

# **Env. Chem A Course Objectives**

## **Unit 1: Water**

### Section A:

- Identify direct and indirect water uses, as well as examples of each.
- Describe water purification techniques.
- Describe the hydrologic cycle.
- Identify the main reservoirs of water on Earth.
- Compare the amount of water a human needs to live with the amount of water we use on a daily basis.
- Identify the difference between potable and gray water.
- Calculate a range, median, and mean (average) of a given data set.

### Section B:

- Define and identify examples of physical properties.
- Classify samples of matter in terms of elements, compounds, and mixtures.
- Interpret and create models that represent elements, compounds, and mixtures at the particulate level.
- Distinguish among different types of mixtures (solutions, colloids, and suspensions).
- Recognize, describe, explain, and distinguish among chemical symbols, formulas, and equations.
- Recognize and distinguish characteristics of the basic subatomic particles: protons, neutrons, and electrons.
- Describe what constitutes an ion.
- Indicate the electrical charge of an ion containing a specified number of protons and electrons.
- Write the formula and name of an ionic compound, given the compound's anion and cation name and electrical charge.

### Section C:

- Define the terms insoluble, unsaturated, saturated, and supersaturated.
- Quantitatively describe and predict solution variables, including concentration, volume, temperature, mass of solute, and solubility.
- Use the concept of polarity to account for water's ability to dissolve many ionic solids.
- Describe the properties, as well as health and environmental effects, of heavy metal ions (particularly lead and mercury).
- Given the pH of a solution, classify it as acidic, basic, or neutral.
- Describe the effect of intermolecular forces on a molecular substance's solubility in water.
- Interpret and explain solubility curves.
- Describe the effect of temperature and external pressure on the solubility of gaseous substances.

### Section D:

- Compare natural and municipal water purification
- Describe the problems associated with hard-water ions and the processes of softening hard water
- Assess the risks and benefits of chlorination

## **Unit 2: Resources**

### Section A

- Distinguish between chemical and physical properties and between chemical and physical changes
- Classify specific examples as either chemical or physical properties
- Classify specific examples as either chemical or physical changes

- Classify selected elements as metals, nonmetals, or metalloids based on observations of chemical and physical properties
- Use the periodic table a) predict physical and chemical properties of an element, b) identify elements by their atomic masses and atomic numbers, and c) locate periods and groups (families) of elements
- Distinguish between isotopes based on their total neutrons and/or mass numbers
- Calculate the mass number for an atom based on its total protons and neutrons
- Explain how an element's chemical and physical properties are associated with the number and arrangement of electrons in its atoms.

#### Section B:

- Describe Earth's atmosphere, hydrosphere, and lithosphere, including the distribution of resources among them.
- Describe or recognize factors that determine the feasibility of mining an ore at a specific site
- Explain why minerals of more active metals are more difficult to refine and process than minerals of less active metals.
- Define oxidation and reduction in terms of apparent electron loss or gain.
- Identify and distinguish between oxidation and reduction processes.
- Represent oxidation and reduction processes using chemical equations and electron dot structures.
- Describe three common methods for separating metals from their ores (electrometallurgy, pyrometallurgy, hydrometallurgy).

#### Section C:

- State and apply the Law of Conservation of matter.
- Relate balanced chemical equations to the Law of Conservation of Matter.
- Write and explain balanced chemical equations.
- Explain the usefulness of the mole concept in chemistry
- Calculate the molar mass of a compound, given its formula and atomic weights of its elements.
- Calculate the quantities of reactants or products involved in a chemical reaction, given its balanced chemical equation.
- Calculate the percent composition by mass of a specified element in a given compound.
- Distinguish between renewable and nonrenewable resources.
- Identify methods for conserving the Earth's resources.

#### Section D:

- Explain allotropes in terms of the bonding and arrangement of an element's atoms.
- Illustrate how alloys and their constituent elements differ in their chemical and physical properties.
- Describe how the electrical conductivity of a material can be changed.
- Describe and differentiate among methods for surface treatment of materials (coatings, electroplating, thin films).

