

Experiland's SELECTED SCIENCE EXPERIMENTS FOR ELEMENTARY SCHOOL

$v_f = v_i + at$

H_2O

$v = \frac{d}{t}$

$E = MC^2$

$F = ma$

$a^2 + b^2 = c^2$

$w = mg$

$\pi = 3.14159265$

11, 29, 31, 37

$M = 5.9736 \times 10^{24} \text{ Kg}$

4cm, 5cm, 90°, X

Diagram of a globe with a satellite orbiting it.

Diagram of a right-angled triangle with a 90-degree angle and sides of 4cm and 5cm.

Diagram of a circle with a radius and a chord.

Diagram of a water molecule (H₂O).

Diagram of a ball-and-stick molecular model.

Diagram of a bar chart with four bars of increasing height.

Diagram of a cube.





INTRODUCTION

Greetings fellow scientists! Welcome to the exciting exploration of the world around us...the world of science. This is a book full of fun & thought-provoking science projects and experiments that will teach you, step-by-step, how to create an exciting project that not only demonstrates good scientific practice but provides a safe and fun educational experience too! With this book you will discover that science is a part of every object in our daily lives. Who knows? Maybe someday you'll create your own fascinating inventions—or even grow up to be a rocket scientist!

You can read all the books on music and guitars in the world, but that won't make you a great guitar player. You have to actually practise with a guitar to get it right! It is easiest to figure things out by getting your hands 'dirty' by doing! Science works exactly the same way. Yes, you can learn a lot in science class or by doing homework, but there's nothing quite as much fun as learning by getting your hands dirty doing some science experiments.

Science can be real simple and is actually only about understanding the world you live in! Science certainly does not need to be complicated formulas, heavy text books and geeky guys in white lab coats with thick glasses. Doing science experiments are all about testing and getting results, even if you get a surprising result than you might not have expected. But remember, even if things don't work out as you would have hoped, a good scientist is constantly asking: Why? Science is in fact only an organized system created by people to gather and store information. We use it as a way to define and understand the world we live in!

Science experiments are an awesome part of science that allows you to engage in cool and exciting hands on learning experiences that you are sure to enjoy and remember! A short introduction to each project will help raise questions in your mind, followed by step-by-step instructions for creating your project. Finally, our conclusion and learn more sections will help you understand what your project demonstrates and how this information can answer broader questions about science.

Most of the items you will need for the experiments, such as jars, aluminium foil, scissors and sticky tape, you can find around your home. Others, such as magnets, lenses or a compass, you will be able to buy quite cheaply at a hobby shop or hardware store.

When you carry out experiments, always keep notes about the things you use (materials / apparatus), what you do (method), and what happens (observations, results and conclusion). All scientists do this. If an experiment does not work first time, don't be discouraged. Try again. You may find there is something simple you have not done. Surprisingly, by doing things wrong, you sometimes learn more than when you do things right!

TAPE NOTICE

In many of the science projects, an item known as 'sticky tape' is required in the materials list. With sticky tape, we only recommend any kind of adhesive tape which you would find most suitable to the particular experiment.

Many types of adhesive tapes are available, from: masking tape which has a paper material making it easier to tear, stick and write on; Sellotape which is stronger and is manufactured from a plastic substance, Insulation tape is often used for insulating electrical wires and can be used effectively where a waterproof bond is required. Duct tape, familiar worldwide is the strongest and most versatile of all tape types.

Have fun experimenting!



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SECRET SCRIPT

Send secret messages to your friends with your own invisible ink

CHEMISTRY > CHEMICAL ANALYSIS

RN: 11021402

SUITABLE GRADES

1 2 3 4 5 6 7 8

DIFFICULTY

1 2 3

TIME REQUIRED

< 12 Hours



ADULT SUPERVISION
REQUIRED!

STUFF YOU WILL NEED (MATERIALS):



