**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 based on students ability of learning). 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  |
| 1&2&3 | Temperature change in baking soda/vinegar reaction  | Students will measure the temperature every 5 seconds; record the data and plot the graph.  |
| 4&5&6 | temperature change in hydrogen peroxide/yeast reaction  | Students will measure the temperature every 5 seconds; record the data and plot the graph.  |
| 7 | Temperature change in baking soda/vinegar reaction  | Students will place the temperature probe in the beaker, the teacher will show their data on the screen.  |
| 8 | temperature change in hydrogen peroxide/yeast reaction  | Students will place the temperature probe in the beaker, the teacher will show their data on the screen.  |

 |
| **Specific Learning Outcomes:** Based on their observation, by the end of the period, students should be able to explain that: * Endothermic reaction absorbs heat from surrounding , so the surrounding temperature will decrease as the reaction proceeds.
* Exothermic reaction releases heat to surrounding so as reaction going surrounding temperature will increase.
 |
| **Narrative / Background Information**  |
| **Prior Student Knowledge Required:** Students should be able to define endothermic and exothermic reaction.  |
| **Problem Solving Practices (Ex: Standards for Mathematical Practice):** * 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* 4.1 Observe and describe transmission of various forms of energy.

Distinguish between endothermic and exothermic reactions, using energy terms in a reaction equation, ∆H, potential energy diagrams, or experimental data. | **Possible Multidisciplinary Concepts:**  |
| **Possible Preconceptions/Misconceptions:** When we talk about endothermic reaction and exothermic reaction. Since endothermic reaction absorbs heat, students usually think the temperature will increase, but since we are measuring the surrounding temperature, it actually drops.  |
| **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) Circle the correct answer and explain your choice: A student observed that when sodium hydroxide was dissolved in water, the temperature of the water increased. The student should conclude that the dissolving of sodium hydroxideA)is endothermicB)is exothermicC)produces an acid solutionD)produces a salt solution |
| **EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:**

|  |  |
| --- | --- |
| Endothermic Reaction  | Exothermic Reaction  |
| Vinegar  | 3% Hydrogen Peroxide  |
| Baking Soda | Yeast  |
| measuring spoon  |  |
| graduated cylinder  |  |
| Beakers  |  |
| COSMOS tool kit with temperature probe  |  |
| Thermometer  |  |

 |
| **EXPLAIN: Concepts Explained and Vocabulary Defined:** **Key Vocabulary:** Endothermic Reaction: In an endothermic reaction, it takes more [energy](https://www.ck12.org/c/physics/energy) to break bonds in the reactants than is released when new bonds form in the products. Exothermic Reaction :In an exothermic reaction, it takes less energy to break bonds in the reactants than is released when new bonds form in the products.  |
| **ELABORATE: Applications and Extensions:** List at least 3 examples of exothermic chemical and endothermic chemical reactions that happen in your everyday life.  |
| **EVALUATE:** **Formative Monitoring (Questioning / Discussion):** 1. Based on your observation of the two experiences that we did today. How can you tell which one is an endothermic reaction and which one is an exothermic reaction?
2. Draw potential energy diagrams for those two experiments.

**Summative Assessment (Quiz / Project / Report):** 1. When an exothermic reaction occurs in a water solution, the temperature of the solution

A)increases because energy is given off by there action B)increases because energy is absorbed by the reactionC)decreases because energy is given off by the reactionD)decreases because energy is absorbed by the reaction2. In a rechargeable battery system, the discharging reaction isA)exothermic and the charging reaction is exothermicB)exothermic and the charging reaction is endothermicC)endothermic and the charging reaction is exothermicD)endothermic and the charging reaction is endothermic3. A student observed that the temperature of water increased when a salt was dissolved in it. The student should conclude that dissolving the salt wasA)involved in the formation of an acidic solutionB)involved in the formation of a basic solutionC)an exothermic reactionD)an endothermic reaction4. Given the balanced equation representing a reaction:Cu + S → CuS + energyWhich statement explains why the energy term is written to the right of the arrow?A)The compound CuS is composed of two metals.B)The compound CuS is composed of two nonmetals.C)Energy is absorbed as the bonds in CuS form.D)Energy is released as the bonds in CuS form.  |
| **Elaborate Further / Reflect: Enrichment:** How long did you take to collect the data and plot the graph for this experiment? How about groups who used wireless connection? why do you think there might be a difference between the time it took to collect data for those who used wireless connection versus those that didn’t use wireless? Discuss with your elbow partner and write down some possible ways that wireless connect could benefit your learning.  |