A03-500S-Y01

Electromagnetic Demonstration Kit

I. Table of content

II. Instrument

No	Name	Amount
1	Plug-in Breadboard	1
2	Straight Connecting Lead	5
3	L-type Connecting Lead	4
4	T-type Connecting Lead	4
5	Galvanometer	1
6	Solenoid (480 turns, 720 turns, 960 turns)	3
7	Iron Rod	3
8	Single Loop Coil	1
9	Spiral Coil	1
10	Conductor of Electromagnetic Effect	1
11	Conductor of Ampère's Right-hand Rule	1
12	Loop of Ampère's Right Opening Plum Rule	1
13	Loops of Electric Motor and Electric Brush (with Hand-Crank)	1
14	Compass	3
15	Acrylic Plate	1
16	Rod Magnet	2
17	U-type Magnet	1
18	U-type Magnet Support Base	1
19	Coil for Lenz's Law	1
20	Cylinder Mounting Rod	1
21	Rod Magnet Support Base	1
22	Magnetic Field Demonstrator	1
23	Parallel Track	1
24	Hydraulic 3-dimensional Magnetic Field Demonstrator	1
25	Sample Rods	5
26	Paper Clip	5
27	Storage Case	1
28	Switch	1
29	Battery Holder	1
30	Hand-Crank	1

				
1	**2**	**3**	**4**	**5**

				
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		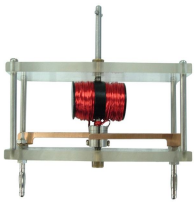		
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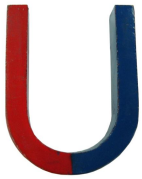
				
16	17	18	19	20
				
21	22	23	24	25
26	27	28	29	30

Experiment 1, What Substances Can Be Attracted by Magnet?

I. Purpose

Realize characteristic of magnet and what substances can be attracted.

II. Instrument

17	U-type Magnet	1
25	Sample Rods	5

III. Purpose

There are two poles on a magnet: the north and south poles. All of us understand that like poles attract and unlike poles repel, so the north and south poles attract each other; it is repulsive for north to north pole and south to south pole. Magnet is capable of magnetizing the substance which contains iron, and then the substance becomes a temporary magnet, so it can be attracted by magnet.

IV. Procedure

1. Hold one of the extremities of the U-type Magnet.
2. In **Figure 1**, use the U-type Magnet to touch the copper, plastic, aluminum, stainless steel (also known as inox or inox steel) and iron rod.
3. Observe the phenomenon and note down the result.

Figure 1

V. Discussion

Substance / Attraction	Copper rod	Plastic rod	Aluminum rod	Stainless steel	Iron rod
Yes					
No					

1. Describe why those rods can be attracted by the magnet?
2. If switching both of the extremities of the U-type Magnet, will the result be the same? Why?

Experiment 2, What Is the Difference between Both of the Poles of Magnet?

I. Purpose

Understand the difference and how to identify both of the poles of magnet.

II. Instrument

14	Compass	3
16	Rod Magnet	2

III. Principle

We can regard a Compass as a small magnet which is always pointing to the north and south poles on Earth (So, the magnetic north and south poles exist on the Compass as well). In this experiment, “like poles attract, unlike poles repel” is the characteristic of magnet to identify both of the poles of magnet.

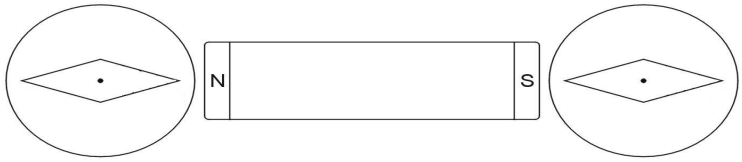
IV. Procedure

1. Place two Compasses and make an approximate ten-centimeter space in between.
2. Place a Rod Magnet between two Compasses which can be shown as **Figure 2**.
3. Observe the phenomenon and note down the result.

Figure 2

V. Discussion

The direction where the Compass points before placing a Rod Magnet. (The red part is presented as the north pole.)	

The direction where the Compass points after placing the Rod Magnet. (The red part is presented as the north pole.)	

1. Why does a Compass always point to North and South Poles of Earth?
2. In the experiment, if switching both of the extremities of the Rod Magnet, will the Compass point to the same direction? Why?

Experiment 3, How to Strengthen Magnetic Intensity?