Purple grape
juice



Baking soda



Tap water



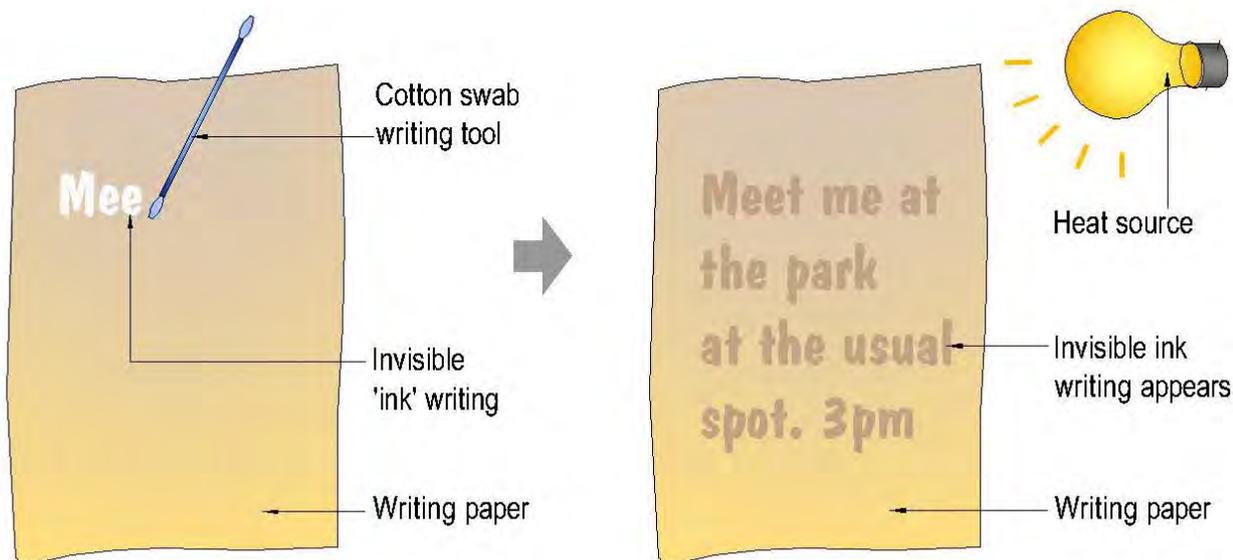
Cotton swab



White writing
paper

HOW TO PROCEED (METHOD):

Invisible ink has been used by spies and secret lovers alike for centuries to transmit hidden messages to their partners. Invisible ink isn't just something you see in James Bond movies; hundreds of liquids, from fruit juices to household liquids, to specially formulated chemicals, can be used as invisible ink. In this science experiment, become a master of 'steganography' by making your own invisible ink from baking soda and send secret messages to your friends:



1. Thoroughly mix equal parts tap water and baking soda powder in a container until dissolved.
2. Use a cotton swab or fine paintbrush to write a message onto the white writing paper, using the baking soda and water solution as invisible 'ink'. Make sure to dip the swab into the 'ink' often so that the recipient can read the message with ease.
3. Allow the 'ink' to dry out thoroughly until the writing becomes completely invisible. Your secret message is now ready to be delivered to the intended recipient.
4. One way for the recipient to read the message is to hold the paper up to a heat source, such as a light bulb, hot iron or it can even be placed in an oven. The baking soda will cause the writing in the paper to turn brown to enable the recipient to read the message!
5. A second method to read the message is to paint over the paper with purple grape juice. The message will appear in a different colour!

WHY IT WORKS (CONCLUSION):

This science experiment works because substances such as vinegar or baking soda are either mildly acidic or alkaline, and such an acid or base weakens paper. The base from the baking soda remains in the paper after the water has evaporated and the paper has dried. When the paper is then held near a heat source such as a light bulb or hot iron, the alkaline parts of the paper burn or turn brown before the rest of the paper does, revealing the message written on the paper!

If you are using the grape juice method to reveal the message, the baking soda and grape juice react with each other in an acid-base reaction, producing a colour change in the paper to enable the recipient to read the secret message. Grape juice concentrate results in a more visible colour change than regular grape juice.

There are many other household liquids that can be used to make invisible ink. Using the heat method, you can also use white wine, vinegar, apple juice, and even milk!



LEARN MORE:

Did you know that during world war I and II, prisoners of war used their own sweat and saliva as invisible ink to sneak messages out of their cells?

GLOSSARY:

Invisible ink

A substance used for writing, which is invisible either on application or soon thereafter, and which can later on be made visible by some means.

Steganography

The art and science of writing hidden messages in such a way that no one, apart from the sender and intended recipient can see or read it.

NOTES:



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MAKING THE CUT

Cut through ice with a string

EARTH SCIENCE & ASTRONOMY
> ENVIRONMENTAL SCIENCE
RN: 10102001

SUITABLE GRADES

1 2 3 4 5 6 7 8

DIFFICULTY

1 2 3

TIME REQUIRED

< 12 Hours



ADULT SUPERVISION ADVISED

STUFF YOU WILL NEED (MATERIALS):



Wine bottle



Wine cork



String



2x Spoons



Block of ice

HOW TO PROCEED (METHOD):

Water is a remarkable substance and no living being on earth can survive without it. Water in its solid form or 'ice' can be especially interesting. Ice is formed when liquid water cools down to '0' degrees °C, its 'freezing point. Let's see what happens when concentrated 'pressure' is being applied to ice in the following science experiment:



1. Push the cork of a wine bottle only slightly in so that about 25mm is visible above the mouth of the bottle.
2. Obtain a large, square ice cube from the freezer and balance it on top of the wine cork.
3. Cut a piece of thin, strong 'string' of about 300mm and tie each end to a heavy spoon or other weight.
4. Hang the string with the 'weight' on either side over the centre of the ice cube and put the bottle in the refrigerator.
5. Remove the bottle after a few hours and you will notice that the string has cut through the ice without dividing it in two pieces!

