

Chasing Rainbows

Become an incredible
color scientist and create
rainbows without rain!



Science4you



WARNING:

CHOKING HAZARD - Toy contains small parts.
Not for children under 3 years.

Play Monster





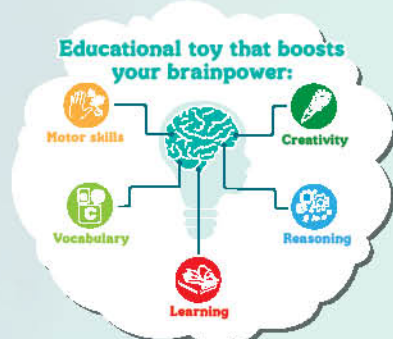
To Parents and Guardians:

Through play, children develop different cognitive skills. Scientific studies show that when we are having fun or making discoveries during an experiment, a neurotransmitter called Dopamine is released.

Dopamine is known to be responsible for feelings like motivation, reward and learning and that's why experiences are related to positive feelings. So, if learning is a positive experience, it will stimulate the brain to develop various skills.

Therefore, Science4you aims to develop educational toys that combine fun with education by fostering curiosity and experimentation.

Find out below which skills can be developed with the help of this educational toy!



The educational feature is one of the key strengths of our toys. We aim to provide toys which enable children's development of physical, emotional and social skills.

Learn more about Science4you toys at:

www.playmonster.com

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SAFETY RULES

- Read these instructions before use, follow them and keep them for reference.
- Keep young children and animals away from the experimental area.
- Clean all equipment after use.
- Make sure that all containers are fully closed and properly stored after use.
- Ensure that all empty containers are disposed of properly.
- Wash hands after carrying out experiments.
- Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.
- Do not eat or drink in the experimental area.
- Do not replace food items back in their original container(s) or packaging. Dispose of immediately.

GENERAL FIRST AID INFORMATION

- **In case of eye contact:** Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.
- **If swallowed:** Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- **In case of inhalation:** Remove person to fresh air.
- **In case of skin contact and burns:** Wash affected area with plenty of water for at least 10 minutes.
- In case of doubt, seek medical advice immediately. Take the chemical and its container with you.
- In case of injury, always seek immediate medical advice.

ADVICE FOR SUPERVISING ADULTS

- Read and follow these instructions, the safety rules and the first aid information, and keep them for reference.
- This experimental set is for use only by children ages 4 and up.
- Because children's abilities vary, even within age groups, supervising adults should exercise discretion as to which experiments are suitable and safe for them. The instructions should enable supervisors to assess any experiment to establish its suitability for a particular child.
- The supervising adult should discuss the warnings and safety information with the child or children before beginning any experiments.
- The area surrounding the experiment should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.
- This experimental set contains colorings, which can stain. Keep colorings away from objects and delicate fabrics.

In case of poisoning by any of the components used in the experiments of this toy, contact your local poison control center or the nearest hospital. Please consult the following link for more information: <https://www.poison.org/>



In case of emergency dial:
9-1-1 or Poison Control: 1-800-222-1222



LIST OF SUBSTANCES SUPPLIED

Blue Coloring

INGREDIENTS: CI 42090, POTASSIUM SORBATE, SODIUM BENZOATE

Precautionary Statements:

- P202** Do not handle until all safety precautions have been read and understood.
- P233** Keep container tightly closed.
- P234** Keep only in original container.

Yellow Coloring

INGREDIENTS: CI 19140, POTASSIUM SORBATE, SODIUM BENZOATE

Precautionary Statements:

- P202** Do not handle until all safety precautions have been read and understood.
- P233** Keep container tightly closed.
- P234** Keep only in original container.

Red Coloring

INGREDIENTS: CI 16255, POTASSIUM SORBATE, SODIUM BENZOATE

Precautionary Statements:

- P202** Do not handle until all safety precautions have been read and understood.
- P233** Keep container tightly closed.
- P234** Keep only in original container.

Recommendations for substances and mixtures: Do not ingest. Avoid contact with the eyes and mouth. Use only according to the instructions. Store in tightly closed containers. Keep in a cool, dry place. Protect from moisture, direct sunlight and heat sources.

DISPOSAL OF SUBSTANCES

Do not dispose of substances and / or mixtures together with household or other waste. Please recycle packaging materials where local recycling programs exist.





