Experiment 1

Title: The properties of magnets.

Objective: To investigate the properties of magnet by identifying magnetic and non-magnetic objects.

Apparatus and Materials: buttons, marbles, copper wire, screw, handkerchief, pencils, ice-cream stick, keys, paper pin, bronze trophy and test tube.

Procedures:

1. Run the experiment with different objects as shown in the picture.
2. Differentiate the objects with magnetic and non-magnetic.
3. Tick (✔) based on the properties at table below.

Objects	Properties of magnet	
	Magnetic	Non-magnetic
Screws		
Buttons		
Marbles		
Bronze trophy		
Keys		
Handkerchief		
Paper pin		
Ice-cream sticks		
Copper wire		
Pencils		
Test tube		

Science behind it:

Magnets have the following properties:

1. Magnets attract ferromagnetic materials, such as iron, nickel, and cobalt.

2. All magnets have two poles: North Pole and South Pole. There are no magnets containing only one pole.

3. Like poles of two magnets repel each other; opposite poles of two magnets attract each other.

4. The magnetic force of a magnet is stronger at its poles than in the middle.

5. The stronger the magnets and the closer two magnets are to each other, the greater the magnetic force exerted on each other.

6. When a bar magnet is suspended by a thread freely in horizontal position, its north pole will move towards the North Pole of the earth and its south pole will move towards the South Pole of the earth. This is because the earth is a giant magnet, and its geographical north pole is its magnetic south pole, and vice versa.

7. There are two types of magnets: permanent magnets and temporary magnets. Permanent magnets remain magnetized even without the influence of external magnetic field, such as a horseshoe magnet. Temporary magnets may lose their magnetism when removed from the external magnetic field, such as an iron pin.

References:

https://sciencing.com/difference-permanent-magnet-temporary-magnet-8180685.html

Experiment 2

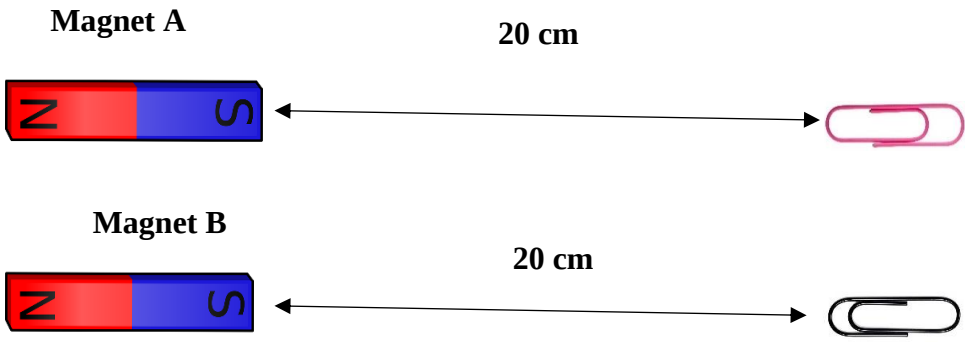
Title: The strength of magnetic fields of magnets.

Objective: To investigate the strength of magnetic fields of magnets.

Apparatus and Materials: Magnets, paper clips, ruler

Procedures:

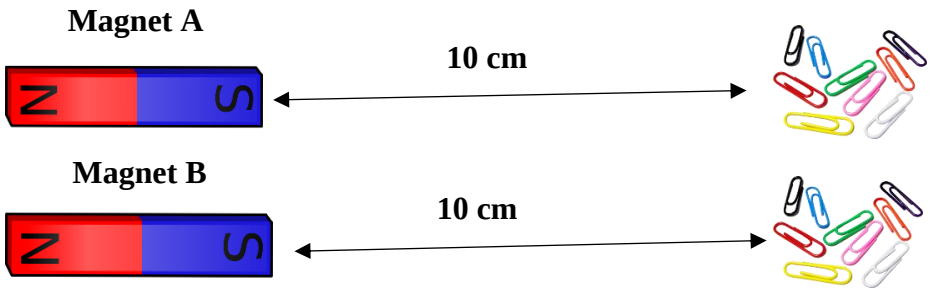
Activity A



1. Students should move the magnet towards the paper clip.
2. Record the distance between magnet and paper clip where it starts to attract.

Magnet	Distance between paper clips and magnet when it attracts.
A	
B	

Activity B



1. Students should move the magnet towards the paper clip.
2. Record the number of paper clips attracted to the magnet.

Magnet	**Number of paper clips attracted to the magnets.**
A	
B	

Science behind it:

Magnetic field strength is one of two ways that the intensity of a magnetic field can be expressed. Technically, a distinction is made between magnetic field strength H, measured in amperes per meter (A/m), and magnetic flux density B, measured in Newton-meters per ampere (Nm/A), also called Tesla (T).

