CHEMISTRY CONTENT FACTS

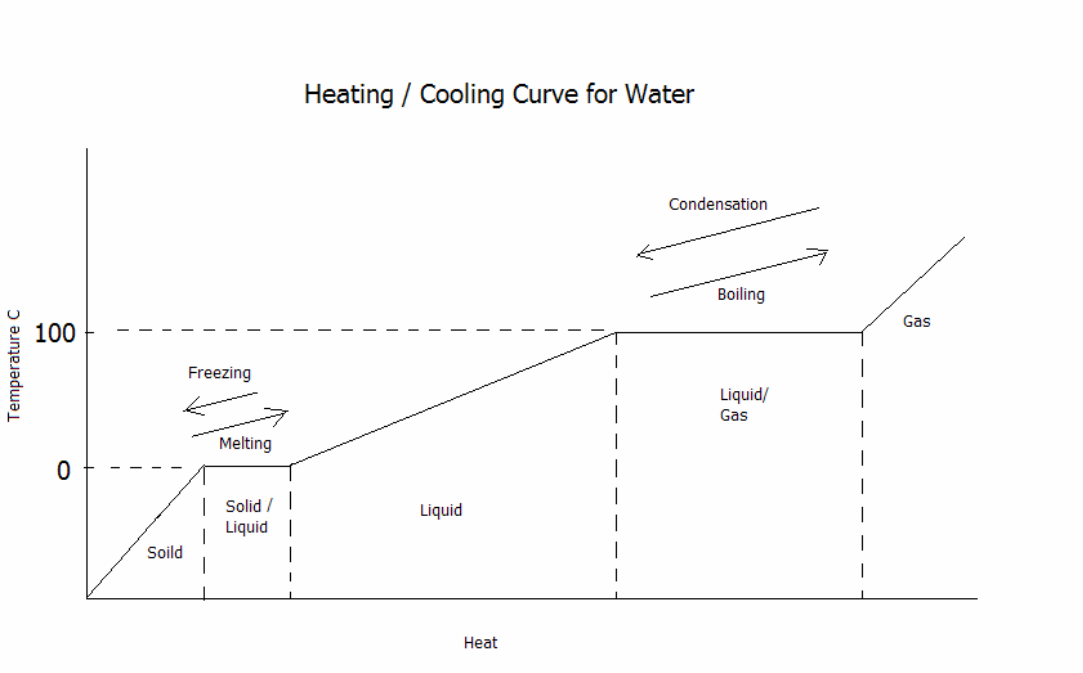
The following is a list of facts related to the course of Chemistry. A deep foundation of factual knowledge is important; however, students need to understand facts and ideas in the context of the conceptual framework. This list is not intended to provide a comprehensive review for State and National Assessments. Its purpose is to provide a highlight of the factual material covered in Chemistry. This list is not all inclusive, be sure to check Nevada State Standards and your district syllabi.

Matter and Energy

- Properties of **solids** - definite shape & volume; regular geometric pattern; crystalline structure
- Properties of **liquids** - no definite shape, but definite volume
- Properties of **gases** - no definite shape or volume, random particle motion
- **Elements** - all atoms have the same ATOMIC #. Can **NOT** be broken down chemically
- **Mixture** - 2 or more elements physically combined. There are different types of mixtures
    - heterogeneous (unevenly mixed – chocolate chip ice cream)
    - homogeneous (evenly mixed SOLUTION - clear tea)
- **Physical change** - no change in the identity of the substance (i.e. gas to liquid to solid, or cutting, crushing, etc.)
- **Chemical change** – substance(s) changes into new substance(s) with NEW properties ($H_2 + O_2 \rightarrow H_2O$)
- **Law of Conservation of Mass:** In a chemical reaction, mass remains constant
- For heat flow problems: know the formula $\Delta q = m(\Delta t)C_p$
- q = heat flow, m = mass, Δt = change in temperature, C_p = specific heat
- Temperature is the measure of the average kinetic energy of particles
- Convert from Celsius to Kelvin (+ 273) and back (- 273)
- The potential energy of a system is considered to be the HEAT of the system
- Fixed points on a thermometer - O° C - freezing/melting point of H_2O; 100° C boiling/condensation point of H_20; at standard pressure (2 points needed to create a thermometer)
- Gas law problems - Combined gas law: (Temp must be in Kelvin) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$
- Boyle's Law – Constant Temperature, Pressure and Volume vary inversely $P_1V_1 = P_2V_2$
- Charles's Law – Constant Pressure, Volume and Temperature are directly proportional

  $\frac{V_1}{T_1} = \frac{V_2}{T_2} or \frac{V_1}{V_2} = \frac{T_1}{T_2}$
- **STP** - Standard Temperature and Pressure of 0° C or 273 K and101.3kPa or 760 mm Hg or 1 atm
- **Density** is directly proportional to mass and inversely proportional to volume $d = \frac{m}{V}$

- **Sublimation** a substance turns directly from a solid to a gas ex. $CO_2(s) \rightarrow CO_2(g)$; $I_2(s)$ (purple crystals) $\rightarrow I_2(g)$ (purple gas)
- **Phase change diagrams**: Melting/Boiling and Freezing/Condensation [*See diagram*]



- **Kinetic molecular theory**
- all matter is composed of very small particles called atoms
- atoms are in constant, random motion
- collisions between atoms are elastic
- Ideal gases are point masses
- **Ideal Gas Law:** $PV = nRT$ P = pressure (atm or kPa), V = volume (L or dm^3), n = # moles, T = temperature (K), R = 0.0821 L·atm/mol·K or 8.31 dm^3·kPa/mol·K
- Real gases **BEHAVE LIKE IDEAL GASES** except at high Pressure and/or low Temperature
    - When there **IS** an attraction between particles (van der Waals forces) and
    - The volume of particles is **NOT** negligible, since atoms/molecules are close together
- ***HYDROGEN** and **HELIUM** are the most **IDEAL** gases. Also, noble gases act very ideally.
    - o THE SMALLER THE MOLECULES ARE THE MORE IDEALLY THEY BEHAVE
- **Molar Heat of fusion** - the amount of heat needed to melt one mole of a solid; for H_2O it is 6.0 kJ/mol
- **Molar Heat of vaporization** - the amount of heat needed to vaporize one mole of a solid; for H_2O it is 40.7 kJ/mol
- **Boiling point** - the temperature at which the vapor pressure of a liquid = the atmospheric pressure. The normal boiling point when the atmospheric pressure = 760 mm Hg = 1 atm = 101.3 kPa
- **Vapor pressure** - depends on;

- a) the temperature of the liquid
- b) the strength of intermolecular forces (i.e. the stronger the van der Waals forces the stronger the Intermolecular forces are and the lower the vapor pressure is)
- c) **Law of partial pressures-Dalton's Law**: the sum of all the partial pressures in a mixture of gases is equal to its total pressure $P_{total} = P_1 + P_2 + P_3$