

SCIENCE – CHEMISTRY I

Subject: Chemistry I

Academic Standard: C.1

Academic Standard Indicator: C.1.2

Core Standard: Yes

Standard Description (Academic or Indicator): Determine the properties and quantities of matter such as mass, volume, temperature, density, melting point, boiling point, conductivity, solubility, color, numbers of moles, and pH (calculate pH from the hydrogen-ion concentration), and designate these properties as either extensive or intensive.

Suggestion for Integrating International Content: Make samples of water with differing concentrations of salt that reflect varying levels of salinity in different bodies of water around the world. Then have students calculate the density and identify the locations on a map to see if there are relationships between similarly located bodies of water.

Subject: Chemistry I

Academic Standard: C.1

Academic Standard Indicator: C.1.10

Core Standard: Yes

Standard Description (Academic or Indicator): Recognize and classify reactions of various types such as oxidation-reduction.

Suggestion for Integrating International Content: Have students study oxidation-reduction reactions by considering fireworks and their history and importance in Chinese culture. *Example:* On the fifth day of the Chinese New Year, extravagant fireworks displays are created to attract the God of Fortune.

Subject: Chemistry I

Academic Standard: C.1

Academic Standard Indicator: C.1.10

Core Standard: Yes

Standard Description (Academic or Indicator): Recognize and classify reactions of various types such as oxidation-reduction.

Suggestion for Integrating International

Content: Have students examine how iron present in clay pottery from Native Americans, ancient Greeks, and other international sources can exhibit different colors based on the oxidation number of the iron. *Example:* Iron oxide can be black or orange-red depending on the technique used to create the piece.

Subject: Chemistry I

Academic Standard: C.1

Academic Standard Indicator: C.1.21

Core Standard: No

Standard Description (Academic or Indicator): Predict how changes in temperature, surface area, and the use of catalysts will qualitatively affect the rate of a reaction.

Suggestion for Integrating International Content: Have students study the importance of catalysts in the polymerization process used to manufacture plastic. Then have them consider the global environmental impact of plastics. *Examples:* Harmful nature of plastic bags; plastic waste shipped to developing countries; harm to animals and birds by six-pack plastic rings. Then have students balance the convenience of the product with its impact on the globe. *Extension:* Have students research alternatives to plastic.

Subject: Chemistry I

Academic Standard: C.1

Academic Standard Indicator: C.1.22

Core Standard: Yes

Standard Description (Academic or Indicator): Use oxidation states to recognize electron transfer reactions and identify the substance(s) losing and gaining electrons in an electron transfer reaction.

Suggestion for Integrating International Content: Have students study oxidation-reduction reactions by considering fireworks and their history and importance in the Chinese culture. *Example:* On the fifth day of the

Chinese New Year, extravagant fireworks displays are created to attract the God of Fortune.

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.22
Core Standard: Yes

Standard Description (Academic or Indicator): Use oxidation states to recognize electron transfer reactions and identify the substance(s) losing and gaining electrons in an electron transfer reaction.

Suggestion for Integrating International Content: Have students examine how iron present in clay pottery from Native Americans, ancient Greeks, and other international sources can exhibit different colors based on the oxidation number of the iron. **Example:** Iron oxide can be black or orange-red depending on the technique used to create the piece.

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.30
Core Standard: Yes

Standard Description (Academic or Indicator): Perform calculations that demonstrate an understanding of the gas laws. Apply the gas laws to relations between pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.

Suggestion for Integrating International Content: Have students study the Gas Laws by learning about the International Balloon Fiesta which is held annually in Albuquerque, NM. Balloonists from around the world come to the event to compete; a directory and pictures of the balloons are available online. Students can do a variety of calculations and experiments to determine the effect of flying the balloon at different temperatures, altitudes, and volumes. At the same time, they can study international balloons for design elements that are unique to their countries of origin. **Suggested resource:** <http://www.balloonfiesta.com>. (See also Standard C.1.31)

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.31
Core Standard: Yes

Standard Description (Academic or Indicator): Use kinetic molecular theory to explain changes in gas volumes, pressure, and temperature (Solve problems using $pV=nRT$).

Suggestion for Integrating International Content: Have students study the Gas Laws by learning about the International Balloon Fiesta which is held annually in Albuquerque, NM. Balloonists from around the world come to the event to compete; a directory and pictures of the balloons are available online. Students can do a variety of calculations and experiments to determine the effect of flying the balloon at different temperatures, altitudes, and volumes. At the same time, they can study international balloons for design elements that are unique to their countries of origin. **Suggested resource:** <http://www.balloonfiesta.com>. (See also Standard C.1.30)

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.4
Core Standard: Yes

Standard Description (Academic or Indicator): Describe solutions in terms of their degree of saturation.

Suggestion for Integrating International Content: Have students read narratives or interview natives of different countries to determine how they prefer their coffee or tea, based on cultural preference. People in some countries prefer very “strong” (high saturation) of coffee or tea, while others prefer “weak” (unsaturated solution) coffee or tea. Students could host a tea party or coffee house with a sampling of the coffee or tea preferences from different countries.

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.42
Core Standard: Yes

Standard Description (Academic or Indicator): Describe that the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E=mc^2$) is small but significant in nuclear reactions.

Suggestion for Integrating International Content: Have students research global policies and utilization of nuclear energy and compare of how nuclear energy is perceived around the world. Have them investigate the historical impact of nuclear incidents like Chernobyl and Three Mile Island and argue for or against the use of nuclear energy. (See also Standard C.1.43)

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.43
Core Standard: Yes

Standard Description (Academic or Indicator): Calculate the amount of radioactive substance remaining after an integral number of half-lives have passed.

Suggestion for Integrating International Content: Have students research global policies and utilization of nuclear energy and compare how nuclear energy is perceived around the world. Have them investigate the historical impact of nuclear incidents like Chernobyl and Three Mile Island and argue for or against the use of nuclear energy. (See also Standard C.1.42)

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.45
Core Standard: Yes

Standard Description (Academic or Indicator): Recognize common functional groups and polymers when given chemical formulas and names.

Suggestion for Integrating International Content: Have students study the importance of catalysts in the polymerization process used in

the manufacturing of plastic. Then have them consider the global environmental impact of plastics. **Examples:** Harmful nature of plastic bags; plastic waste shipped to developing countries; harm to animals and birds from six-pack rings. Then have students balance the convenience of the product with its impact on the globe. **Extension:** Have students research alternative materials to plastic. (See also Standard C.1.21)

Subject: Chemistry I
Academic Standard: C.1
Academic Standard Indicator: C.1.5
Core Standard: Yes

Standard Description (Academic or Indicator): Describe solutions in appropriate concentration units (be able to calculate these units), such as molarity, percent by mass or volume, parts per million (ppm), or parts per billion (ppb).

Suggestion for Integrating International Content: Have students prepare and compare different concentrations of coffee from around the world. Then have them calculate the amount of caffeine in the samples and express those amounts as concentrations using units such as molarity and molality.

Subject: Chemistry I
Academic Standard: C.2
Academic Standard Indicator: --
Core Standard: No

Standard Description (Academic or Indicator): Students gain understanding of how the scientific enterprise operates through examples of historical events. Through the study of these events, students understand that new ideas are limited by the context in which they are conceived, that these ideas are often rejected by the scientific establishment, that these ideas sometimes spring from unexpected findings, and that these ideas grow or transform slowly through the contributions of many different investigators.

Suggestion for Integrating International Content: Join existing international science collaborations to do projects with other schools and use scientists and data from other countries

as resources. ***Suggested resources:***

<http://www.learner.org/>; <http://globe.gov/>.
