Experiment 1

Title: Flying balloons

Objective: To investigate the relationship between the air content in balloon and time taken for it to stay in air.

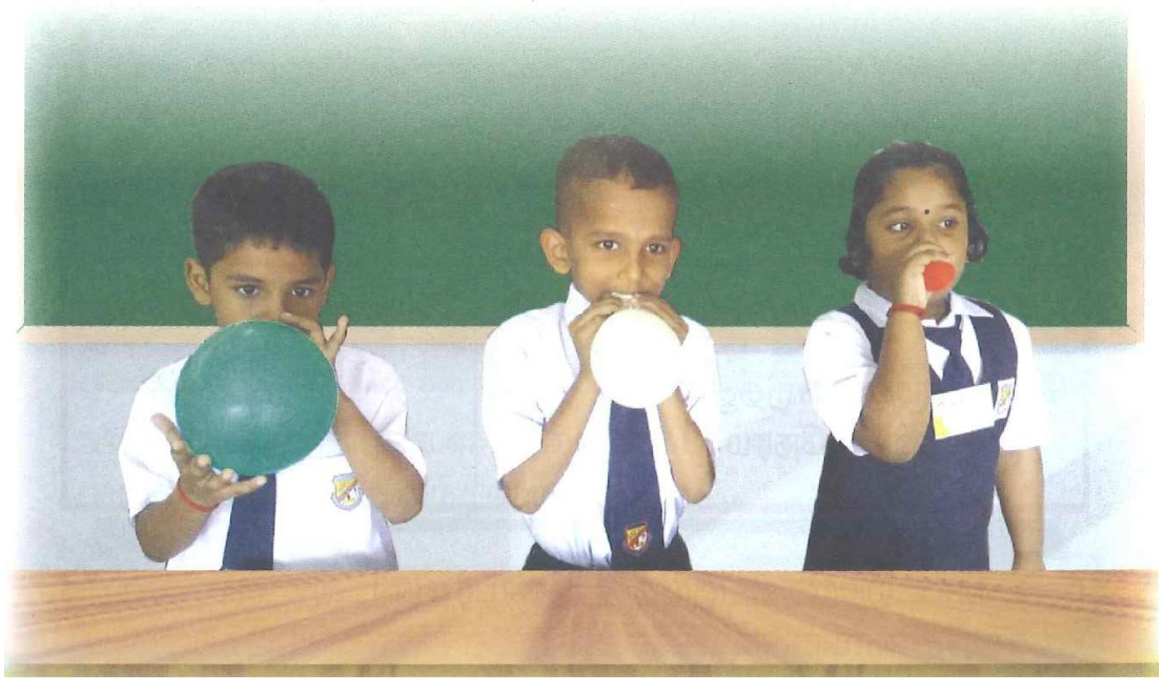
Hypothesis: The larger the volume of air in the balloon, the longer the time for the balloon to stay in air.

Apparatus and Materials:

Balloons

Stopwatch

Procedures:



1. Form a group with 3 students.
2. Give same size balloon to everyone in the group.
3. Fill the balloons with different volume of air.
4. Ask the students to leave the balloon.

5. Measure the time taken for the balloons to stay in air.
6. Observe the time and discuss it in class.

Results / Observations:

Volume of air content in balloon	**Small**	**Medium**	**Big**
Time taken for the balloons to stay in the air (seconds)			

Bigger sized balloon fly longer followed by medium and small sized balloons.

Safety precautions:

Don't blow the balloon too big because it might burst and hurts mouth area.

Science behind it:

When the volume of air in the balloon is larger, it takes longer time for the air to emit from the balloon. The pressure made by the air from the balloon causes it to stay longer in air. Bernoulli's principle can be seen.

Experiment 2

Title: Growth of plants

Objective: To study the changes of a growing plant.

Hypothesis: When the number of days increases, the length of plant and number of leaves on it will increase.

Apparatus and materials: shovel rake spade, mung beans, pot, soil, water and ruler

Shovel rake spade

Mung beans

Pot

Soil

Metre ruler

Flowering can

Procedures:

1. Fill soil in the pot.
2. Plant the mung beans in the pot.
3. Water the seeds and place the pot exposed to sunlight.
4. Observe the growth of the plant for 9 days and record your observations in the table provided.
5. Draw the growth of the plant from day 1 to 9.

