

## Hot and Cold Reactions

### Reaction 1

1. Fill one tube up to the 1 with water.
2. Fill another tube up to the 1 with calcium chloride ( $\text{CaCl}_2$ ).
3. Place the thermometer in the water and wait 1 minute. Record this temperature in  $^{\circ}\text{C}$  at time 0 in the data table.
4. Pour the  $\text{CaCl}_2$  into the water and start the stopwatch. Stir at a consistent rate. Record the temperature every 15 seconds for 2 minute.
5. When you have finished collecting data, you may feel the outside of the tube.
6. Repeat the reaction.

Time (min)	0	:15	:30	:45	1:00	1:15	1:30	1:45	2:00
Temp. ( $^{\circ}\text{C}$ )									

Time (min)	0	:15	:30	:45	1:00	1:15	1:30	1:45	2:00
Temp. ( $^{\circ}\text{C}$ )									

### Reaction 2

1. Fill a dry tube up to the 1 with barium hydroxide ( $\text{Ba}(\text{OH})_2$ ).
2. Add ammonium chloride ( $\text{NH}_4\text{Cl}$ ) to the same tube until it is filled to the 2.
3. Place the thermometer in the tube **without stirring** and wait 1 minute. Record this temperature in  $^{\circ}\text{C}$  at time 0 in the data table.
4. Start the stopwatch and stir rapidly at a consistent rate. Record the temperature every 15 seconds for 2 minutes.
5. When you have finished collecting data, you may feel the outside of the tube.
6. Look inside the tube. You should notice a visible change. You should also note a familiar smell.
7. Dump the contents of the tube into the waste disposal under the fume hood.
8. Repeat the reaction.

Time (min)	0	:15	:30	:45	1:00	1:15	1:30	1:45	2:00
Temp. ( $^{\circ}\text{C}$ )									

Time (min)	0	:15	:30	:45	1:00	1:15	1:30	1:45	2:00
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Temp. (°C)									
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**Questions:**

1. Which reaction was exothermic? How do you know?
2. Which reaction was endothermic? How do you know?
3. Give an example of another exothermic reaction.
4. Give an example of another endothermic reaction.
5. What visible change did you notice in reaction 2?
6. What familiar smell did you notice in reaction 2?

**Opt. Extension:**

Graph the data from both of the reactions.