

Effective Instruction of Experiments and Observations

Project of Science,
Hokkaido University of Education

8. Let's Remove the Color of the Liquid!

Let's do magic! Can you make color of the liquid vanished?

Point: Iodine and vitamin C

Material

A mouthwash (ISODINE),

A vitamin C tablet or candy with vitamin C, Fruit (lemon),

Clear glass, Water, Stick for mixing



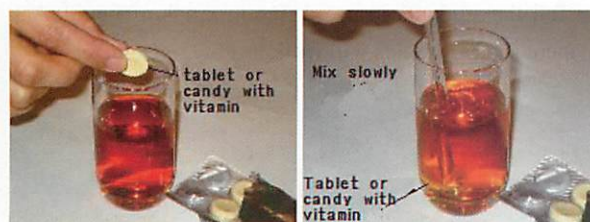
Preparation for MAGIC

1. Put the water in a clear glass.
2. Pour the mouthwash in the glass of water so that the color will change.



How to do the MAGIC

1. Prepare the glass you did in the above procedure. Get the tablet or candy with vitamin C.
2. Put the tablet or candy with vitamin C into the glass. Stir slowly.



3. And observe the water in the glass. The color



Progress

Pour 100g of water and 2 drops of mouthwash (Isodine) in a glass. Make two or more glasses of these (same size is better). Put a drop of different fruit juice or vegetable juice in each glass. Compare which fruit juice or vegetable juice had made the color disappear more and contains more vitamin C. Also try to look around and examine other fruits and vegetable with vitamin C.



In these photos, 5 drops of lemon juice were dropped gradually into 100g of water with mouthwash to observe the change in color.

Information

This is oxidation and reduction experiment. ISODINE's ingredient is Povidone -Iodine.

When dissolved in water, iodine color is brown. When vitamin C is added in solution of iodine, the iodine is reduced and makes the solution colorless.

You can do this experiment with other fruits, vegetables, and candy with vitamin C.

When experimenting on other fruits and vegetable, use only a small amount of mouthwash (Isodine) because some fruits and vegetable might only contain a small amount of vitamin C and would not react if you put a lot of mouthwash.

Simple Experiments of Tancyou-Sensei

<http://cs.kus.hokkyodai.ac.jp/english/top1/index.html>

Tancyou: Japanese Crane, the Symbol of Japan and Hokkaido.

7. Let's See Red Sunset in PET Bottles

Light the PET bottle (with water and milk in it)

Point: Particles of milk and Scattering of light

Prepare

Clear PET bottle (5 bottles)

Milk (or riquid soap or floor wax), Flashlight

Syringe, Water



PET bottle with square cross section can also be used.

How to Make

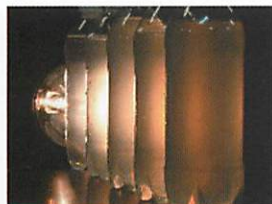
1. Pour water into PET bottle
2. Drop 3 drops of milk into water and mix them well.



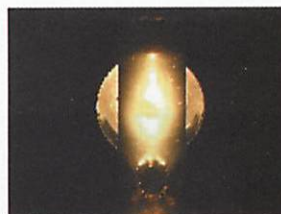
3. Prepare 5 bottles of mixed water and milk. Follow procedure 1 and 2.

Experiment 1

1. Using flashlight, light a PET bottle behind it.
2. Arrange the PET bottle in straight line.



3. Add PET bottle and observe the color of light.



1 PET bottle



5 PET bottles

Experiment 2

1. In a separate PET bottle with water, add 5 drops milk and mix well. Put the flashlight behind the PET bottle and observe the color.



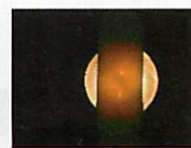
2. Add 5 more drops of milk in the bottle and observe the color of light.



No milk



10 drops



20 drops

Progress

Instead of milk, try to use soap solution, floor wax or other liquid solution.

Information

Passing light through PET bottles have situation similar to the connection between the sun (day time) and Earth.

In the afternoon, sunlight reaches thin layer of air. Because of that, the blue light are scattered so the sunset appear yellowish and reddish.

Passing light through PET bottles have also situation similar to the connection between the sun (evening) and the earth. In the evening, sunlight reaches thick layer of air. The light from the sun is almost red and we can see the red sunlight. That light hit the cloud and dust particles. That is red sky at night.

6. Let's Make Karumeyaki (Brown Sugar Cake)

Making KARUMEYAKI by inflating melted sugar.