Results / Observations:

Days	**1**	**3**	**6**	**9**
Length of plant (cm)				
Number of leaves				

The length/height of plant increases every day. The number of leaves also increases by days.

Safety precautions:

Use gloves when handling sharp object like shovel rake spade.

Science behind it:

Most plants continue to grow if they live. They grow through a combination of cell growth and cell division (mitosis). The key to plant growth is meristem, a type of plant tissue consisting of undifferentiated cells that can continue to divide and differentiate. Meristem allows plant stems and roots to grow longer (primary growth) and wider (secondary growth). Apical meristems are found at the apex, or tip, of roots and buds, allowing roots and stems to grow in length and leaves and flowers to differentiate.

References:

https://courses.lumenlearning.com/suny-biology2xmaster/chapter/plant-growth/

Experiment 3

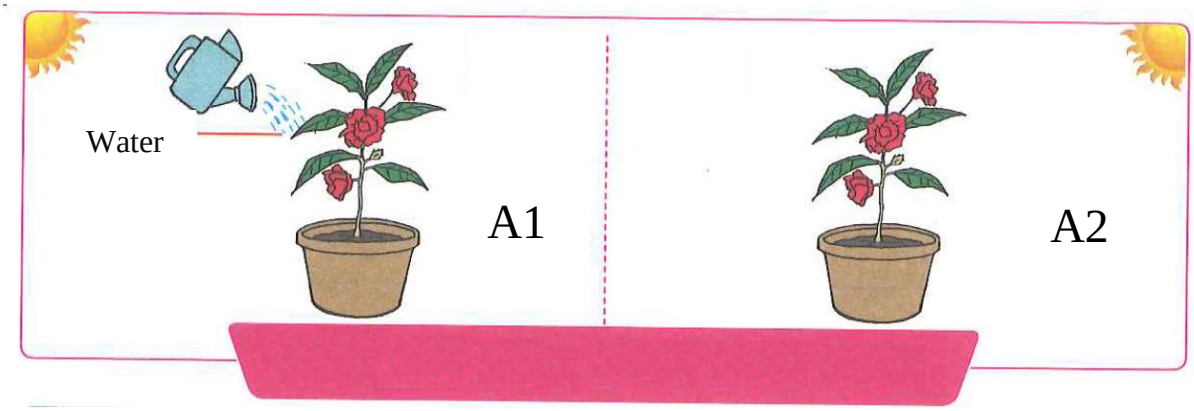
Title: Basic needs of plants

Objective: To study the basic needs of plant to stay alive.

Apparatus and Materials: 8 balsam plants, watering can, black plastic bag, transparent plastic bag, fertilizers and gloves.

Procedures:

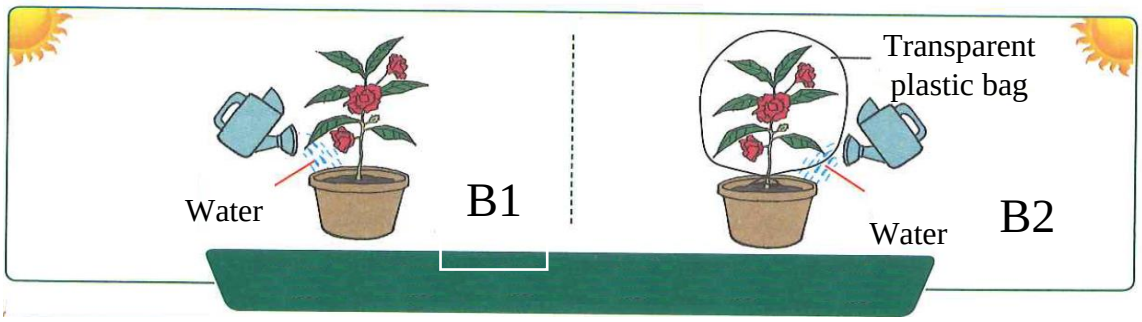
Activity A: To study the needs of water for plants.



1. 2 plants are put at the place where exposed to sunlight and label them as A1 and A2.
2. Water the plant labelled A1 everyday continuously for 2 weeks and leave another plant (A2) without watering it.
3. Record your observations after 2 weeks in the table.

