**Middle School STEM Science Lab/Activity Planner**

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| Name of Lab/Activity: **Calories in a peanut** | Grade: 6 |
| California Science Standard(s): (please copy and paste standards taught during this lesson)3.a. Transfer of heat. |
| Common Core Science Reading and/or Writing Standard(s): (please copy and paste standards taught during this lesson)Reading3. Follow multistep procedureWriting1.b. Support claims.7. Conduct short research project |
| Learning Objective/Goal:Students will:* Be able to demonstrate that energy can be measured and that the calorie is the unit of energy used for determining energy in the food we eat.
* Be able to relate calories to other units of energy measurement and see how conservation of energy may be quantified.
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| Language Objective/Goal: (based on California Common Core Standards) |
| Next Generation Science Standards – ): (please copy and paste any of the 8 Science and Engineering standards taught during this lesson, as well as any Cross Cutting Concepts that apply)

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| **MS-ETS1-2.** | **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** |
| **MS-ETS1-3.** | **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** |

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| Materials & Resources: **test tube, test tube holder, graduated cylinder, cork and unfolded paper clip or a needle, thermometer or a temperature probe, peanuts, matches, triple beam balance or a scale, ring stand with a clamp** |
| Procedure:This activity can be done as a demo or whole class activity.1. Measure the mass of the peanut using a balance.2. Push a needle or an unfolded paper clip into a cork.3. Stick a peanut on the other end of the needle4. Measure 10 ml of water in a graduated cylinder and pour in the test tube. Measure the temperature of water and record.5. Attach the test tube to the clamp and put it above the peanut.6. With a match, light the peanut and let it burn until it burns off. 7. immediately record the temperature. If you are using a temperature probe, you will see the gradual rise of the temperature. 8. Subtract the final temperature of water from the initial temperature. 9.Explain that a calorie is the amount of energy needed to raise the temperature of 1 ml of water, degree Celsius. Therefore, the number of calories contained in the peanut equals the number of degrees the water temperature rose. | Teaching Notes: (include timing)**1 class period** |
| Math Connection (Including CCSS Math Practice(s):**Measurement, reading temperature, calculation of the number of calories.** | Teaching Notes: |
| Technology Used to Extend Learning: **Using temperature probes to show the changes in temperature on the smart board.** | Teaching Notes: |
| Formative Assessment: (please attach a copy)**Questions for discussion about the experiment**1. How many degrees did the temperature of the water change? How many grams of water were heated? How many calories were produced in causing the temperature of the water to raise the amount it raised?Example:10 grams x 15 degree change = 150 calories2. Did all of the energy stored in the peanut go into the tube with the water? (No. Some went into the space around the tube and some of the energy was released as light energy. A calorimeter can capture nearly all of the heat from the burning material.)3. Where did the energy come from that was in the peanut? (The sun)Where did the energy come from that is in coal, natural gas, and oil? (The sun)Where did the energy come from that you used in doing this experiment? (The sun)Where does the energy in ethanol, used in gasoline, come from? (The sun. It is produced mostly from corn.)4. How many BTU's were stored in the peanut? | Teaching Notes: |
| Strategies for EL & Special Needs Students (ELD CCSS:Hands on activity with lots of visuals. | Vocabulary: -Calories, calories (notice the lower case c), BTU (is a heat energy unit used to measure large amount of energy. One --- -BTU is equal to about 251 small calories).- conservation |
| Alignment in science unit: (Brief description of lessons taught **prior to & after** this lab/activity)Prior:Photosynthesis and energy from the sun,Definition of BTUDefinition of calorie (with a lower case c): amount of heat necessary to raise the temperature of one gram of water one degrees Celsius.Definition of Calorie (with upper case C) or kilocalorie is 1000 calories. A kilo calorie is more commonly used. For example if you read that a slice of bread contains 100 Calories, it’s 100 big Calories.. |
| Brief description of lessons taught **after** this lab/activity: Following are some situations where students may see how energy measurement are used in determining energy use and conservation of energy:1. To manufacture 1 kilogram of Aluminum, 12000 Calories of energy is required. To recycle the same amount and make it ready for reuse, only 1/20 of the amount of energy is needed. ( students can calculate how much energy it takes to recycle aluminum to make one Kg of aluminum).
2. Would it take fewer BTU’s of coal to heat your home with electricity made from burning coal or to use coal directly by burning it in a furnace?
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| Lab/Activity adapted from: (website, textbook, etc.)This activity was adopted and modified from Wyoming Energy Curriculum. | Formative Assessment adapted from:This activity was adopted and modified from Wyoming Energy Curriculum. |
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| This lesson was developed by: |
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