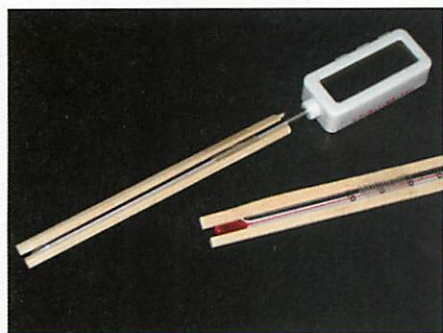
Point: Thermal decomposition of sodium bicarbonate

Materials

Ladle (spoon for soup), Zarame (crystal brown sugar), Sugar, Egg, Baking soda (sodium bicarbonate), Water, Thermometer, Disposable wooden chopstick, Cup, Measuring spoon, Gas stove



Thermometer should be protected using disposable wooden chopstick as shown in the photo.



Prepare

1. Separate egg yolk and egg white.



Egg white become like a sherbet

2. Put baking soda (1tsp) in the egg white. Mix them for about 2 minutes until it looks like a sherbet. Then, put sugar (1/4 tsp) into it.

If it doesn't become like a sherbet, add a little baking soda.

3. Have a size of red beans of the mixture (no. 2 procedure) on the tip of the disposable chopstick as shown in the photo.



Baking soda and egg white

Experiment

1. Put 30g of crystal brown sugar and 11ml (2tsp) of water to the ladle.



2. Put the ladle above the fire of gas stove and stir the mixture well using disposable chopstick with thermometer.

After over 100°C, remove the ladle from the fire, heated to about 117°C

When the temperature is over 100°C, bubbles become bigger and bigger. It is said that KARUMEYAKI's suitable temperature is 125°C. If you use the ladle, when you keep it away from the fire, the temperature will continue to go up for a minute. So keep away the ladle from fire when the temperature is 117°C.

3. When the temperature goes up to 117°C, remove the ladle from the fire and place it above newspaper. Wait for 30 seconds.

4. Put the mixture of egg white and baking soda in the ladle when the big bubbles are gone and stir it quickly for about 30times using disposable chopstick.



It is important to mix it when the big bubbles vanished!

5. Gently pull the disposable wooden chopstick from center upward and wait.



6. When already puffy, put the ladle above the fire to roast it slightly.



Finish!

Information

Carbon dioxide is generated by thermal decomposition of sodium bicarbonate (baking soda) which drives up the membrane that inflates cold and hardened sugar.

Sometimes this experiment might fail because of the temperature. But you should try it many times, so you can give tips on making KARUMEYAKI.



When the bubbles become big...117°C !

5. Let's Make Improvised Concave Mirror

Verify the nature of concave mirror

Point: Nature of Concave mirror and Sun rays

Materials

Aluminum can (the bottom of can's shape should be concave) Ex. Beer can, Abrasive (Metal Polish) Goods brand "PIKA-RU", Cloth (Kitchen paper is OK), Incense stick, Tracing paper



You can buy the tracing paper in the stationery store

Preparation for Equipment

Preparation

Polish the bottom of the can by cloth with abrasive (metal polish) until shiny.

*Approximately 10 mins polishing



I have an inverted image!

Experiment 1

Image formed in Concave Mirror

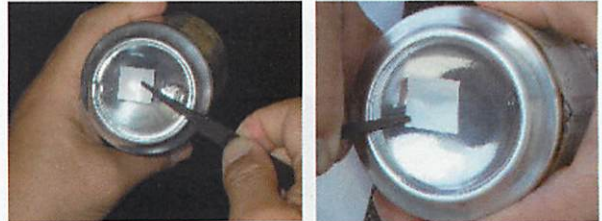
1. Look at the image on the bottom of the aluminum can.

Experiment 2

Concave mirror camera

1. From the dark room, spot the sunlight to the bottom of the aluminum can.

Gradually move the 1cm cut tracing paper to the bottom of the aluminum can.

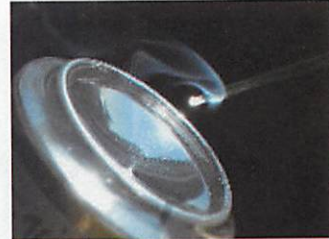


2. Stop when you see the object, and then observe it. The triangular shape is the mountain that can be seen from Science Center of Education. The image is upside down.

Experiment 3

Catch fire with concave mirror

Focus the polished bottom of the can to direction of the sun. Slowly move the incense stick to the bottom of the can about 2cm closer.



You can see smoke

Catch fire when you move the incense stick closer to the brightest part of the aluminum can.

Progress

You can make the temperature higher by gathering the sun light. Can you guess any other things that can be used as concave mirror?



