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Introduction

It's Not Magic, It's Science!

Get your child interested in the forces of nature with *Physical Forces and Chemical Changes*, a part of the parent-friendly *Real Science – Real Fun! at Home* series. Using simple items which can usually be found around your house, you and your child can create all kinds of experiments which demonstrate the wonders of physics and chemistry. Not only will your child have fun working alone and with you to complete activities, he or she will also learn a lot about the science behind physical forces and chemical reactions. Toy with the cohesion of water, build a tiny tower of nails, race balloon rockets and much more! And as an added bonus, many of these activities come with *More Fun Ideas to Try* that will make outstanding science fair experiments. So roll up your sleeves and experiment with the laws of the universe with *Physical Forces and Chemical Changes*!



About this Series: Information for Parents and Other Helpful Adults

The *Real Science – Real Fun! at Home* series makes science accessible and enjoyable for you and your child. These activity books are great for weekends, summers, science fairs and homeschool use.

Your child can move through activities at his or her own pace. Some children will need considerable reinforcement of scientific concepts, while others will catch on quickly. But you will always be prepared to answer questions after each experiment by reviewing the *What's This All About?* section with your child. Through learning simple, fascinating explanations for each activity, your child will be amazed by the science that surrounds us.

You can easily assess how much supervision your child will need during each experiment by looking for the word *adult* in each *Stuff You Need* list. Adults are listed as a *Stuff You Need* item any time an experiment involves using knives, matches, candles, a stove or hot water, or cutting anything thicker than a cardboard tube. See *Lab Safety* on page 6 for more information.

Scientific Method

Be a scientist!

Most of the experiments in this book are planned for you; however, there are other ideas to try and plenty of activities you may think up on your own. Follow these steps when carrying out your own brilliant ideas for experiments.

1. Think of an idea.

When you perform an experiment from the *Real Science – Real Fun! at Home* books, think about what you might learn from it. Or, come up with something else you want to try, and think about what you would like to learn and how you would carry out the experiment.

2. Research your own topic.

You can get some of your research from this book, but don't hesitate to ask Mum or Dad or another obliging adult to help you search the Internet or go to the library to find out more about any of the topics in this book. You may also come up with some things to research on your own. Your ideas are probably great ones!

3. Plan your experiment.

This step means deciding what materials you will need (read *Stuff You Need*), finding a good place to conduct the experiment, asking for help when you need it and writing down the steps you will take to complete the experiment. The steps for the experiments in this book are already written for you, so if you decide to plan your own experiments, you will have examples to follow.

4. Do the experiment.

This is where you have the most fun! Roll up your sleeves and jump right in. If you did all the steps in the Scientific Method before this one, you should have a sound experiment. Just remember, if an experiment doesn't go exactly as planned, look at it as an opportunity to learn something!

5. Collect and record your data and results.

Don't forget to record what is going on. Take notes, jot down questions and think about what is really happening and why – just like a real scientist! Some experiments in this book include an Activity Sheet where you can record information. Always check to see if you need to fill out this sheet during or after each experiment.

6. Come to a conclusion.

What did you learn from the experiment? Was the conclusion what you expected or something very surprising? Don't forget to think about how you might do the experiment differently next time.

7. Always clean up!

A clean scientist is a good scientist! Make sure your work area is clean when you leave it!

Catching Ice Cubes

In winter, people use salt to melt ice on icy roads and footpaths. But, when the weather gets colder, the water freezes again anyway. Learn what this has to do with an **endothermic reaction**.



Here's What to Do

1. Try to catch the ice cube with just a piece of string and nothing else. No, you can't tie the string around the ice cube. Pretty tough to do – next to impossible, even!
2. After you have tried to catch the ice cube, lay the string on the ice cube and sprinkle a little salt on the string. Count to three and slowly lift up the string. Like magic, the ice cube is now attached!



What's this All About?

As the salt touches the water layer on the surface of the ice cube, the water dissolves the salt.

Not only does the salt dissolve, but there is also a decrease in the energy of the system. The salt uses energy to dissolve, and whenever energy is used, heat is released. This change in energy is called an **endothermic reaction**. This cooling effect causes the water to refreeze. This type of reaction also happens when you fill an ice tray with hot water and put it in the freezer. It will actually freeze faster than an ice tray full of cold water!



Stuff You Need

salt (shaker)

ice cube

string (30 cm length)