KIT CONTENTS



Glasses with 6 colored lens inserts



Pipette droppers



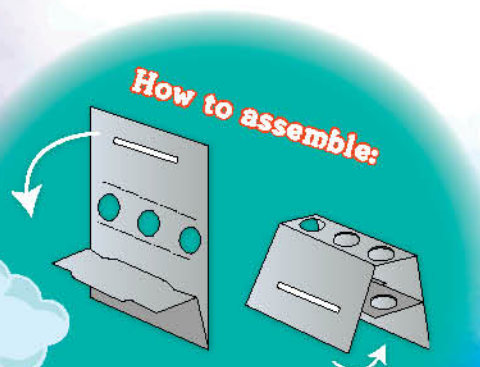
Card with graphic elements



Test tubes with lids



Test tube rack



How to assemble:



Origami sheets



Syringe



Red coloring



Scientist scissors



Yellow coloring



Sponge



Blue coloring

EXTRA CONTENT

Lab bench

Look at the lab bench design! This will help you to always have your "lab" ready to work. Cut out the dotted lines and place the material that you will use during the experiments in the spaces as indicated.



Suggested setup

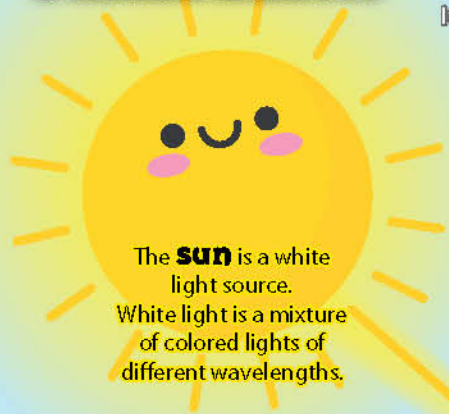
Discover all 7 colors of the rainbow as you explore each of these exciting color-changing experiments!





1. CHASING RAINBOWS

In the magical kingdom of the rainbow...
It was a **gray** day and it wouldn't stop raining...
but suddenly the clouds faded and the sun began to shine.



The **sun** is a white light source.
White light is a mixture of colored lights of different wavelengths.



Refraction

Rain droplets act like a prism and **reflect** the sun's rays that break down into all the colors of the rainbow!

What is a rainbow made of?

Light!

How many colors does a rainbow have?

7 (seven!)



DID YOU KNOW...

most people can only really see 6 of the 7 colors of the rainbow?



KNOW MORE...

To help you remember all the colors of the rainbow, you can use this fun shortcut name:

ROY G. BIV!

The first letter of each color: red, orange, yellow, green, blue, indigo and violet spells an easy name to remember!



Red is the color of:





2. SCIENTIFIC EXPERIMENTS

2.1. COLOR LAB

Greetings, Young Scientist!
In this kit you have **YELLOW, BLUE and RED!** But in the next experiments we will create **PURPLE, ORANGE and GREEN!**
Are you ready to mix the right colors?

Themes: Mix colors (primary colors and secondary colors); Perform measurements (liquids); Capillarity and movement of water molecules.

EXPERIMENT 1

Purple, orange and green

What you will need

Material included in the kit:



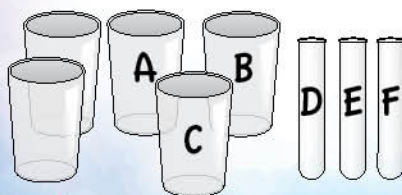
Extra items you will need:

- water • 5 disposable cups • marker
- a pencil to record your results

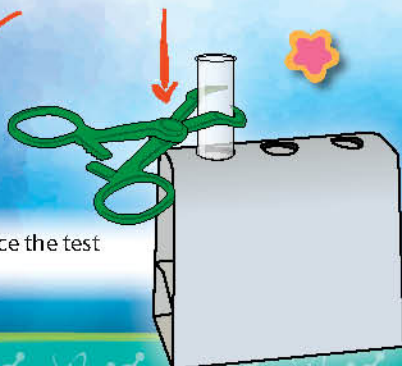
How to make?

Part I

1. With a marker, identify 3 of the cups with A, B and C and the test tubes with D, E and F.



2. Using the scientist scissors, place the test tubes in the test tube rack.



3. Fill the unidentified cups with water.

Scientist, do you know how to use a pipette dropper?



4. With the syringe, pour 25 ml (milliliters) of water into **cup A** and with the pipette dropper, add 3 drops of red coloring.



