

# Charleston Catholic High School

**Subject: Chemistry 1**

**Total Time: Two Weeks**

Essential Question: What is energy? How can energy be classified? What is the difference between temperature and heat? What are exothermic and endothermic processes? How can we experimentally measure changes in energy? What is enthalpy? What is specific heat capacity? How can Hess's law be used to predict and calculate enthalpy changes in a series of reactions?

| Standards                   | Lesson Title  | Skills and Activities  | Assessments                | Resources               | Time   |
|-----------------------------|---|--|----------------------------|-------------------------|--------|
| SC.O.PS.2.4<br>SC.O.PII.2.3 | The Nature of Energy                                    | Students will define energy as the ability to do work or produce heat. Energy will be classified as potential or kinetic. Students will learn the formula for kinetic energy. The law of conservation of energy and state functions will be defined.   | homework                   | textbook                | 1 day  |
| SC.O.C.2.13<br>SC.O.CC.2.19 | Exothermic and Endothermic Processes;<br>Thermodynamics | The system and surroundings will be defined for a process. Reactions and processes that result in the evolution of heat or the absorption of energy from the surroundings as exothermic or endothermic. The first law of thermodynamics and the internal energy of a system will be defined. | various demos,<br>homework | textbook, lab materials | 2 days |

|  |                             |   |   |                            |        |
|--|-----------------------------|---|---|----------------------------|--------|
|  |                             |   |   |                            |        |
|  |                             |   |   |                            |        |
| SC.O.CC.2.1<br>9<br>SC.O.CII.2.12<br>SC.O.CC.2.1<br>3<br>SC.O.CC.2.9<br>SC.O.CII.1.5 | Measuring<br>Energy Changes | Define calories, Calories, and joules as units of energy. Define specific heat capacity and perform calculations involving specific heat capacity. Introduce the concept of a calorimeter as a device to determine the heat associated with a chemical reaction. Students will perform a series of three labs involving calorimetry. In the first experiment students will build a coffee cup calorimeter and determine the calorimetry constant of their coffee cup calorimeter. Students will perform three trials of measuring temperature changes involving the mixture of hot and cold water. This data will then be used to calculate the calorimeter constant of their calorimeter. In the second experiment students will be given unidentified metal pellets. The students will heat the metal pellets to one hundred degree Celsius and mix them with cold water in their calorimeter. The students will calculate the specific heat of their metal pellets using the measured mass of the water and pellets, their previous calculated calorimeter constant, and | lab, homework,<br>prelab and post<br>lab quizzes. | textbook, lab<br>materials | 5 days |

|                   |                 |  |                              |          |        |
|-------------------|-----------------|--|------------------------------|----------|--------|
|                   |                 | the temperature changes. Students will then identify the metal pellets by comparing their experimental data to a list of specific heat capacities of metals. In the third experiment, students will measure the heat flow from the reaction of equal mole amounts of strong acids and bases (neutralization reactions) and classify this process as exothermic or endothermic. |                              |          |        |
| SC.O.CII.2.1<br>1 | Thermochemistry | Define enthalpy under conditions of constant pressure. Perform calculations from a chemical equation to predict how much heat would be absorbed or released as a result of a chemical reaction. Calculate enthalpy change for reactions using Hess's law. Predict whether a reaction will be exothermic or endothermic using Hess's law.                                       | homework,<br>worksheet, Test | textbook | 3 days |

Formative Assessments: Lab reports, prelab quizzes, and worksheets.

Summative Assessments: Test

Essential Unit Vocabulary: Energy, potential energy, kinetic energy, law of conservation of energy, work, state functions, heat, temperature, system, surroundings, exothermic, endothermic, thermodynamics, first law of thermodynamics, second law of thermodynamics, internal energy, calories, Calories, joules, entropy, enthalpy, calorimeter, specific heat capacity, calorimeter, Hess's Law, driving force, energy spread, and matter spread

Instructional Resources: Introductory Chemistry, 8th Edition Steven S. Zumdahl, Donald J. DeCoste