The magnetic field can be visualized as magnetic field lines. The field strength corresponds to the density of the field lines. The total number of magnetic field lines penetrating an area is called the magnetic flux. The unit of the magnetic flux is the tesla meter squared (T · m2, also called the weber and symbolized Wb). The older units for the magnetic flux, the Maxwell (equivalent to 10-8 Wb), and for magnetic flux density, the gauss (equivalent to 10-4 T), are obsolete and seldom seen today.

Magnetic flux density diminishes with increasing distance from a straight current-carrying wire or a straight line connecting a pair of magnetic poles around which the magnetic field is stable. At a given location in the vicinity of a current-carrying wire, the magnetic flux density is directly proportional to the current in amperes. If a ferromagnetic object such as a piece of iron is brought into a magnetic field, the "magnetic force" exerted on that object is directly proportional to the gradient of the magnetic field strength where the object is located.

References:

https://whatis.techtarget.com/definition/magnetic-field-strength

Experiment 3

Title: Attractive and Repulsive force of magnets

Objective: To study the effect of attraction and repulsion behaviour of magnet.

Apparatus and Materials: paper boats, magnet bars, water and basin.

Procedures:

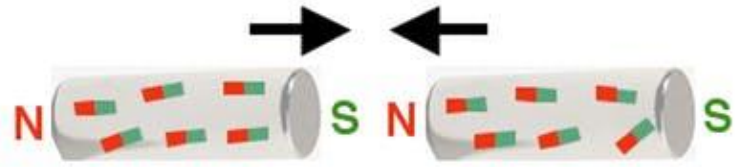
1. Create two paper boats and fix the magnet bars inside it.
2. Place the paper boats in the basin filled with water.
3. Observe the movement of the paper boats and conclude behaviour of magnets.

Results / Observations:

We can observe the both boats repel when magnets with same polarity in contact with each other. The boats also attracted to each other when the magnet polarity is same.

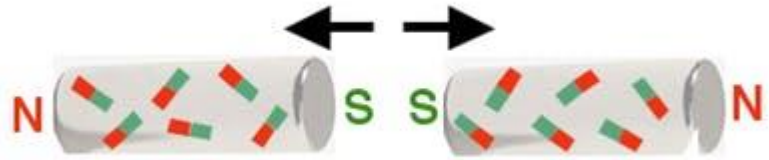
Science behind it:

Attraction



When two unequal magnetic poles attract each other, the one magnet supports the parallel alignment of the molecular magnets in the other magnet. This renders both magnets a little stronger.

Repulsion



When two equal magnetic poles repel each other, however, the one magnet disturbs the parallel alignment of the molecular magnets in the other magnet. This renders both magnets a little weaker. If you pull them far enough apart, however, they regain their original order and therefore their original strength.

References:

https://www.supermagnete.de/eng/faq/Is-the-attraction-between-magnets-as-high-as-the-repulsion

Experiment 4

Title: Water absorption

Objectives: 1. to identify which materials that can absorb water, and which are not.

2. To study the characteristics of materials to absorb water.

Apparatus and materials: Straw, glass, ruler, pillow, eraser, envelope, cloth, mop, raincoat, newspaper, tissue, plastic files, papers, beaker and water.

Procedures:

Activity A: Identify materials that absorb water and materials that are not.

1. Classify (✔) the following objects as follows:

Objects	**Absorbs water**	**Cannot absorb water**
Straw		
Glass		
Ruler		
Pillow		
Eraser		
Envelope		
Cloth		
Mop		
Raincoat		
Newspaper		
Tissue		
Plastic files		
Papers		

Activity B: The rate of water absorption by different types of material

1. Fill the beaker with 300 mL of water.
2. Cut a newspaper with the length and width of 20cm X 20cm.
3. Immersed the newspaper into the beaker filled with water for 5 minutes.
4. Take the immersed newspaper out of the beaker and measure the balance water level.
5. Repeat the steps (2-4) with normal cloth and artificial cloth with same area.
6. Record your observations.

	Volume of water level after the immersed material taken out (mL)
Newspaper	
Cloth	
Artificial cloth	

Experiment 5

Title: The usage of water absorbing materials.

Objective: To study the usage of water absorbing materials.

Apparatus and materials: cloth, thread, wooden stick, water, scissors.

Cloth

Thread

Wooden stick

Procedures:

1. Make a mop with given apparatus with your own creativity in groups.
2. Mop the water that is split on the table.
3. Identify which mop absorbed more water.

Experiment 6

Title: Composition of soil

Objective: To study the composition of soil and identify the layers of it.

Apparatus and Materials: Transparent jar with cap, 50g farm soil, 50g sand, 50g clay and water.