I. Purpose

Comprehend the diverse combinations cause different magnetic intensities.

II. Instrument

7	Iron Rod	3
16	Rod Magnet	2

III. Theory

The magnetic line of magnet starts from the north to south poles. If placing two Rod Magnets side by side to attract each other (the north to south pole or the south to north pole), some parts of lines will directly begins from the north to south poles. However, if placing two Rod Magnets side by side to repel each other (the north to north pole or the south to south pole), in that case, both of Rod Magnets can be regarded as a much powerful Rod Magnet, and the intensity of magnetic lines of it is larger than the ones being placed to attract each other.

IV. Procedure

1. Attract an Iron Rod with a Rod Magnet as **Figure 3**, and note down how many magnets it is competent to attract the most.
2. Make two Rod Magnets attracted each other, which is displayed as **Figure 4**, and note down how many magnets they are able to attract the most.
3. Have two Rod Magnets repelled each other, which is demonstrated as **Figure 5**, and note down how many magnets both of them are capable of attracting the most.

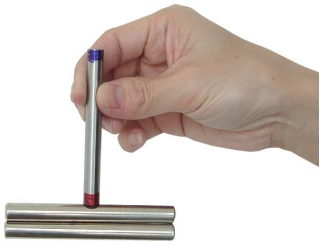


Figure 3

Figure 4

Figure 5

V. Discussion

Rod Magnet / Iron Rod	One	Attractive	Repulsive
Amount			

1. Draw the magnetic lines under three circumstances.

Experiment 4, Magnetic Lines Formed by the Rod Magnet.

I. Purpose

Observe the magnetic line when placing two magnets in different approaches.

II. Instrument

16	Rod Magnet	2
22	Magnetic Field Demonstrator	1
23	Parallel Track	1

III. Theory

Actually, the magnetic line indicates the direction of magnetic force which the north pole receives in the magnetic field, and it is a closed and smooth line as well. Outside the magnet, the magnetic line begins from the north to south poles; in the internal magnet, the magnetic line starts from the south to north pole. Magnetic lines do not cross; the closer that they gather, the more powerful magnetic field that magnet makes, and vise versa.

IV. Procedure and result

A. Place the north pole of a magnet towards the north pole of the other.

1. Lightly knock the Magnetic Field Demonstrator, and have the internal magnetic needles ranked in order automatically.
2. Make both of the Rod Magnets ranked in repulsive order (the north to north pole or the

south to south pole), and put them on the Magnetic Field Demonstrator, which can be expressed as **Figure 6**. Please draw the magnetic lines in **Figure 7**.

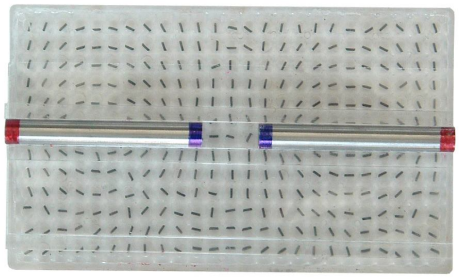


Figure 6 **Figure 7**

3. If both of the Rod Magnets approach each other, what will the magnetic line vary?

B. Place the north pole of a magnet towards the south pole of the other.

1. Lightly knock the Magnetic Field Demonstrator, and have the internal magnetic needles ranked in order automatically.
2. Make both of the Rod Magnets ranked in attractive order (the north to south pole or the south to north pole), and place them on the Magnetic Field Demonstrator, which is present as **Figure 8**. Please draw the magnetic lines in **Figure 9**.

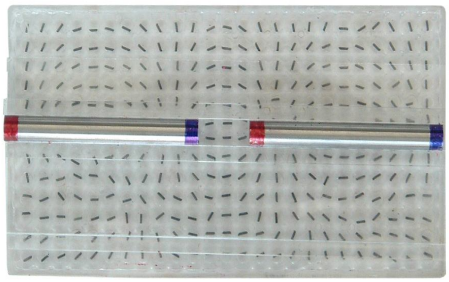


Figure 8 **Figure 9**

3. If both of the Rod Magnets are removed from each other, what will the magnetic lines change?

C. Align the north pole of a magnet and the south one of the other.

1. Lightly knock the Magnetic Field Demonstrator, and make the internal magnetic needles ranked in order automatically.
2. Align Rod Magnets in attractive order (the north to south pole or the south to north pole), and place them on the Magnetic Field Demonstrator, which is demonstrated as **Figure 10**. Please draw the magnetic lines in **Figure 11**.

