

## II. Periodic Table

| KEY  | LINK TO APPENDIX A | MAJOR UNDERSTANDINGS   | SKILLS<br>The student should be able to:   | REAL-WORLD CONNECTIONS   |
|------|--------------------|--|--|--|
| 3.1y | II.1               | The placement or location of an element on the Periodic Table gives an indication of physical and chemical properties of that element. The elements on the Periodic Table are arranged in order of increasing atomic number.   | explain the placement of an unknown element in the Periodic Table based on its properties (3.1xvi) | <ul style="list-style-type: none"> <li>◆ similar properties and uses for elements in the same family</li> <li>◆ characteristics of a class of elements are similar</li> </ul>  |
| 3.1g | II.2               | The number of protons in an atom (atomic number) identifies the element. The sum of the protons and neutrons in an atom (mass number) identifies an isotope. Common notations that represent isotopes include:<br>$^{14}\text{C}$ , $^{14}_6\text{C}$ , carbon-14, C-14. | interpret and write isotopic notation (3.1x)   |  |
| 3.1v | II.3               | Elements can be classified by their properties, and located on the Periodic Table, as metals, nonmetals, metalloids (B, Si, Ge, As, Sb, Te), and noble gases.  | classify elements as metals, nonmetals, metalloids, or noble gases by their properties (3.1xiii)   | <ul style="list-style-type: none"> <li>◆ similar properties and uses for elements in the same family</li> </ul>  |
| 3.1w | II.4               | Elements can be differentiated by their physical properties. Physical properties of substances, such as density, conductivity, malleability, solubility, and hardness, differ among elements.  | describe the states of the elements at STP (3.1xviii)  | <ul style="list-style-type: none"> <li>◆ uses of different elements, e.g., use of semiconductors in solid state electronics and computer technology</li> <li>◆ alloys as superconductors</li> </ul>  |
| 3.1x | II.5               | Elements can be differentiated by chemical properties. Chemical properties describe how an element behaves during a chemical reaction.   |  | <ul style="list-style-type: none"> <li>◆ metallurgy</li> <li>◆ recovery of metals</li> </ul>   |
| 5.2f | II.6               | Some elements exist as two or more forms in the same phase. These forms differ in their molecular or crystal structure, and hence in their properties.   |  | <ul style="list-style-type: none"> <li>◆ different properties for each allotrope:                             <ul style="list-style-type: none"> <li>∞ oxygen gas vs. ozone</li> <li>∞ coal vs. graphite vs. diamond vs. buckminsterfullerene</li> </ul> </li> </ul> |

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| 3.1z                     | II.7               | For Groups 1, 2, and 13-18 on the Periodic Table, elements within the same group have the same number of valence electrons (helium is an exception) and therefore similar chemical properties.  | determine the group of an element, given the chemical formula of a compound, e.g., XCl or XCl <sub>2</sub> (3.1xv)           |   |
| 3.1aa                    | II.8               | The succession of elements within the same group demonstrates characteristic trends: differences in atomic radius, ionic radius, electronegativity, first ionization energy, metallic/nonmetallic properties.   | compare and contrast properties of elements within a group or a period for Groups 1, 2, 13-18 on the Periodic Table (3.1xiv) |   |
| 3.1bb                    | II.9               | The succession of elements across the same period demonstrates characteristic trends: differences in atomic radius, ionic radius, electronegativity, first ionization energy, metallic/nonmetallic properties.  |  |   |
| III. Moles/Stoichiometry |                    |   |  |   |
| 3.1cc                    | III.1              | A compound is a substance composed of two or more different elements that are chemically combined in a fixed proportion. A chemical compound can be broken down by chemical means. A chemical compound can be represented by a specific chemical formula and assigned a name based on the IUPAC system. |  | ◆ reading food and beverage labels (consumer Chemistry) |
| 3.1ee                    | III.2              | Types of chemical formulas include: empirical, molecular, and structural.   |  |   |