Transparent jar with cap

Farm soil

Sand

Clay

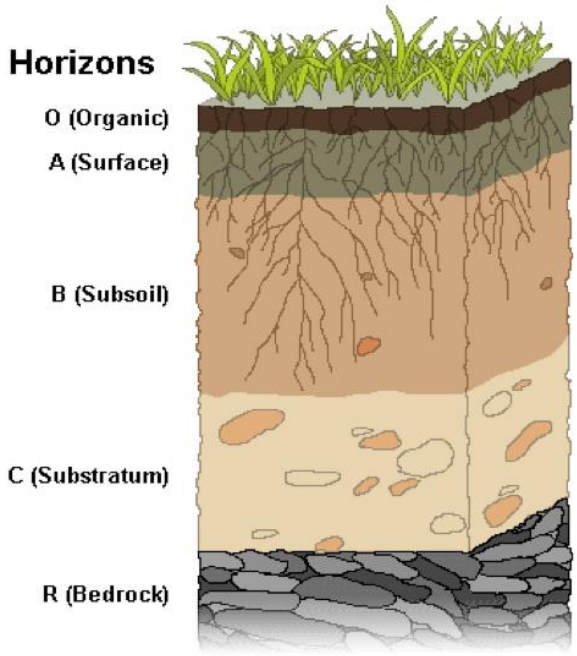
Procedures:

1. Place 50g of farm soil into the transparent jar.
2. Fill it with adequate amount of water and seal with the cap.
3. Shake the jar and let it to settle down for 24 hours.
4. Repeat the steps (1-3) with sand and clay.
5. Draw your observations.

Results / Observations:

Students will observe different layers of farm soil, sand and clay.

Science behind it:



Soil horizons

Soil consists of different layers that are often called horizons. There are three main soil horizons called A, B and C as well as an organic layer (O) on top of the soil (O) and bedrock (R) below:

O: This is a layer of organic matter that is about 2 inches thick and is made up of dead plant material such as leaves and twigs.

A: This upper soil horizon is also called Topsoil. It is only between 5 to 10 inches thick and consists of organic matter and minerals. This is the soil layer where plants and organisms primarily live.

B: This layer is also called Subsoil. It is mostly made of clay, iron minerals as well as organic matter, which has been washed down to this horizon by rainwater.

C: The C horizon is the parent material from which the upper soil layers developed. It consists primarily of large rocks.

R: This is the bedrock and is located several feet under the surface. The bedrock is made up of a solid mass of rock.

References:

https://www.sheffield.ac.uk/ssa/soil-facts/horizons

Experiment 7

Blowing Up Balloons with CO_2

What happens when you mix an acid (vinegar) and a base (baking soda) together?

Materials

- Baking soda
- Vinegar
- 500 mL mineral water bottle
- 1 balloon
- 1 plastic funnel
- plastic gloves

Procedure

1. Before you begin, make sure that you stretch out the balloon to make it as easy as possible to inflate.
2. Place about 50 mL of vinegar in the bottle.
3. Place 2.0 g of baking soda inside the balloon.
4. Attach the balloon to the top of the bottle, taking care to keep the balloon hanging down from the side of the bottle
5. Quickly raise the balloon over the bottle and shake the baking soda down the balloon.

Safety Procedures

We recommend wear gloves during the experiment.

The Science behind it

Mixing a base (baking soda) with an acid (vinegar) creates **carbon dioxide** which is trying to escape the bottle but the balloon catches it and that makes the balloon expand.

Note:

Students can repeat this experiment with different amount of baking soda (2.0 g, 4.0 g, 6.0 g, 8.0 g and 10.0 g).

Adding more baking soda created a bigger reaction. The bottle with the most baking soda made the biggest balloon.

https://www.youtube.com/watch?v=bP7xgV07glc

Experiment 8

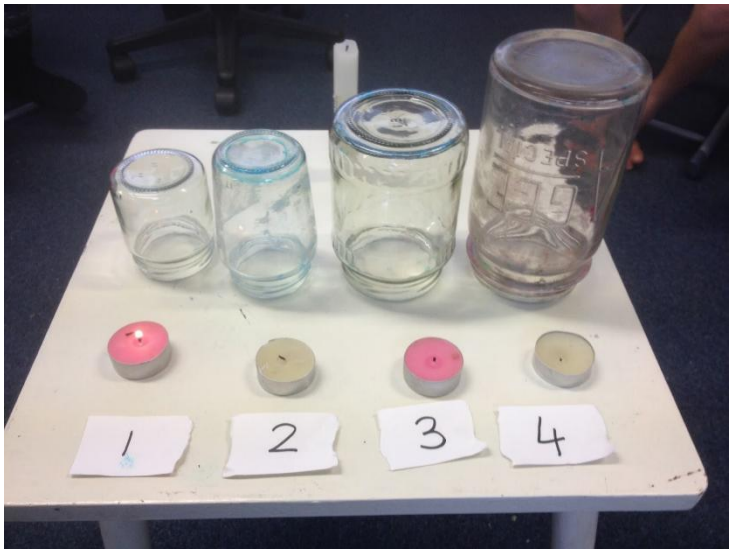
Burning and Air

Does Fire needs Air to Burn?

