<u>Review : Topic II Test</u>

These are some topics on the test. The rest are in your notes and textbook.

1. **Classification of Matter**
    - Understand what is meant by:
        - **The number of phases in a mixture**
            - Heterogeneous – two phases or more
            - Homogeneous – uniform, so always one phase
        - homogeneous and heterogeneous mixtures
            - **Homogeneous (solution)** – uniform composition throughout
                - Examples
                    - Salt H_20
                    - H_20_2 – Hydrogen Peroxide
                        - Molecular compound
                    - Alcohol diluted with water
                    - Sterling silver (Ag Cu)
            - **Heterogeneous** – not uniform composition throughout
                - Examples
                    - Oil and Water (H_20)
                    - Salad
                    - Dirt/sand in water
        - **Pure substances** (elements and compounds, compounds being both molecular and ionic or salts)
            - **Elements** - If a substance is made up of only one kind of atom. Atoms are considered to be the basic building blocks of matter that cannot be easily created nor destroyed. The word **atom** comes from the Greeks and means the smallest possible piece of something. Today, scientists recognize approximately 109 different kinds of atoms, each with its own unique composition. These atoms then are the building blocks of elements when only one kind of atom makes up the substance.
            - **Compounds** – when two or more atoms of different elements are chemically combined.
                - The smallest naturally occurring unit of a compound is called a **molecule** of that compound. A molecule of a compound has a definite shape that is determined by how the atoms are bonded to or combined with each other. An example is the compound water: it always occurs in a two hydrogen atoms to one hydrogen atom relationship.
                    - **Molecular** – atoms linked together by sharing electrons. Basically they bind together in electrically neutral particles called molecules. Some molecular compounds are very simple. The very examples of these are diatomic molecules, which only consists of two atoms.

Carbon Monoxide (CO) is an example of a diatomic compound.
    - **Ionic** – a compound that results when a metal reacts with an nonmetal (to form cations and anions)
        - Salts – ionic compound example
- ***Know examples for all of the above from homework, lab, and class notes***

2. **Physical Properties/ Physical Changes:** Review examples from homework and class notes
    - **States of matter** – solid, liquid, gas. Change of state is a physical change.

```
     sublimation            deposition
SOLID  ============>  GAS    ==============> SOLID

         melting               freezing
SOLID  ============>  LIQUID  =============>  SOLID
                             (solidfication)

      condensation            vaporization
GAS  =============>   LIQUID  =============> GAS
```

    - Sublimation, deposition
        - **Sublimation –** change of state straight from solid to gas
            - Exs, dry ice, solid air freshener
        - **Deposition –** change of state straight from gas to solid
    - Boiling point, Freezing point, Melting, Condensation
        - **Boiling point** - the temperature at which a liquid boils and turns to vapor. (A change of state from liquid to gas by adding heat/energy absorbed called vaporizing. Example boiling water.)
        - **Freezing point** - the temperature at which a liquid turns into a solid when cooled. (A change of state from liquid to solid by releasing heat/energy called freezing. An example is water to ice.)
        - **Melting** – change from solid to liquid by adding heat (energy absorbed). An example is ice to liquid water.
        - **Condensation** – change from gas to liquid as heat/energy is released. An example is rain.
    - **Solubility –** the ability of solute that can dissolve in a given amount of solvent at a given temperature and pressure.
        - Solution = solute + solvent
            - Solvent - the liquid in which a solute is dissolved to form a solution. **The substance present in the largest amount.**
            - Solute – the minor component in a solution, dissolved in the solvent. Generally a solid **Other substance or substances.**
            - Aqueous Solution – solutions with water as the solvent

- **Factors that Affect Solubility Chart -**

Solute	**Solvent**	**Solubility**
Solids	H_20	• **Temperature –** **increase in temp. = increase in solubility** ○ **sometimes solubility decreases**
Liquids	H_20	• Chemical composition of solute (nature) • **Miscible/immiscible depending on substance**
Gases	H_20	• **Pressure increase = increase in solubility of (dissolved) gas** **Temperature decrease = decrease in solubility**

Chemical Properties/Chemical Changes: Review examples from homework and class notes.

- Combustion, corrosion, rusting, acid and base reactions – **examples of chemical changes**
- **List of "Evidence of chemical reactions**"
  - Color – forming new color
  - Energy change
    - Heat given off (exothermic reaction)
    - Heat absorbed (endothermic reaction)
    - Light Energy - Flash of light
    - Sound Energy
  - Odor – New odor. Gas is evolved (given off), bubbling/fizzing.
  - Formation of a Precipitate – solid formed from combining two solutions
- **Reactants → Products**: Chemical changes are called **reactions**. Silver tarnishes by reacting with substances in the air.
- Law of Conservation of Mass and Law of Conservation of Energy
  - **Law of Conservation of Mass** – the observation that the total mass of materials is not affected by a chemical change in those materials.
  - **Law of Conservation of Energy** – Energy can be neither created nor destroyed, so that the energy of the universe is constant.