Plant	Observations	Inference
A1		
A2		

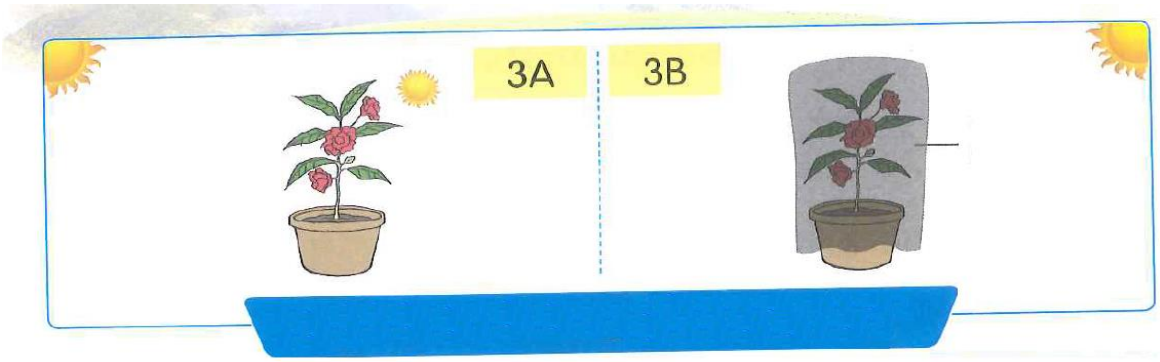
Activity B: To study the needs of air for plants.



1. 2 plants are put at the place where exposed to sunlight and label them as B1 and B2.
2. Cover the plant labelled B2 with transparent plastic bag and leave another one uncovered.
3. Water both plants continuously for 2 weeks.
4. Record your observations after 2 weeks in the table.

Plant	**Observations**	**Inference**
B1		
B2		

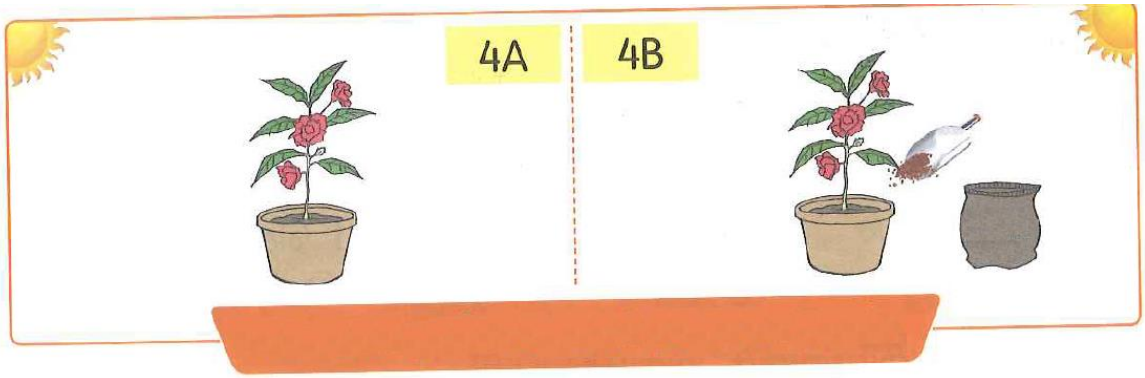
Activity C: To study the presence of sunlight for plants.



1. 2 plants are put at the place where exposed to sunlight and label them as C1 and C2.
2. Cover the plant labelled C2 with black plastic bag and leave another one uncovered.
3. Water both plants continuously for 2 weeks.
4. Record your observations after 2 weeks in the table.

Plant	**Observations**	**Inference**
C1		
C2		

Activity D: To study the effect of fertilizers in the plant's growth.



1. 2 plants are put at the place where exposed to sunlight and label them as D1 and D2.
2. Apply fertilizer on the soil of plant labelled D2 and another one not.
3. Water both plants continuously for 2 weeks.
4. Record your observations after 2 weeks in the table.

Plant	**Observations**	**Inference**
D1		
D2		

Science behind it:

- **Water**

Like humans and animals, plants need both water and nutrients (food) to survive. Most all plants use water to carry moisture and nutrients back and forth between the roots and leaves. Water, as well as nutrients, is normally taken up through the roots from the soil. Therefore, it's important to water plants when the soil becomes dry.