5. With the syringe, pour 15 ml of water into **cup B** and with the pipette dropper add 5 drops of yellow coloring.

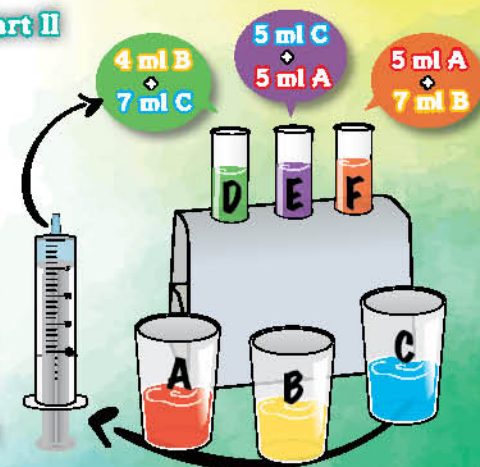
6. With the syringe, pour 20 ml of water into **cup C** and with the pipette dropper add 2 drops of blue coloring.

Part II

1. Let's mix the colors! Follow the instructions of the illustration:

Use the cup of water to clean the syringe whenever you use a different color!

What colors do you get?



Note your results here:

Containers	Liquid color	Quantity of liquid (ml)
A		
B		
C		
D		
E		
F		
Total quantity of liquid:		ml

Red is the color of:





a) The world of colors

All colors can be created from 3 colors: red, yellow and blue. These colors are called **primary colors**!

They cannot be created by mixing other colors.

Blue

Yellow

Red

The colors that result from mixing 2 primary colors are called **secondary colors**!

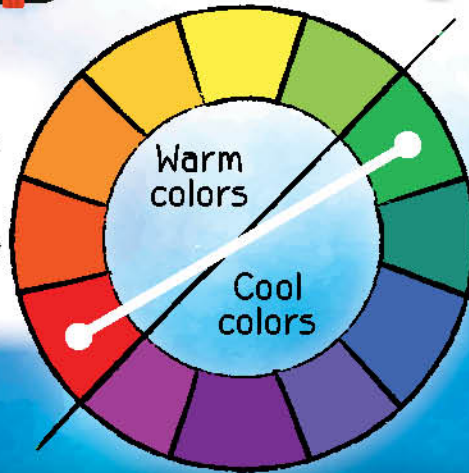
Purple
(Blue + Red)

Orange
(Red + Yellow)

Green
(Blue + Yellow)

Can you create **violet** and **indigo**? Watch the color wheel and create the 7 colors of the rainbow with your colorings!

All of these colors make up the **color wheel**. The opposite colors on the wheel are called **complementary colors**, like red and green.



If we mix all these colors together, we get even more shades, like lime green and reddish-orange (**tertiary colors**). Did you know that our eyes can distinguish about 10 million colors?



But what are colors? Why are leaves green and roses red?



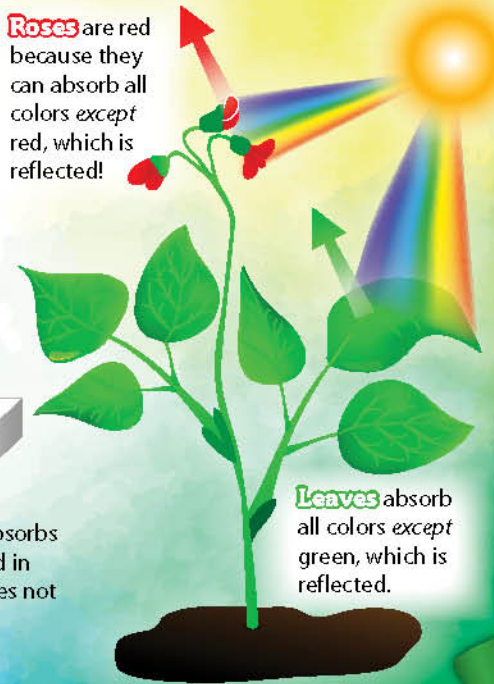
The colors around us are actually different types of light; if light did not exist, there would be no colors except for **black**, which is exactly the absence of light.



Color is assimilated by us through our eyes!

The color of an object results from the color of light it can reflect.

Roses are red because they can absorb all colors *except* red, which is reflected!



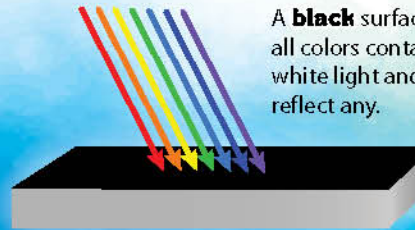
Leaves absorb all colors *except* green, which is reflected.

On the other hand...

A **white** surface reflects all colors, giving the visual perception of white color.



