

How Cold Packs Work

What Happens With Chemicals:

- Two chemicals that need heat energy to react are combined to make a new substance.
- The exact amount of each chemical needed to make the new substance is used up.
- The chemicals that aren't needed for the new substance still remain.

What Happens With Heat:

- The reaction takes the heat energy that it needs from its surroundings.
- Heat transfers into the reaction from anything nearby.
- When more chemicals react, the reaction needs more heat.

Putting it all together:

- When you use the exact amount of each chemical, all of the chemicals react and the cold pack gets the coldest!



How To Engineer a Cold Pack

Materials Needed:

- Clear Plastic Zipper Baggie
- Spoon
- Thermometer

Chemicals Needed:

- Container of Baking Soda
- Container of Vinegar

Step 1: Build

Work with your partner to build and test your first prototype of a cold pack using these steps:

- We can use _____ total spoons of chemicals for each try.
- Decide how much of each chemical you will use and record it in the table on the Data Table handout.
- Make sure your baggie is clean.
- Add enough baking soda and vinegar to equal your total spoonfuls that you are using. Make sure you are using leveled spoonfuls of baking soda!

Step 2 - Test

Work with your partner to record information about what temperature your cold pack reaches.

- Put the end of the thermometer into bag and zip it closed as much as you can.
- Observe the temperature on the thermometer and feel the temperature with your hand.
- Record the temperature you observed and felt in the table on the Data Table.



Step 3: Modify

Discuss with your partner how you want to change your prototype.

- Empty your baggie and rinse with water if you need to.
- Decide how you want to change the amount of each chemical for your next test.
- Repeat Step 1 to build and Step 2 to test your modified prototype.
- Keep building and testing prototypes until you find the combination of chemicals that results in the lowest temperature.

Data Table

Record the data from your trials on the table below:

Prototype Number	Baking Soda Spoonfuls	Vinegar Spoonfuls	Coldest Temperature	Notes about how cold it feels
1				
2				
3				
4				
5				