3. **Separation of Mixtures** (usage for homogeneous and heterogeneous mixtures) – see below

○ Chromatography ○ Simple distillation ○ Fractional Distillation ○ Evaporation	○ Using a separatory funnel ○ Filtration ○ Decanting ○ Centrifuging ○

- *Know examples in your notes and handout.* – See below and handout on mixtures/

Separation of Mixtures Chart

#	Type of Mixture	Method of Separation	Example	(Type of) Matter
1	Insoluble solid in liquid	Filtering	sand and water	Heterogeneous Mixture
		Centrifuge	blood	Heterogeneous Mixture
2	Liquids immiscible	- Separatory funnel - Decanting	Oil + H_20 (Oil and water)	Heterogeneous Mixture
3	Soluble solid in liquid	- Simple distillation - Evaporation	salt in H_20	Homogeneous Mixture
		Chromatography	ink - marker	Homogeneous mixture
4	2 miscible liquids	Fractional distillation	- alcohol + H_20 - fossil fuels	Homogeneous mixture

4. **Solubility and Aqueous Solutions – See solubility chart**
   - **Units of solubility: # grams of solute/100 grams of solvent – See packet with the "Solubility Curve" on the front and pg. 456**
     - solubility = grams of solute/100 grams of solvent
   - **Compare solubility of gas and solid solute as temperature increases or decreases)** – see the chart above: Factors that Affect Solubility
   - **Solute – a substance dissolved in a solvent to form a solution**
   - Soluble substance, insoluble substance, saturated solution, unsaturated solutions, supersaturated solutions
     - **Soluble substance** (solid) – a solid that readily dissolved in water
     - **Insoluble substance** (solid) – a solid where such a tiny amount of it dissolved in water that it is undetectable by the human eye
     - **Saturated solution** – solution that has the maximum amount of solute at a given temperature.
     - **Unsaturated solution** – a solution in which more solute can be dissolved than is dissolved already.

- **Supersaturated solution** - an unstable solution containing more of the solute than it (the solvent) can permanently hold. A rare exception under extremely perfect conditions

5. **Energy $q = s\ m\ \Delta T$**
   - Energy –the ability to do work
   - Formula for calculating energy (heat required)
     - Q = energy (heat) required
       - Positive #= heat added/absorbed (endothermic)
       - Negative # = heat released (exothermic)
     - s = specific heat capacity
     - m = mass of the sample in grams
     - Δ T = Change in temperature (°C)
       - Final – Initial
   - Heat energy, change in temperature (final – initial), heat capacity, specific heat capacity, joules, calories
     - <u>Heat – flow of energy due to a temperature difference</u>
     - Change in temperature (final – initial) – if the equation says the temperature is cooled, then energy is released; if it says heated, then the energy is absorbed
     - Specific heat capacity/ specific heat – the amount of energy required to change the temperature of one gram of a substance by one Celsius degree.
     - Calorie – the amount of energy (heat) required to raise the temperature of one gram of water by one Celsius degree. (The calorie for measuring the energy content of food is actually a kilocalorie (1000 calories), written with a capital C to distinguish it from the calorie used in chemistry.
     - Joule – an SI unit that can be most conveniently defined in terms of the calorie: **1 calorie (cal) = 4.184 joules (J)**

   - Specific heat capacity of metals, specific heat of water – see table below
     - Specific Heat Capacities of Some Common Substances

Substance	**Specific Heat Capacity (J/g °C)**
water (*l*)) (liquid)	4.184
water (*s*) (ice)	2.03
water (*g*) (steam)	2.0
aluminum (*s)*	0.89
iron (*s*)	0.45
mercury (*l*)	0.14
carbon (*s*)	0.71
silver (*s*)	0.24
gold (*s*)	0.13

   - The symbols (*s), (l), and (g)* indicate the solid, liquid, and gaseous states, respectively.