Information

The sun light is gathered using a concave mirror. When a black paper is put closer to it, the black paper will start to burn. The point of the sun light is the“focus” of a concave mirror. The image of sun light is formed in this point.

Instead of the sun light, face the concave mirror into the distant scenery or object; you can see the same scenery or object.



Start to burn
Can and Black paper



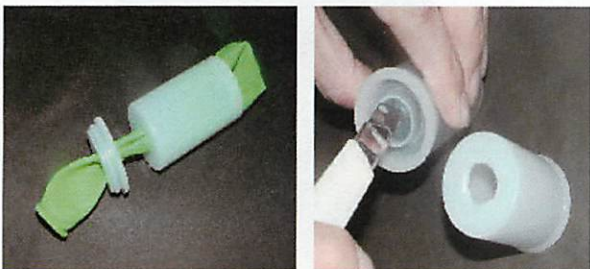
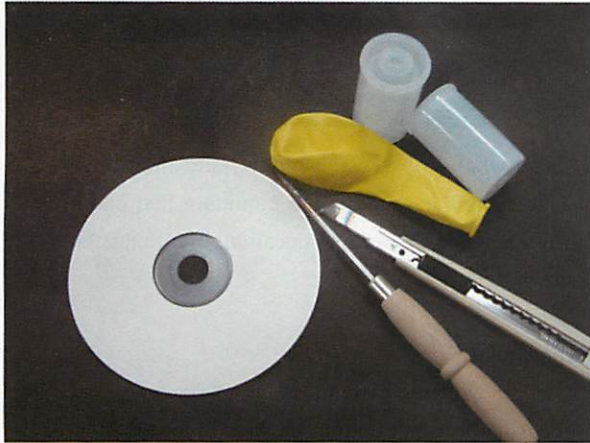
4. Let's Make a Balloon Hovercraft

Let's make hovercraft using the pushing force of air.

Point: Pushing force of air

Materials

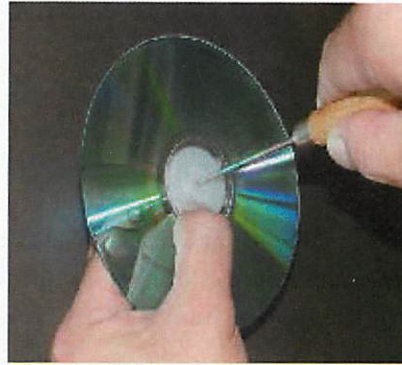
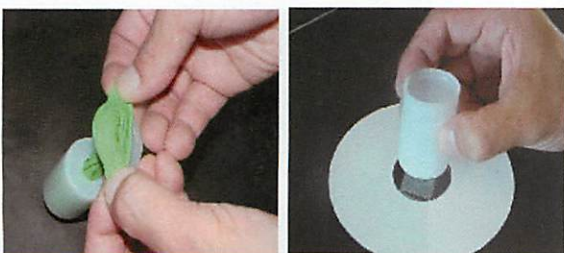
Rubber balloon, CD, 2 Film case with lid,
Double sided tape, Awl (tool for making hole)
Cutter



How to do

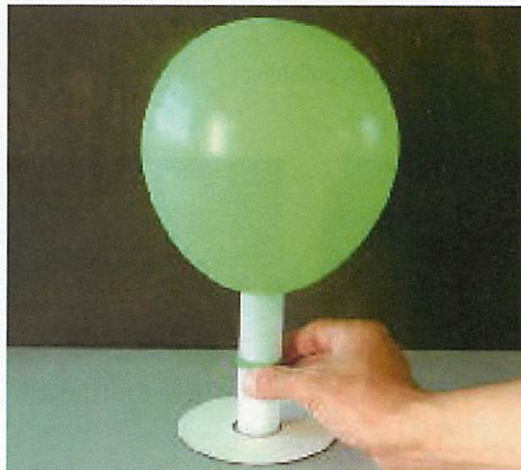
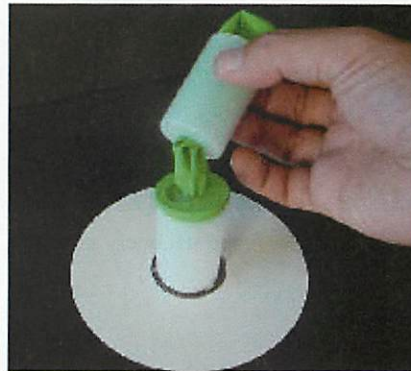
How to make the experimental apparatus

1. Make a hole at the bottom of the film case and the film case's lid (use heated cutter) .
2. Thread the rubber balloon through from the mouth to the hole of the film case and lid as shown in photo.