WHY IT WORKS (CONCLUSION):

This science experiment works because the 'pressure' of the string applied to the block of ice, causes the ice to melt just below it. Pressure creates 'heat' causing water to form under the string and it slides down through the ice with the help of the spoons or weights on either side of the string, pulling it down. The ice freezes again just above the string as the string slides down.



LEARN MORE:

Similar to this experiment, the same phenomenon happens when people skate on ice at the ice ring. The skater's weight presses on the ice and makes it melt under the blades of the skates. The layer of water helps the skates to glide over the ice. The water freezes again afterwards.

GLOSSARY:

Freezing point

The temperature at which a liquid changes state and forms a solid.

Ice

Water frozen in the solid state.

Pressure

The force applied to a unit area of surface often measured in Pascals (SI unit) eg. "the compressed gas exerts an increased pressure"

$$\text{Pressure} = \text{Force} / \text{Area}$$

NOTES:



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STROKE OF LUCK!

Make steel objects magnetic by stroking them with a permanent magnet

ELECTRICITY & MAGNETISM >
MAGNETISM
RN: 11011902

SUITABLE GRADES

1 2 3 4 5 6 7 8

DIFFICULTY

1 2 3

TIME REQUIRED

< 12 Hours



ADULT SUPERVISION
ADVISED

STUFF YOU WILL NEED (MATERIALS):



Bar magnet



Iron nail



Iron filings



Sandwich bag



Pencil



Paper

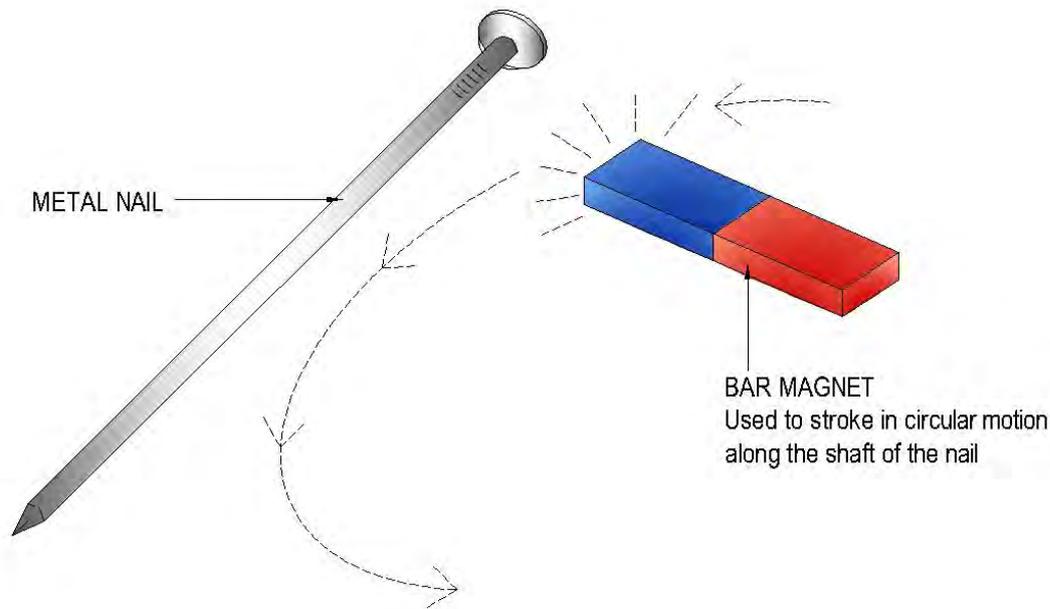


Kitchen scale

HOW TO PROCEED (METHOD):

Although only temporary, any metal object that is touched with a magnet becomes magnetic itself and can attract other metal items which then also becomes magnetic. As soon as the first object is no longer in contact with the magnet, all the steel objects loses their magnetic properties.

