**Endothermic and Exothermic Reaction**

|  |  |  |
| --- | --- | --- |
| **Grade/ Grade Band**: 9-12 | **Topic:** Temperature Change in Endothermic/Exothermic Reaction | **Lesson #** \_\_1\_\_\_ **in a series of** \_1\_\_\_\_ **lessons** |
| **Brief Lesson Description**:  Depends on the class size, for a typical class of 34 students, the teacher will divide students into 8 groups (heterogeneous grouping, groups students with different learning abilities together). 6 groups will use the traditional way to perform the experiment. 2 groups will use the cosmos tool kit to perform the experiment. Toward the end of the period, the teacher will hold a brief discussion on how wireless communication took place in this lesson.   |  |  |  | | --- | --- | --- | | Group # | Experiment | Description | | Group #1 &2 | Plotting Heating Curve with COSMOS tool kit. | Students will use COSMOS tool kit to plot the graph. They will be asked to talk about how they feel like using new technology to do chemistry experiment. | | Group 3,4,5,6,7,8 | Plotting Heating Curve in traditional method | Students will work in groups to plot heating curve of water. | | | |
| **Specific Learning Outcomes:**  Based on their observation, by the end of the period, students should be able to tell:  -During phase change, the temperature stays the same  - Kinetic Energy (KE) stays the same when temperature stays the same  - During melting, KE stays constant, Potential Energy (PE) increases.  - During boiling, KE stays constant, PE increases. | | |
| **Narrative / Background Information** | | |
| **Prior Student Knowledge Required:**   * Students should know what phases changes are. (melting, evaporating, deposition, sublimation, freezing, condensation). * Students should know the freezing point of water is 0 Celsius, the boiling point of water is 100 Celsius. | | |
| **Problem Solving Practices (Ex: Standards for Mathematical Practice):**  Common Core Literacy Standard   * CCSS.ELA-Literacy.RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. * Plot graph of time vs temperature and find the best fit line.   [CCSS.Math.Content.6.SP.B.5](http://www.corestandards.org/Math/Content/6/SP/B/5/)  Summarize numerical data sets in relation to their context, such as by:  [CCSS.Math.Content.6.SP.B.5.a](http://www.corestandards.org/Math/Content/6/SP/B/5/a/)  Reporting the number of observations.  [CCSS.Math.Content.6.SP.B.5.b](http://www.corestandards.org/Math/Content/6/SP/B/5/b/)  Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. | **Main Content Ideas:**  Physical Setting/ ChemistryChemistry Core Curriculum  4.2Explain heat in terms of kinetic molecular theory.  Iii qualitatively interpret heating and cooling curves in terms of changes in kinetic and potential energy, heat of vaporization, heat of fusion, and phase changes. | **Possible Multidisciplinary Concepts:** |
| **Possible Preconceptions/Misconceptions:**  Temperature is directly proportional to kinetic energy. So when kinetic energy increases as temperature increases; kinetic energy decreases as the temperature decreases. During phases change, when temperature stays the same, kinetic energy stays the same, potential energy changes. | | |
| **LESSON PLAN – 5-E Model** | | |
| [**ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions:**](http://www.youtube.com/watch?v=PUB1GU_tvpI&safe=active)  How can we explain the gaining or losing of energy when matter changes from one phase to another?  Do now:The graph below represents the heating curve of a substance that starts as a solid below its freezing point.    What is the melting point of this substance?(Circle the correct answer and explain your reason why)  (1) 30oC (2) 55oC (3) 90oC (4) 120oC | | |
| **EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:**   |  |  | | --- | --- | | Groups using COSMOS Tool Kit | Groups using traditional data collection Method | | hot plate | hot plate | | 600 mL beaker | 600 mL beaker | | ring stand | ring stand | | 200 mL of distilled water | 200 mL of distilled water | | 200 mL of ice (approximate) | 200 mL of ice (approximate) | | COSMOS tool kit with temperature probe | thermometer | | WIFI signal receiver | timer | | | |
| **EXPLAIN: Concepts Explained and Vocabulary Defined:**  **Key Vocabulary:**  Kinetic energy: *Kinetic energy* is the *energy* an object possesses due to its motion Temperature is the measure of average kinetic energy.  Potential energy: **Potential energy** is that **energy** which an object has because of its position. | | |
| **ELABORATE: Applications and Extensions:** | | |
| **EVALUATE:**  **Formative Monitoring (Questioning / Discussion):**  In this lab, we are able to use COSMOS tool kits to measure the temperature; transfer the data through wireless correction so the computer is able to process the data and plot the graph. How can we apply this concept in other areas? Turn and Talk with your elbow partner, write down at least three ideas. You will be asked to present your idea to the class.  **Summative Assessment (Quiz / Project / Report):**  Complete the lab report (post lab questions) | | |
| **Elaborate Further / Reflect: Enrichment:**  Students should analyze cooling curve in terms of potential energy and kinetic energy. | | |