- **Fertilizers**

Fertilizer also provides plants with nutrients and is usually given to plants when watering. The most important nutrients for plants growing needs are nitrogen (N), phosphorus (P), and potassium (K). Nitrogen is necessary for making green leaves, phosphorus is needed for making big flowers and strong roots, and potassium helps the plants fight off disease. Too much nutrients can also be harmful.

- **Air**

Fresh, clean air and healthy soil. Dirty air caused by smoke, gases, and other pollutants can be harmful to plants, limiting their ability to take in carbon dioxide from the air for making food (photosynthesis). It can also block out sunlight, which is also necessary for healthy plant growth. Healthy soil is extremely vital to plants. In addition to essential nutrients found in soil (from organic matter and micro-organisms), soil provides an anchor for plant roots and helps support the plants.

- **Sunlight**

Plants also need sunlight to grow. Light is used as energy for making food, a process called photosynthesis. Too little light can make plants weak and wilt looking. They will also have fewer flowers and fruits.

Safety precautions:

Wear gloves when handling and mixing fertilizers with soil. Fertilizer is a chemical.

References:

https://www.gardeningknowhow.com/special/children/how-plants-grow.htm

Experiment 4

Title: Differences in shadow formation.

Objective: To study the differences in shadow formation by different types of objects.

Apparatus and materials:

Torch light

A4 papers

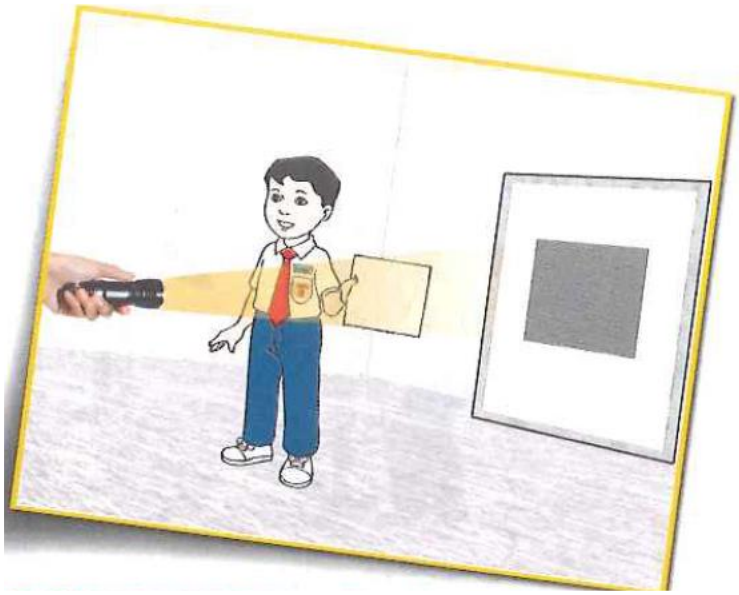
carbon papers

Transparent sheets

Plastic colourful sheets

Screen

Procedures:



1. Form a group of 3 students.
2. One student torch the light towards the screen.
3. Another student places the A4 paper between the torchlight and the screen.
4. The third students should draw the image formed on the screen.

5. Repeat steps (2-4) with carbon paper, transparent sheet and plastic colourful sheets.
6. Record your observations.

Observations / Results:

Objects	**A4 paper**	**Carbon paper**	**Transparent paper**	**Plastic object**
Shape of the shadows				

Safety precautions:

Don't light the torchlight straight towards the eyes of any students.

Carry out this experiment in dark room for better results.

Science behind it:

A shadow is a dark area on a bright surface. It is caused by something blocking a source of light. A shadow's outline, called a silhouette, will have the same shape as the object blocking the light.

Different objects have different clearness of the shadows. When a light pass through an opaque object, the shadow formed very clear compared to transparent object. Every object has different shapes. The shadow of an object depends on the shape of the object.

Experiment 5

Title: Investigating Electrical Conductivity

Objective: To investigate the electrical conductivity materials.

