

Design an experiment to determine whether the reactions above are endothermic or exothermic. Your design may incorporate **qualitative** or **quantitative** data. Your group will lose ten points for any members who fail to follow safety procedures.

- A. Briefly describe your procedure. The available equipment is on your lab bench. You may use any or all of it you wish but are limited to those materials only. *\*\*detail safety precautions in your procedure*

- B. Data Table. Create a table to record any measurements and/or observations you make.

**All analysis is to be done individually.**

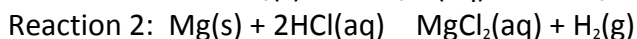
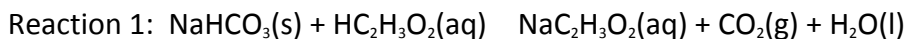
- C. Analysis

	Reaction 1	Reaction 2
Claim		
Evidence		
Reasoning		

Students work in groups of 3-4 on large whiteboards to brainstorm data collection. Depending on the level of the class, you can give them equipment or ask them to choose what equipment would be needed.

Possible equipment includes: thermometer or temperature probe (or just have them determine by touch), test tubes, test tube rack, disposable pipettes, vinegar, baking soda, Mg ribbon, and 3M HCl\*\*

\*\*try and use the most dilute HCl solution you can - students should use extreme caution when handling 3M HCl



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- A. Briefly describe your procedure. The available equipment is on your lab bench. You may use any or all of it you wish but are limited to those materials only.

Students need to observe a temperature change. They could use temperature probes, thermometers, or touch. Reactions can be carried out in a test tube – any endothermic reaction or exothermic reaction can be substituted for those listed above.

- B. Data Table. Create a table to record any measurements and/or observations you make.

Look for a decrease in temperature for reaction 1 and an increase in temperature for reaction 2.

**All analysis is to be done individually.**

**Student Misconceptions:**

- An increase in temperature comes from the reaction absorbing heat; meaning the reaction is endothermic.
- A decrease in temperature comes from a reaction releasing heat; meaning the reaction is exothermic.

If students have this misconception, review the system vs. the surroundings and energy transfer between them.

- C. Analysis

	Reaction 1	Reaction 2
<b>Claim</b>	Reaction 1 is endothermic.	Reaction 1 is exothermic.
<b>Evidence</b>	The temperature decreased (or the test tube got cold).	The temperature increased (or the test tube got hot).
<b>Reasoning</b>	The decrease in temperature results from the reaction absorbing energy from the surroundings.	The increase in temperature results from the reaction releasing energy to the surroundings.