Properties & Changes of Materials

Year 5

Working Scientifically: Planning an Investigation
Welcome!

Properties & Changes of Materials – Planning an Investigation

Here you will find all you need for delivering this Programme of Study in your Year 5 class. This Programme of Study consists of an initial assessment lesson, followed by 8 practical science lessons, and a final assessment lesson.

The lesson plans provide you with National Curriculum coverage, suggested classroom organisation, key questions and vocabulary and a list of the resources you need for every lesson.

Make sure you download the PowerPoint at www.empiribox.org to support your lesson, where you will find further information such as common misconceptions, examples of how the children can record their learning and the subject knowledge you will need.

If you find you need any help with any of the investigations, or if you just want to have a chat about Science, please get in touch at

support@empiribox.org

We hope you and the children thoroughly enjoy learning about Properties & Changes of Materials

Properties & Changes of Materials: Planning an Investigation: Year 5 Lesson 3
Empiribox
November 2018
# National Curriculum Properties & Changes of Materials

In the National Curriculum, all objectives relating to this Programme of Study can be found within the Year 5 Programme of Study. The Working Scientifically objectives are taken from the Upper Key Stage 2 Programme of Study. This table details the complete coverage of the National Curriculum provided by this Programme:

<table>
<thead>
<tr>
<th>National Curriculum Objective</th>
<th>Science Subject Knowledge</th>
<th>Working Scientifically</th>
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</thead>
</table>
| **Lesson 2**                  | compare and group together everyday materials on the basis of their properties, including thermal conductivity.  
  give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. | planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. |
| **Lesson 3**                  | compare and group together everyday materials on the basis of their properties, including electrical conductivity and response to magnets.  
  give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. | planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. |
| **Lesson 4**                  | compare and group together everyday materials on the basis of their properties, including their hardness, and transparency.  
  give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. | planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. |
<p>| <strong>Lesson 5</strong>                  | compare and group together everyday materials on the basis of their properties, including their solubility. | planning different types of scientific enquiries to answer questions, including recognising and controlling variables. |</p>
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<tbody>
<tr>
<td><strong>Lesson 6</strong></td>
<td>demonstrate that dissolving and changes of state are reversible changes</td>
<td>planning different types of scientific enquiries to answer questions, including recognising and controlling variables</td>
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<td></td>
<td>describe how to recover a substance from a solution</td>
<td>where necessary</td>
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<tr>
<td><strong>Lesson 7</strong></td>
<td>demonstrate that mixing is a reversible change</td>
<td>planning different types of scientific enquiries to answer questions, including recognising and controlling variables</td>
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<td></td>
<td>use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</td>
<td>where necessary</td>
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<td><strong>Lesson 8</strong></td>
<td>explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning</td>
<td>planning different types of scientific enquiries to answer questions, including recognising and controlling variables</td>
</tr>
<tr>
<td><strong>Lesson 9</strong></td>
<td>explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with the action of acid on bicarbonate of soda</td>
<td>planning different types of scientific enquiries to answer questions, including recognising and controlling variables</td>
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Health and Safety

Please login to the Empiribox staffroom to download the assessments and guidance, or click on the links below:

- Risk Assessments
- Equipment Safety Data Sheet

Please read, sign and date the Risk Assessment;
The magnetic wand contains a neodymium magnet which is powerful. Those with pacemakers or cochlea implants should avoid using them;
Beware of pinching between magnets and the objects attracted to them;
Have care when handling the copper and iron nails as they may cause cuts.

Knowledge Learning Objective

National Curriculum: compare and group together everyday materials on the basis of their properties, including electrical conductivity and response to magnets
give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
I understand that all materials can be either a conductor or an insulator. I understand that electrical energy travels through conductors and can talk about everyday uses of conductors and insulators.
I can explain that some materials are magnetic, and others are not, and explain what that means.

Working Scientifically Learning Objective

National Curriculum UKS2: planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
I can plan a fair test by listing a range of dependent and independent variables

Resources

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key vocabulary/questions</th>
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<tbody>
<tr>
<td>Crocodile Leads</td>
<td>Electrical Energy</td>
</tr>
<tr>
<td>Bulb Holders</td>
<td>Conductor</td>
</tr>
<tr>
<td>Bulbs</td>
<td>Insulator</td>
</tr>
<tr>
<td>Materials Collection – Electricity</td>
<td>Magnet</td>
</tr>
<tr>
<td>AA Batteries</td>
<td>Independent/Dependent Variables</td>
</tr>
<tr>
<td>AA Battery Holders</td>
<td></td>
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<tr>
<td>Large Bowl (See starter kit)</td>
<td>1kg Rice</td>
</tr>
<tr>
<td>Washers</td>
<td>Iron Nails</td>
</tr>
<tr>
<td>Shredded materials</td>
<td>Marble</td>
</tr>
<tr>
<td>Copper Nails</td>
<td>Magnetic Wand</td>
</tr>
<tr>
<td>Blue/Red coated Magnets</td>
<td>Electrical Conductors Cards</td>
</tr>
</tbody>
</table>

*Not provided: Plastic Bottles, 4 small bowls

Why do some materials conduct heat and electricity and other materials do not??