Apparatus and Materials:


Eraser


Nail


Cloth


Pencil


Thumbtacks


Paper pin


Lemon juice


Keys


Safety pin


Glass rod


Match box


Iron ruler

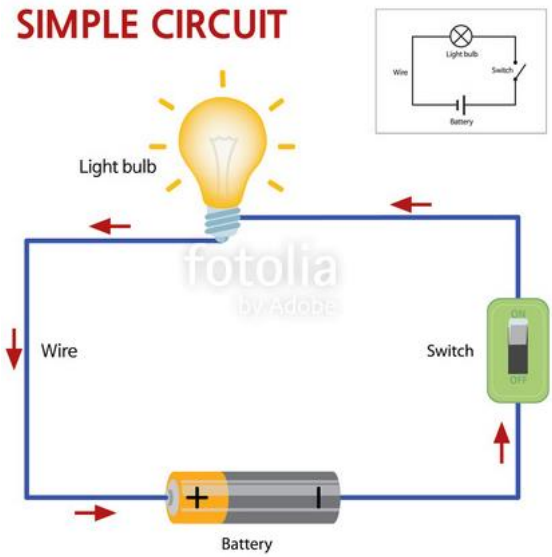

Cloth pencil case


Plastic ruler


Iron pencil case


Book

Procedures:



1. Form a complete electric circuit as shown above.
2. Replace the switch with given apparatus.
3. Record your observations in the table below.

Objects	Bulb	
	Light up	Not light up
Eraser		
Nail		
Handkerchief		
Pencil		
Thumbtack		
Paper pin		
Lemon water		
Key		
Safety pin		
Glass rod		
Matchbox		
Iron ruler		
Cloth pencil case		
Plastic ruler		
Plastic pencil case		
Book		

Safety precautions:

- Handle sharp items with care.

Science behind it:

Electrical conductivity in metals is a result of the movement of electrically charged particles. The atoms of metal elements are characterized by the presence of valence electrons, which are electrons in the outer shell of an atom that are free to move about. It is these 'free electrons' that allow metals to conduct an electric current.

Because valence electrons are free to move, they can travel through the lattice that forms the physical structure of a metal. Under an electric field, free electrons move through the metal much like billiard balls knocking against each other, passing an electric charge as they move.

In a conductor, electric current can flow freely, in an insulator it cannot. Metals such as copper typify conductors, while most non-metallic solids are said to be good insulators, having extremely high resistance to the flow of charge through them. "Conductor" implies that the outer electrons of the atoms are loosely bound and free to move through the material. Most atoms hold on to their electrons tightly and are insulators. In copper, the valence electrons are essentially free and strongly repel each

other. Any external influence which moves one of them will cause a repulsion of other electrons which propagates, "domino fashion" through the conductor.

Simply stated, most metals are good electrical conductors, most non-metals are not. Metals are also generally good heat conductors while non-metals are not.

Most solid materials are classified as insulators because they offer very large resistance to the flow of electric current. Metals are classified as conductors because their outer electrons are not tightly bound, but in most materials even the outermost electrons are so tightly bound that there is essentially zero electron flow through them with ordinary voltages. Some materials are particularly good insulators and can be characterized by their high resistivity:

References:

https://www.thebalance.com/electrical-conductivity-in-metals-2340117

http://hyperphysics.phy-astr.gsu.edu/hbase/electric/conins.html

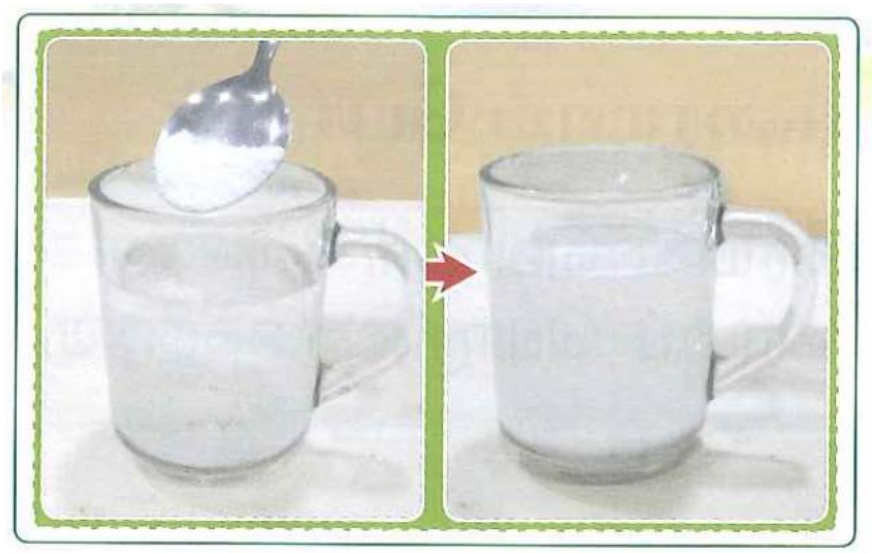
Experiment 6

Title: Dissolution of solutes

Objective: To identify which materials dissolve in water.