A piece of steel or steel nail can also be turned into a 'permanent' magnet by stroking it several times with another strong permanent magnet as you will see in the following science experiment:



1. Hold the iron nail on a flat surface; then with the north end of a strong bar magnet stroke the iron nail from the head towards the end multiple times. Make sure that you raise the magnet clear of the nail at the end of each stroke and come back down to the head of the nail in a circular motion. Continue this motion for about 50 strokes and the nail should be a little magnetised.
2. Place the magnetized nail into a small sandwich bag and hold the plastic of the bag tight over the nail.
3. Pour some iron filings onto a piece of paper and dip the nail into the filings.
4. Slowly lift the bag with the iron filing sticking to the nail and measure the weight of the filings with a sensitive (grams) kitchen scale. Use pen and paper to record your findings in a chart.
5. Remove the filings from the scale and do not use it again as it might have become magnetised and would influence the accuracy of the rest of the results.

6. Now, stroke the nail about 50 more times as in 'step 1' and repeat the dipping, weighing and recording of the results as in 'step 3 & 4'.
7. Repeat these steps several times for strokes of 200 as well as 500 times and keep on charting the results.
8. Examine the data recorded and notice that the more the nail is stroked the stronger it becomes!

WHY IT WORKS (CONCLUSION):

A magnet is a metal object of which its electrons are lined up so that it can attract other pieces of ferrous (metal) objects. Certain metals have a structure that allows their electrons to more easily line up and form a magnetic field. Iron, nickel and cobalt are the easiest metals to magnetize by stroking with a permanent magnet. The longer the nail in this science experiment is stroked by the permanent magnet, the more electrons in the metal are lined up and the stronger the magnetic field it produces. The longer any piece of metal is stroked by a magnet the stronger a magnet the metal piece will become, but it can never become stronger than the original magnet!



LEARN MORE:

A magnet is any object that has a magnetic field. It attracts ferrous objects like pieces of iron, steel, nickel and cobalt. Magnetite is an iron oxide that is regularly found in nature with a strong magnetic field. Such samples of magnetite are called lodestones. In the early days, the Greeks observed that the naturally occurring 'lodestone' attracted iron pieces. From that day onwards began the journey into the discovery of magnets. Modern theories propose that the lodestones were magnetized by lightning strikes. Magnetite's crystalline structure allows large groups of molecules to all have the same polar orientation or direction, allowing for its strong magnetic field.

GLOSSARY:

Magnetism

The force of attraction or repulsion of a magnetic material due to the arrangement of its atom. A magnet is a metal object that attracts pieces of ferrous (metal) objects.

Ferrous

Of or relating to or containing iron. Metals that contain iron as the major alloying element.



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AIR FORCE ONE

Study the powerful force of air pressure

PHYSICS > AIR PRESSURE

RN: 10102803

SUITABLE GRADES

1 2 3 4 5 6 7 8

DIFFICULTY

1 2 3

TIME REQUIRED

< 12 Hours



ADULT SUPERVISION ADVISED

STUFF YOU WILL NEED (MATERIALS):



Wooden ruler



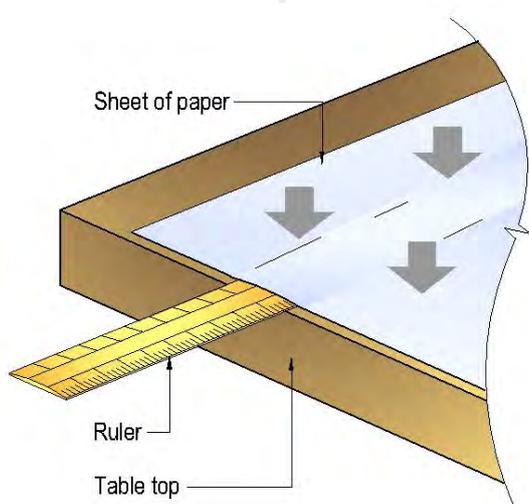
Large sheet of paper



Table top

HOW TO PROCEED (METHOD):

Air pressure is a very powerful force. Let us prove how powerful air pressure can be with the following simple science experiment:



1. Lay a wooden ruler over the edge of a table so that about $\frac{1}{3}$ of it lies over the edge.
2. Spread a large piece of paper over the ruler to the edge of the table.
3. Now, hit the ruler to try and make the paper fly up into the air. You might be surprised that this is quite impossible! Don't hit the ruler too hard – it might break or you might hurt your hand.

WHY IT WORKS (CONCLUSION):

The weight or 'pressure' of the air presses down on the sheet of paper. Because it is a large piece of paper, there is a lot of air pushing down on it. This is enough pressure to prevent the ruler from lifting up the paper in one blow.



LEARN MORE:

Can you believe that the weight of the air present in a large room of your house could weigh about 70kg or as much as a person!