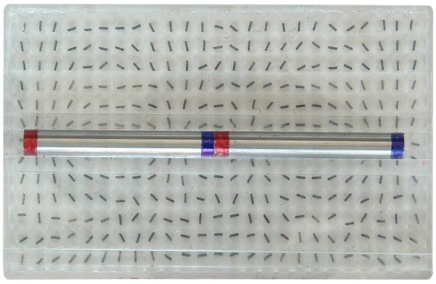
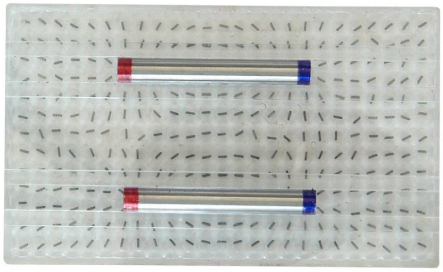


Figure 10 **Figure 11**

3. What is the difference of the magnetic lines with connecting and disconnecting the north to south pole?
4. After both of the Rod Magnets is linked up, is it available to form a complete Rod Magnet?

D. Place a magnet abreast of the other and the north poles are at the same side.

1. Lightly knock the Magnetic Field Demonstrator, and have the internal magnetic needles ranked in order automatically.
2. Make both of Rod Magnets ranked in repulsive order (the north to south pole or the south to north pole), and parallelize them on the Magnetic Field Demonstrator, which is indicated as **Figure 12**. Please draw the magnetic lines in **Figure 13**.



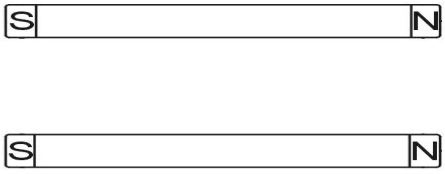
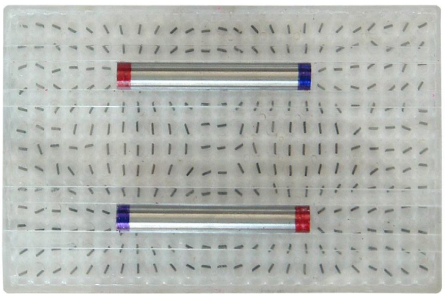


Figure 12 **Figure 13**

E. Place a magnet abreast of the other and the north poles are at the same side.

1. Lightly knock the Magnetic Field Demonstrator, and have the internal magnetic needles ranked in order automatically.
2. Make both of Rod Magnets ranked in attractive order (the north to south pole or the south to north pole), and parallelize them on the Magnetic Field Demonstrator, which is shown as **Figure 14**. Please draw the magnetic lines in **Figure 15**.



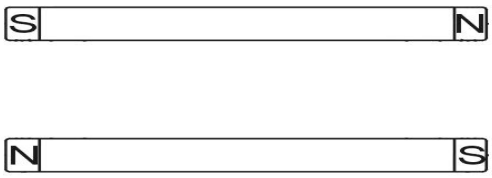
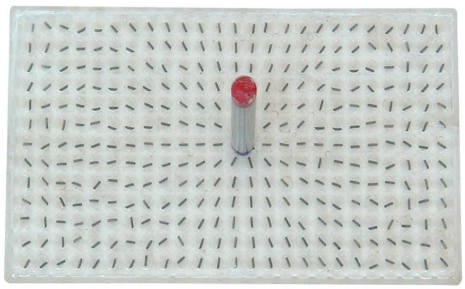


Figure 14 **Figure 15**

F. The magnetic line formed by single magnetic pole.

1. Lightly knock the Magnetic Field Demonstrator, and have the internal magnetic needles ranked in order automatically.
2. **In Figure 16**, erect an extremity of the magnet (the north or south pole) on the Magnetic Field Demonstrator; the magnetic line is displayed as **Figure 17**.
3. If changing the magnetic pole (the north pole changes to the south pole or the south pole changes to the north pole), will the magnetic line be the same? Why?



Experiment 5, the Magnetic Line Formed by the U-type Magnet

I. Purpose

Observe the magnetic line when placing two magnets in different approaches.

II. Instrument

17	U-type Magnet	1
22	Magnetic Field Demonstrator	1

III. Theory

In fact, the magnetic line is the direction of magnetic force which the north pole receives in the magnetic field, and it is a closed and smooth line as well. Outside the magnet, the direction of the