A **black** surface absorbs all colors contained in white light and does not reflect any.



The **reflection** of light occurs when light rays fall on a surface and returns to its original medium.



Orange is the color of:





EXPERIMENT 2

Rainbow walking water

What you will need

Material included in the kit:



• Colorings



• Pipette droppers

Extra items you will need:

- Water - 6 Cups (same size)
- 6 Sheets of paper towel

1. Fold 6 sheets of paper towel in half several times, until you get a width of about 1 inch.

2. Arrange the cups as shown in a circle, alternating the filled and empty cups. Next, insert one end of each piece of folded paper towel into each cup, making sure one end of each is placed in one full and one empty cup, as shown here.

Yellow

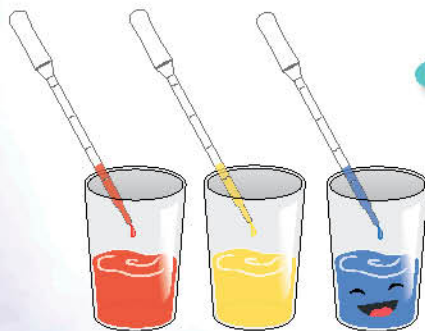


How to make it:

1. Fill 3 cups with water so each one is just over half full.

2. Using a pipette dropper, add a few drops of **blue** coloring to one of the cups of water and swirl slowly to mix.

3. With a new pipette dropper, add a few drops of **red** coloring to the second cup of water and swirl. Repeat the procedure for the remaining cup of water and the **yellow** coloring.

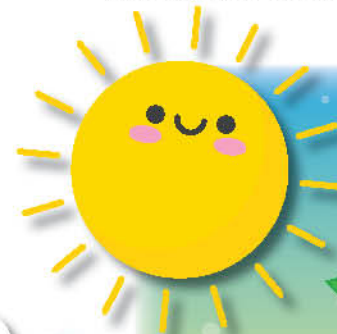


Scientist, what happens to the paper that you put inside the cups? And what happens in the empty cups?



What happens?

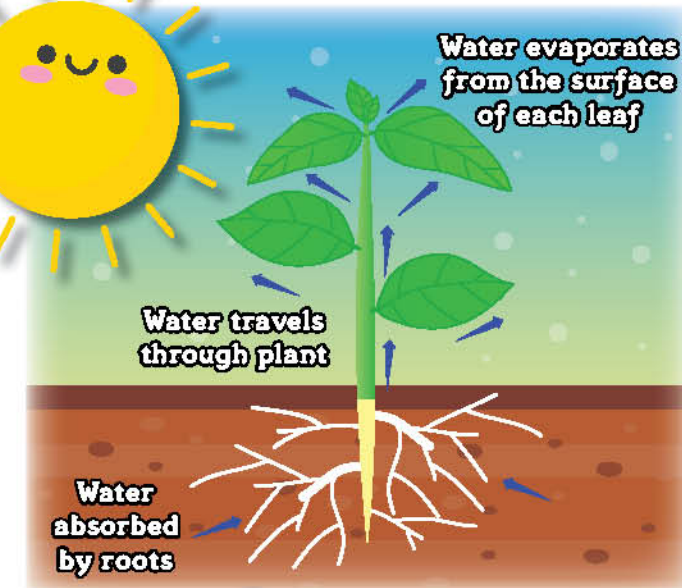
In this experiment you observe the **process of capillarity**. The water fills the small spaces in the absorbent paper and manages to rise through it to the empty cups. That is why it is possible to mix the two colorings of different colors in the empty cups and create new colors!



Water evaporates from the surface of each leaf

Water travels through plant

Water absorbed by roots



It is also through this process that plants can carry nutrients and water from the roots to the leaves.

Orange is the color of:





EXPERIMENT 3

Change the color of a flower

What you will need?

Material included in the kit:



• Colorings
(of your choice)



• Pipette droppers

Extra items you will need:

• Water • Tall cup • Scissors
• Flower with white petals
(like a Daisy or Carnation)

Ask an adult to help you!



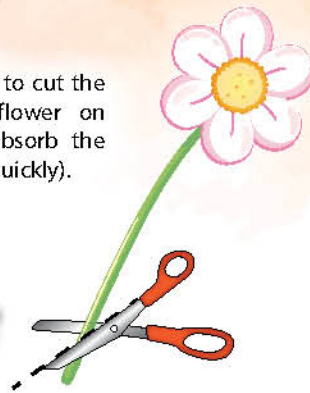
You will gradually notice a color change in the flower petals. This change may take a few days to be fully visible.