Experimental Method

1. Fit the lid with balloon to the mouth of the film case with CD and inflate the balloon.
2. In a flat surface, gently push it down and release it.
How does it move?



- The air that comes out under the balloon pushes the hovercraft upward so it float. The friction between the CD and the floor become small causing the craft to glide. When the craft hardly move, try to adjust the size of the hole.

Progress

Can you guess other things to use instead of balloon?

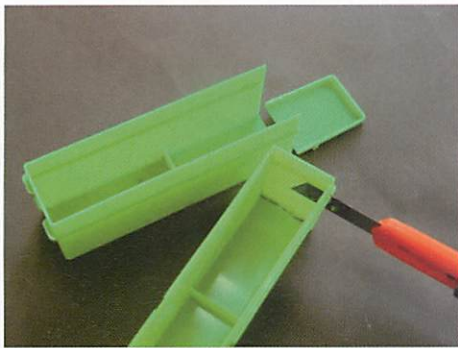
3. Let's Make a Fault using Cocoa and Flour

Let's make layer (strata) model made of cocoa and flour. A Strata (consist of volcanic ash, sand and clay) formation needs an additional power to create a fault (stratum breaks when a large force is applied).

Point: Let's look how to make fault.

Materials

Cover and clear slide case (Length 11cm : You can ask in camera shop), Flour, Cocoa powder, Used phone card, Small spoon, Scotch tape, Cutter



The long one on the cut part of the case.
You should heat the cutter before cutting

How to do

How to make the experimental apparatus

1. Cut the cover's end about 2mm from the edge.

You should heat the cutter before cutting

- You need to have help from adult.

2. Separate the long one on the cut part of the case.

How to experiment

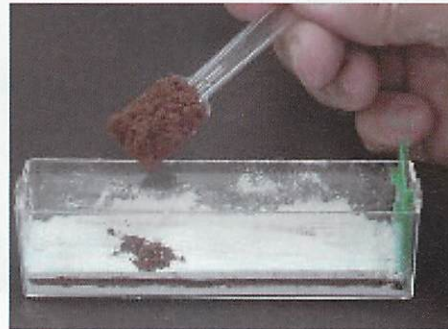
1. Put the cut cover's end on the corner of clear slide case and secure it with scotch tape.

2. Spread flour in the slide case about 2mm thick.
Press the flour using the cut long part of case.
Align the height of the flour using phone card. Make a neat layer.

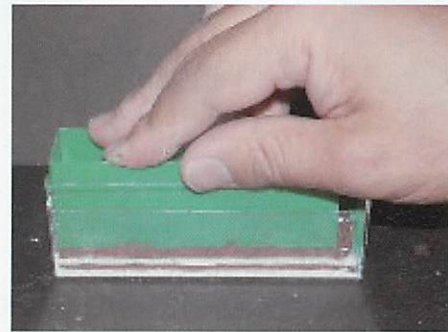


Make first layer of flour

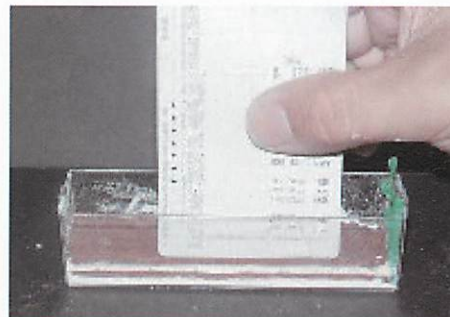
3. Spread cocoa powder above the flour (2 ~ 3mm thick).
Press again.



Make second layer using cocoa powder



Press them



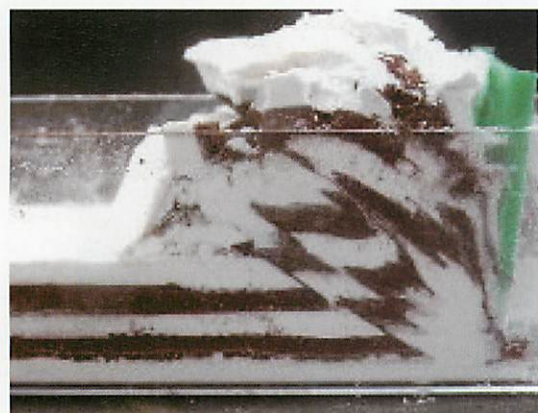
Align the height by phone card



Completed layer



Move the plastic board to the center slowly



Fault was made.

This fault is called "Reverse fault". This experiment comes from Osaka University of Education (attached school) Tennoji High School and referred to Yoshio Okamoto (flour fault model).