Apparatus and materials: Spoon, glass cup, sugar, sand, milk powder, pepper, detergent powder, mung bean, condensed milk, cumin and water.

Procedures:



1. Fill water in the glass cup and put some sugar.
2. Stir for few seconds and observe the changes.
3. Repeat step 2 with sand, milk powder, pepper, detergent powder, mung bean, condensed milk and cumin.
4. Record your observations in table below.

Results / Observations:

Solutes	**Dissolve**	
	Yes	**No**
Sugar		
Sand		
Milk powder		
Pepper		
Detergent powder		
Mung bean		
Condensed milk		

Cumin		

Science behind it:

Not all materials can dissolve in water. Sago, wheat flour and chili powder are cannot dissolve in water. After few minutes, we can observe the precipitation of these materials at the bottom of cup.

Solids, liquids, and gases can all dissolve. Dissolving depends on the molecules of the substance doing the dissolving, called the solvent, and the molecules of the substance being dissolved, called the solute. Dissolving is the process in which these molecules interact and attract each other to form a solution. The extent to which a substance dissolves is a characteristic property of that substance called its solubility. Water is a good dissolver because of its areas of positive and negative charge. The mutual attraction between water molecules and other substances with positive and negative charges causes these substances to dissolve.

References:

http://www.inquiryinaction.org/chemistryreview/dissolving/

Experiment 7

Title: Time for dissolution

Objective: To study the relationships between the types of materials and time taken by them to dissolve in water.

Hypothesis: 1. Is solute dissolve faster in the solvent of higher temperature?

2**.** Is stirring affects the solubility of solutes?

Apparatus and Materials:

Sugar

Candy

Tap water

Hot water

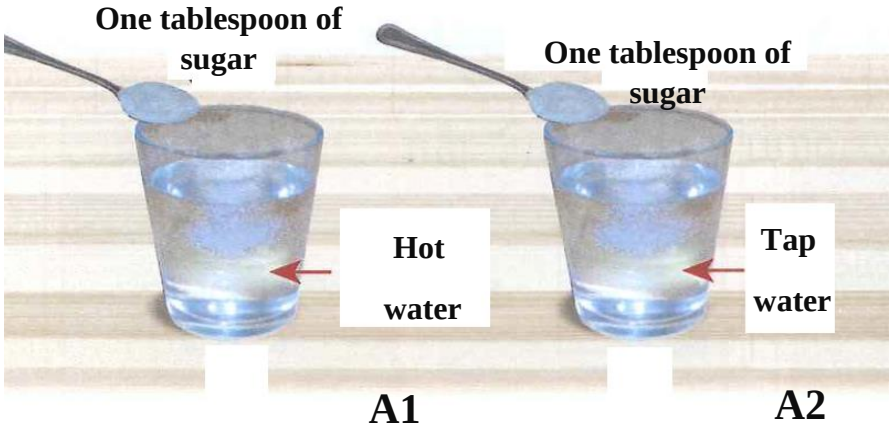
Stopwatch

2 Glass cups

Spoon

Procedures:

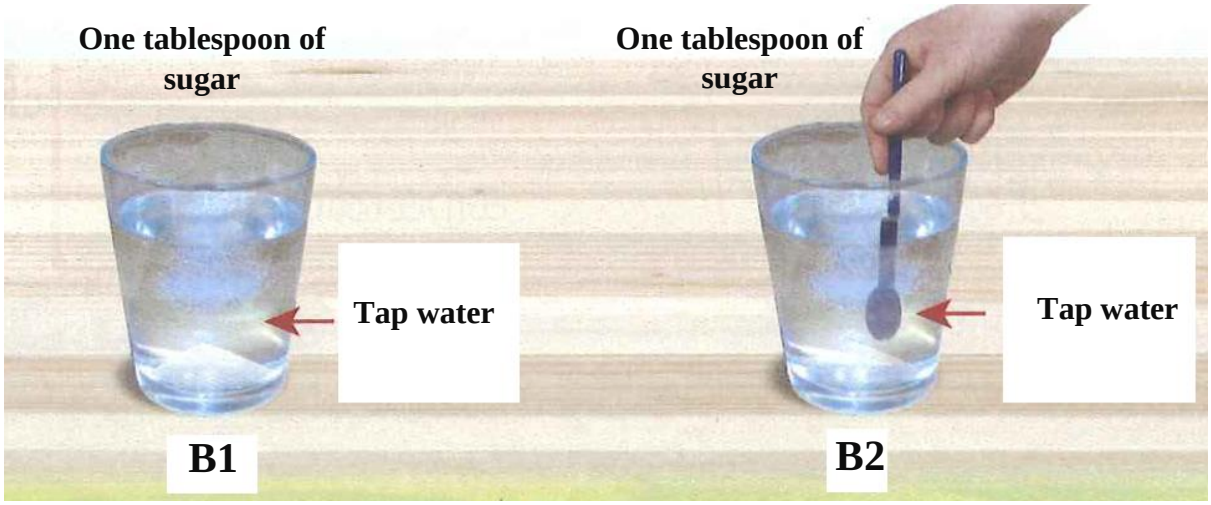
Activity A:



1. Fill tap water in 2 glass cups and labelled it as A1 and A2.
2. Fill the cup A1 with sugar and cup A2 with candy.
3. Stir both solutes with spoon at same rate.
4. Repeat steps (1-3) with hot water.
5. Record your observations. Tick in the table provided.

Water	**Dissolution rate**	
	Faster	**Slower**
Tap water		
Hot water		

Activity B:



1. Fill tap water in 2 glass cups and labelled it as B1 and B2.
2. Put one tablespoon of sugar in both cups.
3. Stir cup labelled B2 with spoon and leave cup B1 sugar to dissolve by its own.
4. Record your observations.

Cup	**Dissolvement rate**	
	Faster	**Slower**
B1		
B2		

Safety precautions:

Be careful when handling hot water.

Science behind it:

Students should remember that water molecules move faster in hot water than in cold. The reason why sugar dissolves at a faster rate in hot water has to do with increased molecular motion. The added energy in the hot water causes water molecules to move faster and sucrose molecules to vibrate faster. This added movement tends to make the bonds between sucrose molecules easier to overcome. When faster-moving water molecules attach to sucrose molecules, a higher proportion of these sucrose-water interactions have enough energy to pull sucrose molecules away from other sucrose molecules, so the rate of dissolving increases.

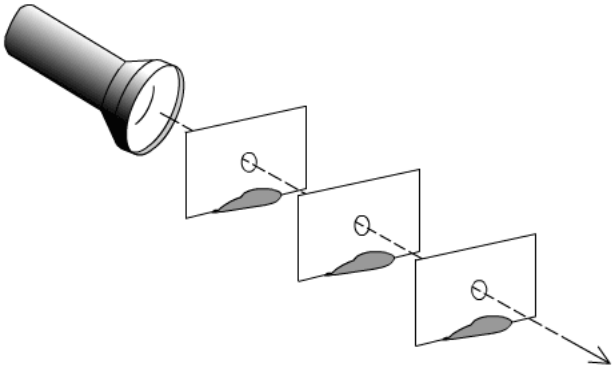
Stirring simply moves the solvent molecules around, allowing them to interact with the solid pieces of undissolved solute and transporting the dissolved solute away into the bulk of the solution. In the absence of stirring, the concentration of solute will be highest close to the pieces of solute, so more solute won't dissolve into the solution until the dissolved solute has been transported away by diffusion.

References:

https://socratic.org/questions/how-does-stirring-affect-the-rate-of-solution-formation

Experiment 8

Light travels in straight lines



When you turn on a torch, it produces a ray of light. This experiment shows how light travels only in straight lines.

Materials

- 3 index cards
- small piece of modeling clay or sticky tack
- flashlight
- hole puncher
- ruler

Method

1. For each index card, use a ruler to draw lines connecting opposite corners of the card.
2. At the intersection of the two lines, use a hole puncher to punch a hole in the center of the index cards.
3. For each card, use a small piece of modeling clay and place the card into the clay to create a "stand" for the card. Place the cards so that they stand vertically and at an equal distance from each other. See Diagram.
4. Place the flashlight at one end of the row of index cards and turn off the light in the room.
5. Arrange the index cards so that light can be seen through all the holes.
6. Observe and record your observations.

