Holt Modern Chemistry Review CHAPTER 5: THE PERIODIC LAW

The following pages contain the bulk (but not all) of the information for the chapter 5 test. Focus on this content, but make sure to review class notes, activities, handouts, questions, etc. If you study this document and NOTHING else, you should at least be able to PASS the test. ***** Test items will be <u>recall</u>, <u>examples</u>, and/or <u>application</u> of this content. *****

OUTCOMES

- Collaborate with peer(s) to understand chemistry content (C C)
- Communicate chemistry content to teacher and peer(s) (E C)
- 5.1: Describe the organization of the modern Periodic table; distinguish between periods and groups (T & R)
- 5.2: Use the Periodic Table to obtain information about the properties (physical and chemical), ionization energy, and atomic sizes of the elements (*F & PK*)
- 5.2: Identify common non-metals, metalloids, and noble gases; identify the representative groups and name them (groups 1,2, 13, 14, 15, 16, 17, 18) (*T & R*)
- 5.3: Compare periodic trends of atomic radii, ionization energy, and electronegativity (T & R)

5.1: HISTORY OF THE PERIODIC TABLE

- Vocabulary
 - periodic law -- the law that states that the repeating chemical and physical properties of elements change periodically with the atomic numbers of the elements
 - periodic table -- an arrangement of the elements in order of their atomic numbers such that elements with similar properties fall in the same column
 - lanthanides -- a member of the rare-earth series of elements, whose atomic numbers range from 58 (cerium) to 71 (lutetium)
 - **actinides --** any of the series of heavy radioactive elements that extends from thorium (atomic number 90) through lawrencium (atomic number 103) on the periodic table
- Chapter Highlights
 - The periodic law states that the physical and chemical properties of the elements are periodic functions of their atomic numbers.
 - The periodic table is an arrangement of the elements in order of their atomic numbers so that elements with similar properties fall in the same column/group/family.
 - The columns in the periodic table are referred to as groups.

5.2: ELECTRON CONFIGURATION AND THE PERIODIC TABLE

- Vocabulary
 - **alkali metal --** one of the elements of Group 1 of the periodic table (lithium, sodium, potassium, rubidium, cesium, and francium)
 - **alkaline-earth metal --** one of the elements of Group 2 of the periodic table (beryllium, magnesium, calcium, strontium, barium, and radium)
 - o transition element -- one of the metals that can use the inner shell before using the outer shell to bond
 - main-group element -- an element in the s-block or p-block of the periodic table
 - halogen -- one of the elements of Group 17 (fluorine, chlorine, bromine, iodine, and astatine); halogens combine with most metals to form salts

• Chapter Highlights

- \circ $\;$ The rows in the periodic table are called periods.
- Many chemical properties of the elements can be explained by the configurations of the elements' outermost (valence) electrons.
- The noble gases exhibit unique chemical stability because their highest occupied levels have an octet (8) of electrons, ?s²?p⁶ (with the exception of helium, whose stability arises from its highest occupied level being completely filled with two electrons, 1s²).

• Based on the electron configurations of the elements, the periodic table can be divided into four blocks: the *s*-block, the *p*-block, the *d*-block, and the *f*-block.

5.3: ELECTRON CONFIGURATION AND PERIODIC PROPERTIES

• Vocabulary

- o atomic radius -- one-half the distance between the center of identical atoms that are bonded together
- o ion -- an atom, radical, or molecule that has gained or lost one or more electrons and has a negative or positive charge
- ionization -- the process of adding or removing electrons from an atom or molecule, which gives the atom or molecule a net charge
- o ionization energy, IE -- the energy required to remove an electron from an atom or ion (abbreviation, IE)
- o electron affinity -- the energy needed to remove an electron from a negative ion to form a neutral atom or molecule
- o cation -- an ion that has a positive charge
- o anion -- an ion that has a negative charge
- valence electron -- an electron that is found in the outermost shell of an atom and that determines the atom's chemical properties
- electronegativity -- a measure of the ability of an atom in a chemical compound to attract electrons

• Chapter Highlights

- The groups and periods of the periodic table display general trends in the following properties of the elements: electron affinity, electronegativity, ionization energy, atomic radius, and ionic radius.
- The electrons in an atom that are available to be lost, gained, or shared in the formation of chemical compounds are referred to as valence electrons.
- In determining the electron configuration of an ion, the order in which electrons are removed from the atom is the reverse of the order given by the atom's electron-configuration notation.