GLOSSARY:

Air pressure (Atmospheric pressure)

Air pressure is the weight of the atmosphere pressing down on the earth. It is measured by a barometer in units called millibars.



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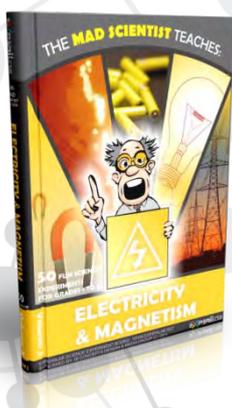
OTHER SCIENCE E-BOOKS BY EXPERILAND:

THE MAD SCIENTIST SERIES:

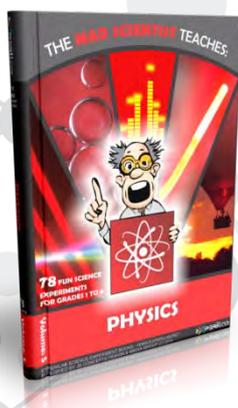
**Volume 1 – The Mad Scientist teaches:
Chemistry [50 projects]**



**Volume 3 – The Mad Scientist teaches:
Electricity & Magnetism [50 projects]**



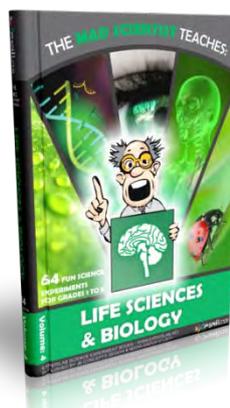
**Volume 5 – The Mad Scientist teaches:
Physics [78 projects]**



**Volume 2 – The Mad Scientist teaches:
Earth science & Astronomy [58 projects]**



**Volume 4 – The Mad Scientist teaches:
Life sciences | Biology [64 projects]**



NOTE:

This e-book series are suitable for elementary & middle school science enthusiasts (grades 1 to 8) Projects take from only few hours, up to weeks to complete.



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OTHER SCIENCE E-BOOKS BY EXPERILAND:

FUN & EASY SCIENCE PROJECT SERIES:

Volume 1 – Fun & Easy Science projects: Grades 1 & 2



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for grades 1 & 2

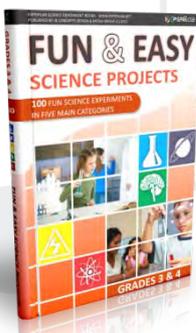
PROJECTS:

60 Fun science experiments [121 PAGES]

TIME REQUIRED:

From only few hours, up to weeks to complete.

Volume 2 – Fun & Easy Science projects: Grades 3 & 4



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for grades 3 & 4

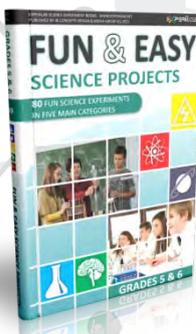
PROJECTS:

100 Fun science experiments [215 PAGES]

TIME REQUIRED:

From only few hours, up to weeks to complete.

Volume 3 – Fun & Easy Science projects: Grades 5 & 6



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for grades 5 & 6

PROJECTS:

80 Fun science experiments [186 PAGES]

TIME REQUIRED:

From only few hours, up to weeks to complete.

Volume 4 – Fun & Easy Science projects: Grades 7 & 8



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for grades 7 & 8

PROJECTS:

60 Fun science experiments [149 PAGES]

TIME REQUIRED:

From only few hours, up to weeks to complete.



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OTHER SCIENCE E-BOOKS BY EXPERILAND:

LAST MINUTE SCIENCE EXPERIMENT SERIES:

Volume 1 – Last Minute Science experiments: 12 Hours & Counting...



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for elementary & middle school science enthusiasts (grades 1 to 8)

PROJECTS:

150 Fun science experiments [300 PAGES]

TIME REQUIRED:

From only few hours, up to about 12 hours to complete.

Volume 2 – Last Minute Science experiments: A Day or Two Remains...



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for elementary & middle school science enthusiasts (grades 1 to 8)

PROJECTS:

100 Fun science experiments [220 PAGES]

TIME REQUIRED:

Science experiments take a few hours up to a day or two to complete.

Volume 3 – Last Minute Science experiments: Due in a Week or More...



SUBJECTS COVERED:

Chemistry, Earth sciences, Electricity & Magnetism, Life sciences, Physics

GRADES:

Suitable for elementary & middle school science enthusiasts (grades 1 to 8)

PROJECTS:

50 Fun science experiments [122 PAGES]

TIME REQUIRED:

Science experiments take a week or more to complete.



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