Progress

Let's search for places with faults.

2. Let's Make Leaf Puzzle

Let "Puzzle of leaves" be cut in different ways, the shape of a leaf, and the difference between front and back of leaves, leaf vein might be confusing! You can give hint!
Point: Observe nature of leaf using puzzle!

Materials

The leaf sample made using Book coat (clear adhesive plastic) or packing tape, this include construction paper, but double sided book cover is also good, Scissors



How to do: 6 pieces jigsaw

1. Prepare for the leaf specimen sample made using Book coat or packing tape.
2. Divide the specimen into 6 pieces and cut it using scissors.



3. Disarrange the 6 pieces of specimen.
4. The original shape of the leaf is the assemble leaf.

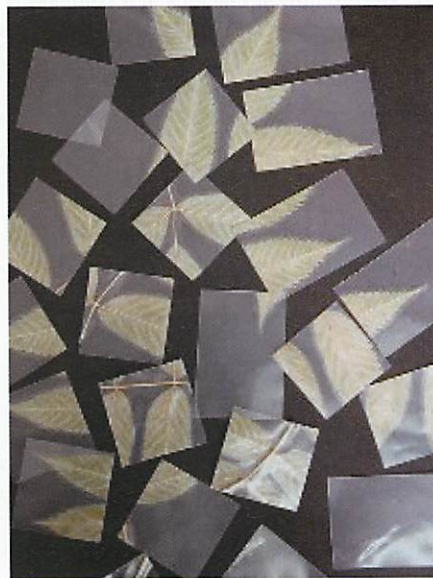
Let's assemble!!

Development

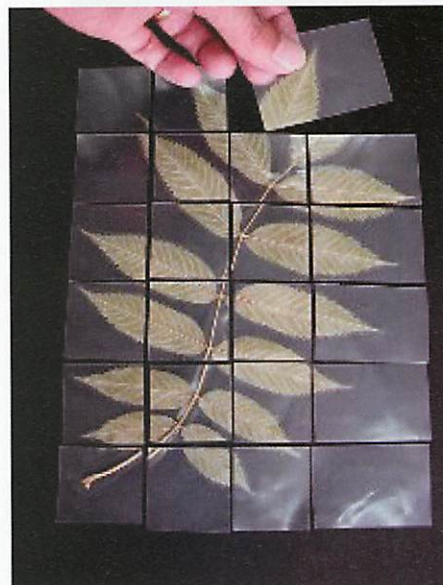
Challenging puzzle using leaf specimen!

Let's use two or more leaves in a puzzle. Divide it into 10 parts or more. The more number of divided parts, the more the puzzle become difficult. In addition, a leave specimen that uses the both side of book court (clear adhesive plastic) is more difficult to solve.

Let's make original leaf puzzle using different kinds of leaf. Let's observe the part of the leaves carefully – color, shape, veins and variety and the difference between the back and front part of the leaves.



Disarrange...



Let's assemble!

Chapter 1

Simple Science Experiments

Simple Science Experiments of Tancyou Sensei

Chihiro SAKAI

1. Let's Make Specimen of Plant in 3D

Let's make specimen of plant in three-dimension. If the remains of blooming flowering plant keeps on wearing, it is still possible to observe how it changes and compare it to the same species of flower. Let's observe carefully how flower change in the sample.

Point: To preserve a flower

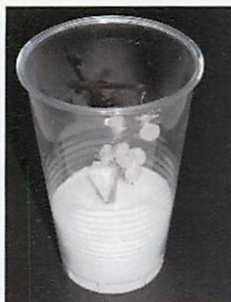
Materials

Spoon, Large plastic cup, Salt, Rubber band, Plastic wrap, Specimens of plants



How to Prepare

1. Put salt in a plastic cup about 2 cm deep and set up the plant into the salt so it could stand.



Stand the plant

2. Gradually cover the plant with salt using spoon avoiding any change in the shape of the plant. Fill the plastic cup with salt.



Add the salt



3. Cover the cup using plastic wrap avoiding any trash to enter the cup. Secure it with a rubber band.

4. Keep it on dry place. Make sure it is still.



The solid sample!

5. One week later, gently remove the salt and remove the specimen

Development

Cut styrofoam cup about same size of the plastic cup. Use the bottom of it as a stand for the specimen.

Upon covering the plastic cup with plastic wrap, salt acts as a Desiccant (usually can be seen in food package). As a result, the plants become solid creating a three-dimensional specimen.

The sample results are preserved smell and color (red color will slightly change).

There are lots of familiar plants with interesting foliage. Let's make you own plant solid sample!