- Exothermic and endothermic changes in chemical and physical changes.
    - If the energy released in the formation of a new structure exceeds the chemical energy in the original substances, energy will be given off, usually in the form of heat or light or both. This is called an **exothermic reaction**. If however the new structure needs to absorb more energy than is available from the reactants, the result is an **endothermic reaction.**
- Where is energy in the chemical reaction?
    - Exothermic – energy released
    - Endothermic – energy absorbed

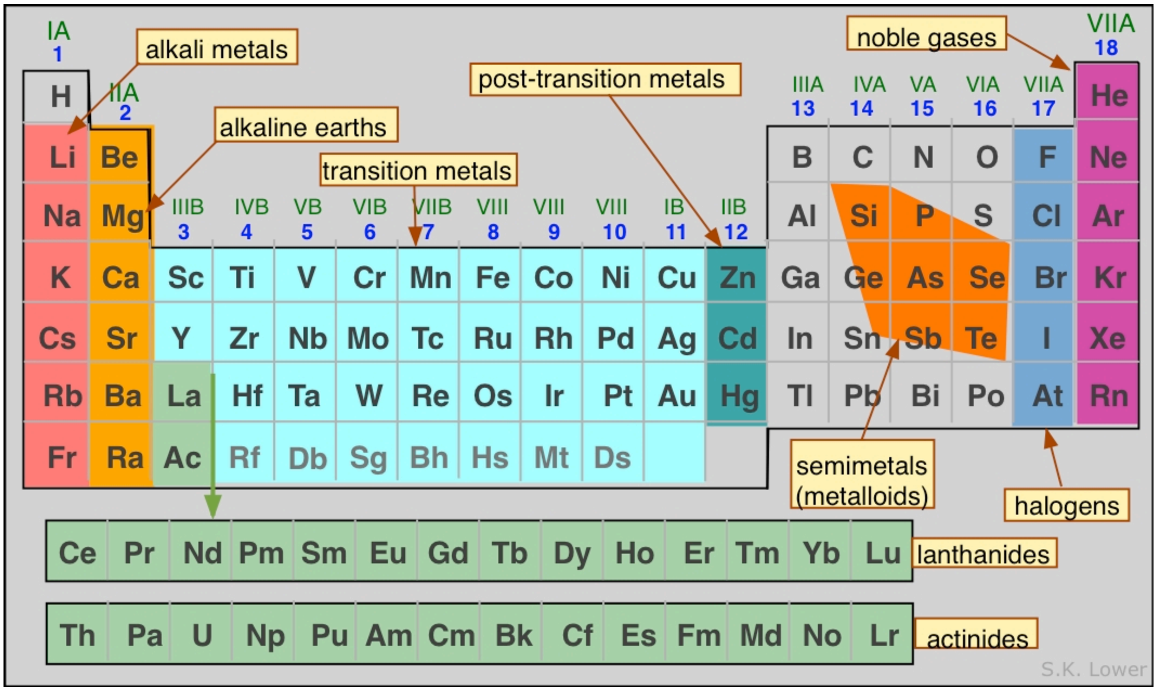
6. **Periodic Table** (see textbook reading and class notes)

- Metals, Nonmetals, Metalloids (also called semimetals) – **Pages 90--91**
    - **Metals** – an element that gives up electrons relatively easily and is typically lustrous (shiny), malleable, and a good conductor of heat and electricity. Most elements are metals. All from the beginning (left) of the periodic table to the stairs are metals.
    - **Nonmetals** – the relatively small number of elements that appear in the upper-right corner of the period table (to the right of the stairs) are called nonmetals. Nonmetals generally lack those properties that characterize metals and show much more variation in their properties than metals do. Whereas all metals are solids at normal temperatures, many nonmetals are gaseous, bromine is liquid, and several others are solids.
    - **Metalloids (semimetals)** – the elements that lie close to the stairs line that often show a mixture of metallic and nonmetallic properties. They include silicon, germanium, arsenic, antimony, and tellurium.

- **Properties of Metals and Nonmetals**

Metals	**Nonmetals**
1. Good conductors of heat and electricity (Silver and Copper are the best conductors)	1. Poor conductors of heat and electricity
2. Malleable – can be hammered into sheets	2. Brittle
3. Ductile – can be pulled into wires	
4. Luster (shiny)	3. Dull
5. Solid at room temperature (**except Hg – Mercury*)	4. State varies – Bromine (Br) is a liquid, other are solids and gases
6. Tend to lose electrons	5. Tend to gain electrons

- Know location on table:
    - Alkali metals, alkaline earth metals, transition metals, halogens, noble gases – **see page 89 in text**


IA
1
alkali metals
H
IIA
2
alkaline earths
post-transition metals
transition metals
noble gases
VIIA
18
IIIA 13
IVA 14
VA 15
VIA 16
VIIA 17
IIIB 3
IVB 4
VB 5
VIB 6
VIIB 7
VIII 8
VIII 9
VIII 10
IB 11
IIB 12
Li Be B C N O F Ne He
Na Mg Al Si P S Cl Ar
K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr
Cs Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe
Rb Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn
Fr Ra Ac Rf Db Sg Bh Hs Mt Ds
semimetals
(metalloids)
halogens
Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
lanthanides
Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr
actinides
S.K. Lower