What this show?

Light is a form of energy and travels as a wave in straight lines. We see things when light hits them and bounces off and enters our eyes

Experiment 9

Float or Sink

In these experiments, you see that some things floats and some things sink. You can also see why materials that normally sink can be used to make boats that float.

Materials

- Work Surface
- Washing –up bowl or sink
- Balloon
- Water
- Small block of wood
- Small bowl
- Small plate
- Modeling Clay or Sticky Tack
- Optional: Food Colouring

Method

1. Fill the washing-up bowl with water. Blow up the balloon and tie a knot in it. Put the balloon in the water and push it under. Then let go. Does the balloon float?
2. Put the piece of wood in the bowl of water. Push it underwater and then let go. Does the wood floats?
3. Roll a ball of sticky tack or modeling clay. Drop this in the water too. Does clay sink?
4. Put a small bowl on a plate and fill it with water, right to the top. You could add food colouring so you can see the results clearly. Mould a piece of modeling clay into a boat shape and carefully lower it into water. Make the bottom of the boat flat. Make some small balls of modeling clay as cargo for your boat. Add them one at a time to the boat. Does it sink?

Experiment 9

Which Type of Sponge Holds the Most Water?

Objective:

We are going to find out which type of sponge holds the most water.

Research Questions:

What factors determine how much water a sponge will hold?

Sponges are useful for cleaning as it holds moisture. They are porous, which means they have tiny holes in them that allow cleaning fluid or water to be held. This does the cleaning job much more quickly than you bare hands or even a wash cloth.

Materials:

Choose sponges of relatively the same size

Natural Sponges

- Cellulose
- Sea Sponge

Artificial Sponges

- Polyurethane
- Polyether (those rainbow packs)
- Polyester

Water

Large Bowl(s)

Measuring Beaker

Experimental Procedure

1. Take one sponge and press it inside a bowl full of water. Let it drain a little.

2. Squeeze the sponge until all of the water comes out in a measuring beaker. Record this measurement.
3. Do the same for all the other sponges.
4. Evaluate which one held the most water.
5. Examine and compare the sponges and try to understand what properties might help one hold more water than another.

Note: You may want to repeat this experiment for a few trials to be accurate.

Suggested Chart

Amount of Water Held

	MATERIAL	**Trial #1**	**Trial #2**	**Trial #3**
NATURAL SPONGES	Cellulose			
	Sea Sponge			
ARTIFICIAL SPONGES	Polyurethane			
	Polyether			
	Polyester			

Terms/Concepts: Sponge; Porosity; Absorbency

Experiment 10

Parachutes

Objective:

To determine if the size of the parachute will change the rate at which an object falls.

- How does a parachute work to slow the force of gravity?
- Do larger parachutes slow the force of gravity more than smaller parachutes?

A parachute is a device that creates air resistance or drag which pushes against gravity slowing down the fall of a person or object. The drag force from the parachute is less than the force of gravity.

Materials:

- 4 identical handkerchiefs
- ruler
- scissors
- 5 identical fishing weights
- string
- balcony, playground platform, ladder, or other secure surface about 10 feet from the
- ground
- paper
- pencil

Experimental Procedure

1. Gather the necessary materials.
2. Cut three of the handkerchiefs to make four different-sized parachutes. Measure and cut 1 inch from the perimeter of one handkerchief, 2 inches from the second handkerchief, and 3 inches from the third handkerchief.
3. Cut 16 12-inch lengths of string.

4. Tie one piece of string to each corner of each of the handkerchiefs. Then tie the four strings on each handkerchief to one of the weights.
5. Compare the dropping rates of the each of the four parachutes to the weight alone. To do this, take one parachute and the weight and drop them at the same time and from the same height. Record the results.
6. Repeat step 5 with each of the parachutes and the weight along and each of the parachutes to each other. Collect the data for each drop.
7. Analyze the data and draw a conclusion.

Terms/Concepts: drag: a force that causes an air resistance gravity: a force that draws everything toward the center of the earth air resistance: air movement that slows down forward movement; A parachute enables a person or object to fall from an airplane to the ground at a safe speed. Gravity is a force that pulls everything to the ground. Air resistance or drag is a force that keeps something from being pulled to the ground or slows the speed of something being pulled to the ground.