Why is it important to know which materials conduct electricity and heat, and which are insulators?

Why would it matter if a scientist didn't think about the variables in their investigation?
Main Lesson

This lesson is divided into 3 Labs. It is recommended that children work in mixed ability pairs, and that they circulate around the Labs during the lesson (approximately 15-20 minutes at each Lab).

During this lesson, we recommend that the teacher is stationed at Science Lab A to support learning as appropriate. If another adult is available, we recommend that they facilitate learning by circulating around the classroom, extending conversations through questioning, targeting children for assessment, taking photographs for evidence and recording direct quotes from the children which demonstrate understanding for evidence of learning.

Science Lab A: Electrical Conductors and Insulators (Teacher Activity)

**You will need:** Crocodile Leads, Bulbs, Bulb Holders, AA Batteries, AA Battery Holders, Materials Collection – Electricity

In this activity the children will work in groups of 4 – 6 to learn about electrical conductors and insulators. They will be able to find out which material conducts electrical energy the best, and which is the best insulator of electrical energy. They will talk about possible everyday uses for both electrical conductors and insulators.

**Method:**
1. Make a simple circuit with the bulb, bulb holder, battery, battery holder and crocodile leads. The bulb should light up.
2. Choose one of the materials to add in to the circuit. You will need another crocodile lead to do this. Make a prediction about whether you think it will allow electricity to pass through it or not.
3. In a table, record the material and whether it is a conductor or an insulator.

Working Scientifically: Variables in Science Lab A

Here are some of the independent and dependent variables for the investigation in Science Lab A:
The type of material being tested, the thickness/width/length of the material, the number of batteries in each circuit, the voltage of the batteries, Brightness of Bulb; whether the bulb lights up or not

Science Lab B: Magnetic Materials

**You will need:** Large Bowl, Rice, Washers, Iron Nails, Copper Nails, Marbles, Shredded Materials, Magnetic Wand, Rec/Blue Coated Magnets; and 4 small bowls (not included)

In this activity the children will work in groups of 4 – 6 to learn about magnetic materials. They will be able to find out which materials are magnetic, and which are not. They will talk about possible everyday uses for both magnetic and non-magnetic materials.

**Method:**
1. Mix the rice, washers, iron nails, copper nails, marbles and shredded materials together.
2. Using the magnets, separate the mixture by taking out any materials which are magnetic and putting them in separate bowls.
3. The rice, shredded materials, copper nails and marbles are not magnetic, so they will not be able to use the magnets to extract them.
4. The washers and iron nails are magnetic, so they will be able to take them out of the bowl using the magnets.
5. As an extension, you could ask the children to find and record (either in a table or by taking...
Science Lab C: Electrical Conductors

**You will need** Electrical Conductors information Card; Tablets/iPads

In this activity the children will work in pairs to find out about everyday uses of electrical conductors and insulators.

**Method:** Read the information on the cards to find out about Electrical Conductors. You could also research electrical conductors and insulators on your tablets/iPads. You could ask the children to create posters or fact files about electrical conductors and insulators, or you could ask them to design a product, labelling materials, featuring electrical conductors and/or insulators (such as televisions, microwaves, Play stations etc.).

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**Mastery opportunity**

Joseph makes a circuit. He connects a battery to a bulb, but the bulb doesn't light up. Could you suggest some reasons why the bulb might not light up? Draw pictures to help you explain and give reasons for your answer using what you know about electrical conductors and insulators.

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**Common Misconceptions**

- All non-metals are poor conductors of electricity – carbon (graphite) is a good conductor of electricity
- Only solids conduct electricity – liquids conduct electricity too, and there would be no lightning without air!

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**Cross-Curricular Links**

**English:** Write an information leaflet about conductors and insulators of electricity and their uses. Write a safety instruction poster for anyone working with electricity.

**History:** Research Magnetite and the Ancient Greeks

**Art:** Create a magnetic painting: Place a piece of paper on a thin tray. Dip some ball bearings in paint. Move the ball bearings around by putting the magnets underneath the tray and moving them in different directions.