How to make it:

1. Fill 1 cup with water and add a few drops of coloring of your choice, using the pipette dropper.

2. Ask an adult to cut the stem of the flower on an angle (to absorb the coloring more quickly).

3. Put the flower in the cup and wait about 24 to 48 hours.



SUPER SCIENTIST:

Rainbow flower

1. Fill 2 cups with water. Use 2 different colorings and add 20 drops of each into the different cups, so you get 2 different color solutions.

2. Take another white flower and trim off the end of the stem at an angle with scissors.

3. Ask an adult to make a long vertical cut along the stem, dividing it in two.

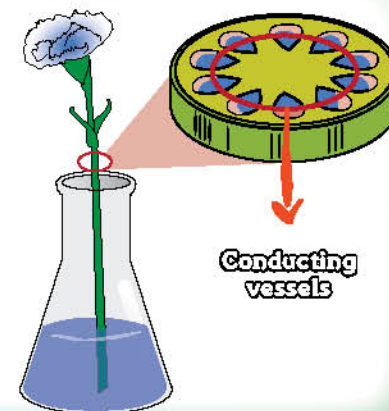
4. Place the cups with colored water side by side. Very carefully separate the stem and put one part of the stem in one solution and one in the other.

Wait 24 to 48 hours and watch what happens to your flower!



What happens?

The color of the petals occurs due to the **phenomenon of capillarity** in the vessels present in the flower stem. How quickly the process takes place depends on the distance between the liquid, the petals and the stem section. In this experiment you can see that water rises up the stem of the plant to the petals.



Yellow is the color of:





EXPERIMENT 4

Colored discs

What you will need

Material included in the kit:



• Colored discs - Card with graphic elements

Extra items you will need:

- Scissors • 3 Pencils • Clear tape
- Extra pencil to record your results

Ask an adult to help you!

2. Ask an adult to poke a hole in the center of the discs using a pencil.

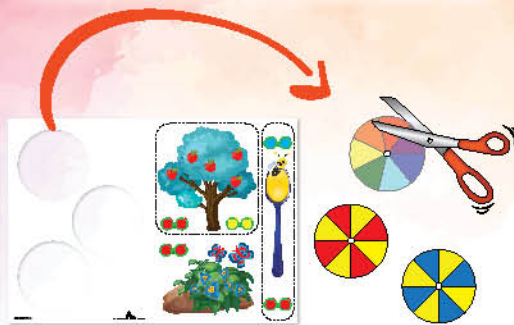


5. Now make the discs spin, as if you were a spinning top. Make sure to spin on a piece of paper so you don't make pencil marks on your tabletop!



How to make it:

1. With scissors (and the help of an adult) cut out the colored discs of the card with graphic elements.



3. Then push a pencil through the hole of each disc.

4. Attach the pencil to Newton's disc with some clear tape.



Spin like this!

Fill in the following table with your results!

Disc	What do you think will happen?	What do you see?
Yellow and red		
Blue and yellow		
Rainbow		

What happens?

Two primary colors combine to give a secondary color and this is what you see when the discs spin fast!



When the disc spins too fast, the eyes and brain working together cannot distinguish each color separately!

Therefore, we mix the visible colors of the rainbow and observe the white color as it is the sum of all these colors.

White/Gray



Did you know that the rainbow disc was discovered by Sir Isaac Newton? And that it is also known by his name?

A Colorful Discovery

In the 17th century the English physicist, Sir Isaac Newton, discovered that white light was composed of the 7 colors of the rainbow. This discovery led him to invent the well-known Newton's Disc.

Newton observed the decomposition of white light using a glass prism!

It was also this great scientist who realized during his experiments that the colors we observe derive from the ability of bodies/objects to reflect light and a certain color more than others.



Yellow is the color of:





EXPERIMENT 5

Rainbow glasses - a colorful world

What you will need

Material included in the kit:



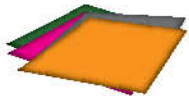
• Glasses



• Colored lenses



• Card with graphic elements



• Origami sheets

2. Put on your glasses and observe the world with your chosen color!

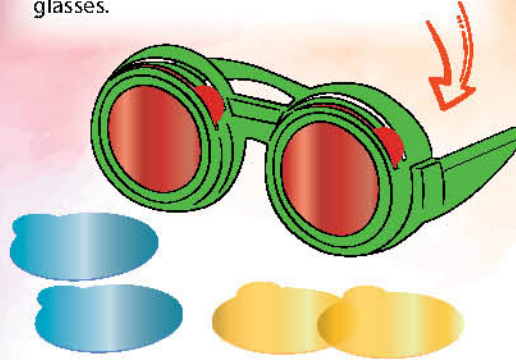
3. Let's mix the colors! Place one blue and one yellow lens in each eyepiece of the glasses. Observe what happens!

