ELEMENTARY EXPERIMENTS IN MAGNETISM & ELECTRICITY

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ELEMENTARY EXPERIMENTS

IN

MAGNETISM & ELECTRICITY

INTENDED FOR THE USE OF JUNIOR PUPILS IN SCIENCE CLASSES

BY

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SECOND EDITION

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PREFACE.

IN writing this small Elementary Text-Book, the Author has followed the lines laid down in a "List of Experiments in Physics," written by Dr. Guthrie, and published some twelve months ago by the Science and Art Department of the Committee of Council on Education. The Author's primary object has been to supply the Junior Pupils of his own classes with a book suited to their age and attainments; but it is, at the same time, his hope that it may also prove useful in the hands of others commencing the study of Magnetism and Electricity. For some valuable hints as to the classification of examination questions given at the end of the book, the Author is indebted to the Rev. D. Balsillie, M.A., House Governor of Donaldson's Hospital, Edinburgh.

January 1879.

MAGNETISM.

Definition of term. By the term **Magnetism** is understood that property possessed by iron, steel, and some other bodies, by virtue of which other pieces of iron and steel are attracted to them.

Derivation of word. Magnetism is derived from the name Magnesia, a town in Lydia, where natural magnets were stated by ancient writers to abound.

The Natural Magnet, or Loadstone, is an ore of iron every molecule or smallest particle of which is composed of three atoms of iron combined with four atoms of oxygen gas. Its chemical name is Triferric Tetroxide, and its chemical formula Fe_3O_4, *ferrum* being the Latin name for iron. This loadstone or natural magnet has the power of attracting small pieces of iron, and if balanced and suspended will point nearly north and south, like an artificial magnet. It has also the power of conferring magnetism upon pieces of steel if rubbed along one of its ends a few times.

Artificial Magnets are pieces of iron or steel which have been under the action of either the loadstone or other magnets, or of the electric current, or have been subjected to percussion while in certain positions.

Permanent Magnets are those magnets which

retain their magnetic properties permanently. They are bars of hard steel, either straight or bent in the form of a horseshoe.

Temporary Magnets are those which retain their magnetism only so long as they are under the influence either of other magnets or of the electric current. They are bars of soft iron, either straight or bent.

Magnetic Polarity is that property possessed by a magnet, by virtue of which it points towards the earth's poles when freely suspended.

Poles of a Magnet are its two points of greatest attraction and repulsion. They are near the two ends.

Equator of a Magnet, an imaginary line drawn across a magnet, joining all points where attraction and repulsion are equal. As a rule, this line divides the magnet into two equal parts; or, in other words, it is drawn across the middle of the magnet.

MAGNETIC POLARITY.

Experiment 1. Take off the keeper or armature of a horseshoe magnet; balance it by tying a thread round its middle, and suspend it. It comes to rest nearly north and south. Call the end pointing north the north-seeking pole, and that pointing south the south-seeking pole. Take a strip of steel which has been rendered magnetic by discharging a Leyden battery across it, and suspend it in the same manner. It will also come to rest nearly north and south.

Experiment 2. To show that unlike poles attract and like poles repel one another.

Holding the magnetized strip by its thread, bring its north-seeking end to the north-seeking end of the armature; it will be **repelled.** Again, bring the south-seeking end of the strip to the north-seeking end of the keeper; **attraction** will now take place.

Experiment 3. Suspend two magnetized strips of steel with **like** poles adjacent, that is, N. pole to N. pole and S. pole to S. pole. The strips will **repel** one another. Now suspend them with **unlike** poles adjacent, and they will now **attract** each other.

Experiment 4. To show that the poles are near the two ends. Scatter iron filings over a magnet, and they will cluster most abundantly around the two ends, showing that the points of greatest attraction are there.

Experiment 5. To find out which is the north and which the south pole of a magnet. Bring one end of the magnet to be tested near the N. pole of a suspended magnetic needle. If it be attracted, that end is a S. and the other a N. pole; if it be repelled, the repelling end is a N. and the other a S. pole.

DISTRIBUTION OF MAGNETISM IN A MAGNET.

Experiment 6. To magnetize a strip of steel. Draw it from end to end several times over one of the poles—say the N. pole—of a strong permanent magnet. The strip will be magnetized, the end which last leaves the N. pole of the magnet becoming a S. pole.

Experiment 7. To show that the smallest