Gold Seal Lesson:

Copernicus Education Gateway

Author(s): ***Michael Lucky Voiselle***			***Lesson Title:*** ***HOT OR COLD PACKS***			
Grade Span			***ICLE Application Model***			
K-4	***5-8***	***9-12*** ***X***	***A***	***B***	***C***	***D*** ***X***

Instructional Focus:

Writing
Students write for a variety of purposes and audiences with sophistication and complexity appropriate to the grade level.

Measurement
Students use a variety of tools and techniques of measurement in a problem-solving situation. Students communicate the reasoning used in solving these problems.

Science as Inquiry
Students demonstrate knowledge and skills necessary to perform scientific inquiry.

Science in Personal and Social Perspectives
Students apply scientific principles to personal and social

Performance Task

Your first task is to obtain a 250 ml beaker, a centigrade thermometer, a ring stand, and 15 grams of ammonium nitrate. Place the ammonium nitrate in the beaker, hang the thermometer from the ring stand, and position the thermometer approximately 1 centimeter off the bottom of the beaker. You may work in groups of 3 or 4.

Record the temperature on the thermometer. Place 125 ml of water in the beaker. Using a clock second hand, record the temperature every 15 seconds for 5 minutes. Record the times and temperature results in a well-organized data table. Plot a graph of your results. Make sure the responding variable is on the y-axis and the controlling variable is on the x-axis.

What happens to the temperature? What type of chemical reaction is this? What must happen during the reaction to produce an overall lowering of the temperature? How long is this process able to continue?

Visit a pharmacy or a sporting goods store and look at the ingredients on a cold pack. How is this cold pack produced? Are the ingredients similar to your experiment? Explain the chemical mechanism that causes an ammonium nitrate -water mixture to become cold. State the two steps in this reaction and how heat is absorbed to make it cold. How is entropy related to this cooling?

Your second task is to find a way to make a hot pack and demonstrate it to the classroom. What must happen to make a hot pack? How long will this process continue? What type of chemical reaction is this? How is entropy related to this heating? You may use any resources available to you including textbooks, encyclopedias, the Internet, and other people.

Each student must synthesize all observations, research, and knowledge gained from the experiment in a well organized, well written summary that addresses all questions and is free from spelling and grammatical errors. Conclude the summary by responding to the following two questions. Under what conditions would a person use a cold pack and why? Under what conditions would a person use a hot pack and why?

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling. (ela1)
Identify, collect and/or select pertinent information while reading. (ela5)
Use expository writing skills in subjects other than English language arts. (ela58)
Know the components and properties of the ***rectangular coordinate system***, (i.e., x - y axis, origin, quadrants, abscissa (x-coordinate) and ordinate (y-coordinate), and the general representation of a point (x,y)). (m23)
Know and apply the principles of scientific inquiry. *(Implicit in this statement are the processes of prediction, estimation, developing hypotheses, drawing conclusions, evaluation, and following ethical principles and professional procedures.) (Not Ranked s114)*
Make observations using senses and instruments. Inferences and interpretations are arrived at based on observations. Classify observable properties and organize observations in a meaningful and logical way. (s5)
Exhibit good data management skills by collecting, organizing, and graphing data. (s19)
Understand the historical development of the periodic table and apply the principles inherent in its development, including the properties and atomic structure of elements and resultant chemical compounds, the forces acting between and among atoms and molecules, and changes in substances as a result of chemical combination. (s78)

Scoring Guide:

RATE THE CRITERIA: 3=Excellent, 2=Satisfactory, 1=Unsatisfactory, 0=Does not attempt or does not understand

CRITERIA	**SCORE**
Experimental procedure and group cooperation	_____
Data table organized and neatly done	_____
Graph labeled and plotted correctly	_____
Student demonstrates an understanding of endothermic reactions and the mechanisms involved	_____
Student was able to relate entropy to the chemical mechanism in a cold pack	_____
Student demonstrates an understanding of the differences between a hot and a cold pack	_____
Students group was able to make and demonstrate a hot pack	_____
Student summary answered all questions	_____
Student summary was free from spelling and grammatical errors	_____
Student was able to relate the hot and cold packs to practical daily uses	_____

Keywords

English Language Arts	Mathematics	Science
Reading	**Algebra** **Graphs** **Manipulatives**	**Earth Science**
Writing **Spelling** **Grammar** **Expository**	**Geometry**	**Life Science**
Communications	**Statistics**	**Chemistry** **Heating** **Cooling** **Chemical Bonds** **Chemistry in Daily Life**
Literature	**Calculus**	**Physics**
Other	**Trigonometry**	**Other**
	Other	