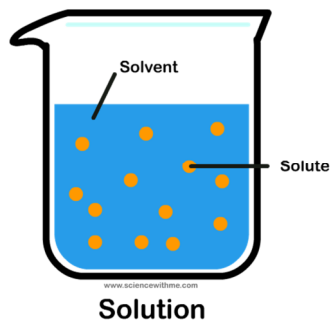
### Physical Change and Chemical Change (p. 249-250)

- **Physical change**- a change in the form or physical properties of a substance without a chemical reaction or the creation of a new substance
  - When ice melts into water and then evaporates into a gas
  - When temporary haircolor is applied to the hair
  - When nail polish is taken off a nail *without a remover solvent*
- **Chemical change**- a change in the chemical composition or make-up of a substance
  - When grapes ferment and make wine
  - When wood burns and makes charcoal
  - When hair is bleached

### Pure Substances and Physical Mixtures (p. 251-255)

- **Pure substance** - chemical combination of matter in definite proportions
  - Examples: atoms, elements, distilled water
  - Most substances do not exist in a pure state
- **Physical mixture** - physical combination of matter in any proportion
  - Examples: salt water, air

### Solutions, Suspensions and Emulsions (p. 251-253)



**solute**- substance that is dissolved

**solvent**- substance that dissolves the solute

*ex: when you make salt water, salt is the **solute** and water is the **solvent***

- **Miscible-** liquids can be **mixed together** to form stable solutions; they do not separate when left still
- **Immiscible-** liquids are not capable of being mixed together; they separate when left together (ex: water and oil)

**Solutions, suspensions, and emulsions are all physical mixtures.**

- **Solution-** a stable physical mixture of two or more substances (ex: salt water)
- **Suspension-** an unstable physical mixture of undissolved particles in a liquid (glitter in nail polish; oil and vinegar salad dressing); must be shaken before using
- **Emulsion-** an unstable physical mixture of two or more immiscible substances (substances that do not normally stay blended) plus an emulsifier (which binds the substances together) (ex: hand lotion)

**Common Chemical Product Ingredients** (p. 255-256)

- **Volatile alcohols-** evaporate easily (ex: rubbing alcohol, hairspray)
- **Alkanolamines-** neutralize acids or raises pH; used in place of ammonia because they produce less odor
- **Ammonia-** colorless gas used to raise pH so solutions can penetrate hair shaft
- **Glycerin-** sweet, colorless, oily (used as a moisturizer in lotions)
- **Silicones-** special oil used in hair conditioners (less greasy than other oils)
- **Volatile organic compounds-** compounds that contain carbon and evaporate easily (found in hairspray, nail polish, polish removers)

## Potential Hydrogen (pH) (p. 256-258)

*Cosmetologists should understand pH and how it affects the hair, skin, and nails*

- **pH** is the abbreviation for potential hydrogen; pH represents the quantity of hydrogen ions in a substance
- **ion-** an atom or molecule that carries an electrical charge
- **ionization-** the separation of atoms into positive and negative ions

## pH Scale (p. 257)



ACIDIC

NEUTRAL

ALKALINE

**A pH below 7 indicates an acidic solution.**

**A pH of 7 is neutral.**

**A pH above 7 indicates an alkaline solution.**

## Acids and Alkalis

- **Alpha hydroxyl acids-** also known as AHAs; derived from plants (mostly fruits); often used in salons to exfoliate skin and help adjust pH of lotions; acids contract and harden hair; an example is theoglycolic acid, a colorless liquid with a strong unpleasant odor used in perms
- **Alkalis-**also known as bases; have a pH above 7; feel slippery and soapy on the skin; they soften and swell hair, the cuticle on the nail plate, and calloused skin