Fire is a chemical reaction that creates light and heat from oxygen and fuel. A lit candle needs to draw oxygen from the air in order to continue burning. If you limit the amount of air available, the candle's flame eventually goes out once it uses up all the oxygen.

Materials

- Candle
- 4 glass jars in different sizes
- Matches
- Permanent marker
- Pen or pencil
- Paper
- Stopwatch



Procedure

1. Fix a candle firmly on a small lid with modeling clay.
2. Put it on a flat surface.
3. Carefully light the candle. Take the help of an adult to do so.
4. Place a jar over the candle
5. Observe how long the candle burns.
6. Repeat step four with different size of jars and estimate to the actual length of time each candle burned.

The Science behind it

When the jar placed over the candle, the candle will burn for a short while. When it has used the oxygen in the air in the jar, it will goes out. The candle burn longer under larger jars due large volume of oxygen.

https://www.youtube.com/watch?v=xh1-YnI6Z_Q

Experiment 9

Waiting to Grow

In parts of the world that have four seasons-springs, summer, autumn and winter-many plants have a life cycle that takes a year to complete. Seeds germinate (grow a root and a shoot) in spring, when the weather is getting warm. Flowers blossom in summer, when there are plenty of insects around to pollinate them. Fruit and seeds form in the autumn, when animals are fattening themselves up for winter. Seeds and bulbs wait in the soil over winter before they germinate again in the spring.

Watch a seed grow a root and shoot

Materials
-a packet of broad beans
-a paper towel
-a jam jar
-a jug of water
-a plate

Method

1. Soak the beans overnight to soften their tough seed coat.
2. Crumple a paper towel and put it into a clean glass jam jar. Carefully push at least two beans between the towel and the side of the jar.
3. Sprinkle water onto the towel and make sure you keep it damp throughout this experiment.
4. Leave the jar in a warm, dark place, as the beans would be if they were in soil. After about a week, the beans should start to germinate.
5. Bring the jar out into the light and watch the beans grow into bean plants. As the bean plants get taller, why not try planting them in soil? One day you might be able to harvest beans from your plant.

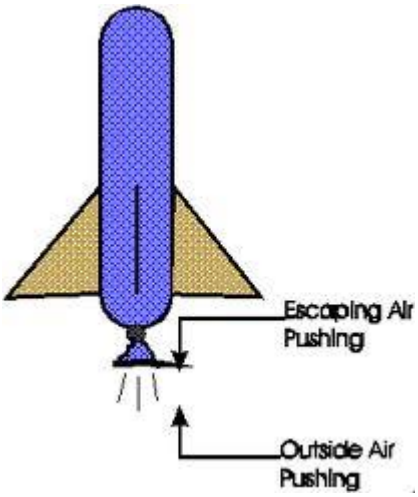
Why it Works

Inside the seed is the embryo-the root and shoot that will grow into the new plant. The pale, fleshy part of the bean is the food store, which the young plant will need until it grows leaves and can start to make its own food. Outside is the tough skin that protects the bean. Dry seeds will not start to grow in the seed pocket. The seeds need three things to germinate- warmth, water to swell the seed and oxygen. Once they have these, most seeds will germinate and grow into a new plant.

https://www.youtube.com/watch?v=zEOfdGaO5r8

Experiment 10

Flying through Air (Rocket Engine)



Materials

- Scissors
- Card
- Balloon
- Cellophane tape

Method

2. Cut out a semicircle from a large piece of card.
3. The straight edge needs to be about 40cm long.
4. Fold it round, tape it and trim the edge to make a cone with a wide opening.
5. Fold a rectangle of card in half, and cut out a triangle shape with a flap along the long site.
6. Fold the flaps back and tape them to the edge of the cone.
7. Repeat this until you have four triangles.
8. Blow up a balloon and push it inside the rocket.
9. Let go of the neck and watch the rocket take off as the air in the balloon escapes.

What this show

Aero planes fly because the shape of their wings gives them life and engines give them speed. Rocket and jet engines work by using the pushing power of hot gases. Rockets take air, in liquid form, with them into space. They push out air and hot gases to move through space. Air rushing out of the balloon pushes your rocket in a similar way.

https://www.youtube.com/watch?v=N6NIgPIh7HU