Hand Warmer

Your Task: To produce a portable hand warmer that is self-heating.

Expectations: You will make a hand warmer with using a chemical process. Your research for this will need to use scientific evidence, from credible recourses and cite all sources. You will be working in groups of three. Each person is expected to contribute their strengths to the group and work on improving in their areas of weakness.

The Project: You will build an actual hand warmer. Make a presentation to a member of the product design class and they will give feedback on how feasible it is to produce your product.

Timeline:

		Monday	Block Day	Thursday	Friday
Week 3/10-3/14	In class	Review Limiting Reactant Quiz and Stoichiometry	Introduction to energy & First Law of Thermodynamics and difference between heat and temperature	Introduce Enthalpy; introduce project	Demos of Exothermic and Endothermic Reactions
	HW Due			SQ3R Due	List of 10 "Need to Knows"
Week 2 3/17-3/21	In class	Enthalpy in chemical Reactions	Practice Enthalpy and Investigation lab on how to measure energy in chemical reactions	Measuring energy change through Calorimetry	Calorimetry practice
	HW Due				5 "need to knows" answered
Week 3 3/24-3/28	In class	Calorimetry practice	Calorimetry lab	In class research on projects	Project proposal/Outline Due
	HW Due				
Week 4 4/7-4/11	In class	two practice experiments (write ups due)	Lab experimentation day	Lab experimentation day	Self and peer Evaluation of experiments. What needs to be improved, what went well.
	HW Due				
Week 5 4/14-4/18	In class	Rough Draft of project due	Final Experiment Day	Building the product day	Building the Product Day
	HW Due				Final Project
Week 6 4/21-4/25	In Class		Presentations	Presentations	Presentations
	HW Due				

Thermochemistry Project – Content Rubric

CATEGORY	Approaching Standard	Standard	Above Standard
Calorimetric Calculations	Theoretical calorimetric calculations are presented but they are either irrelevant or incorrect	Some appropriate and correct theoretical calorimetric calculations are presented to explain how heat should work in the product	Complete and appropriate and correct theoretical calorimetric calculations are presented to explain how heat should work in the product
Specific Heat	Specific heat is briefly discussed or only tied to the project	Specific heat is briefly discussed and tied to the project	Specific heat is thoroughly discussed and relevantly tied to the project
Enthalpy of Chemical Reactions	Demonstrates a superficial understanding of either enthalpy or chemical reactions	Demonstrates a clear understanding of either enthalpy or chemical reactions	Demonstrates a clear understanding of chemical reactions and their relationship to enthalpy
Cost analysis	Costs of few materials are included	Costs of most materials are included with a price point and demonstrate some understanding of the necessity to produce profits in relation to costs	Costs of all materials are included with a price point and demonstrate a full understanding of the necessity to produce profits in relation to costs
Chemical, Material and Environmental Safety	Provides inaccurate material and environmental safety data on few substances used in hand warmer	Provides accurate, in-depth material and environmental safety data on some of the substances used in hand warmer	Provides accurate, in-depth material and environmental safety data on all substances used in hand warmer
Marketing of Product	Marketing pitch is inadequate and highlights the few important aspects of the product or highlights unimportant aspects	Marketing pitch is directed and concise and highlights some important aspects of the product	Marketing pitch is persuasive, directed, and concise and highlights the most important aspects of the product (ie. efficiency, heating time, temperature, safety, etc.)
Research	Research and evidence is poorly documented and no references are provided for research	Research is conducted in a systematic way; evidence is partially documented and some references are provided for research. At least one peer reviewed journal is referenced.	Research is conducted in a systematic, clear, and concise way; evidence is documented thoroughly and many references are provided for research. There is more than one peer-reviewed journal referenced.
Product Design	Product is poorly constructed and does not function appropriately	Product is clean and organized and partially functions appropriately	Product is clean, organized, and well-designed (ie. functions appropriately and as expected)

Total Score: _____/200

Each section is worth up to 25points

Exemplary performance	22-25 points
Proficient performance	18-21 points
Potential performance	12-17 points
Insufficient performance	0-11 points