4. Make different color combinations! Combine **blue red** and **yellow** to create new colors! Observe the origami sheets with your glasses. Can you create new colors?

5. Observe each of the colored drawings on the card with your glasses!

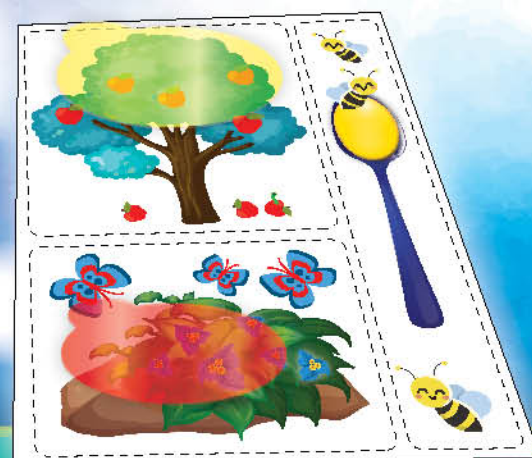
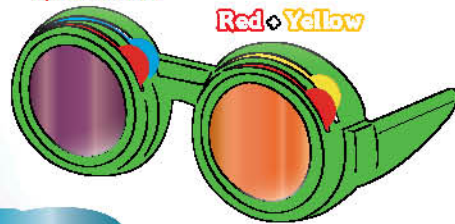
How to make it:

1. Start by placing the same color lens (yellow, blue or red) in each eye piece of the glasses.



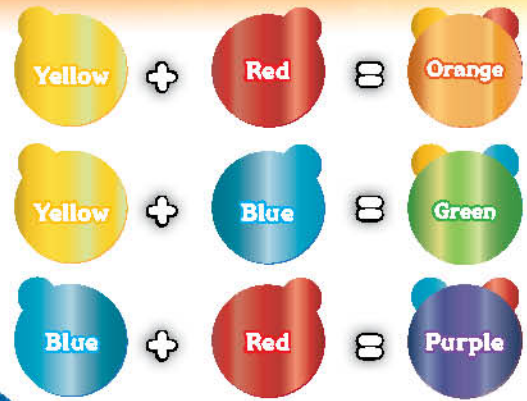
Red + Blue

Red + Yellow



What happens?

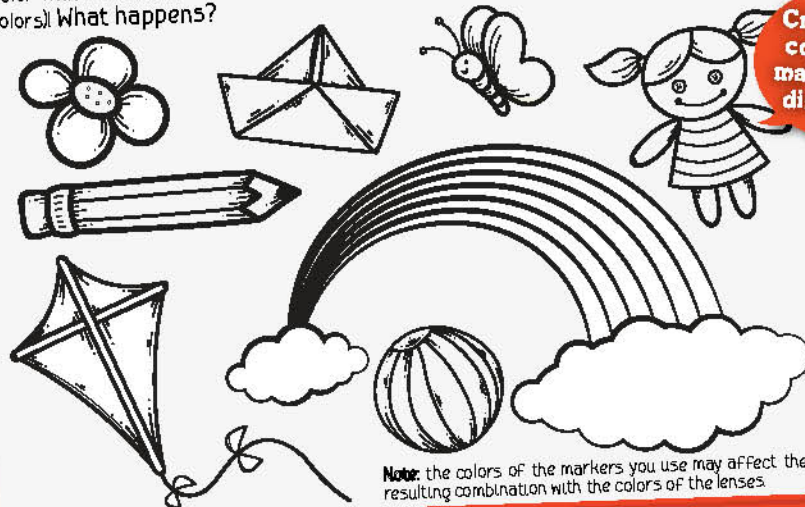
With colored lenses you can create these different color combinations:



Test new combinations! Use the colored lenses to see the world around you in another color!



Color with Fluorescent markers and observe the drawings with your glasses (with different colors)! What happens?



Note: the colors of the markers you use may affect the resulting combination with the colors of the lenses.



Green is the color of:





EXPERIMENT 6

Rainbow glasses - 3D images

What you will need

Material included in the kit:



Glasses



Colored lenses



Colored lenses

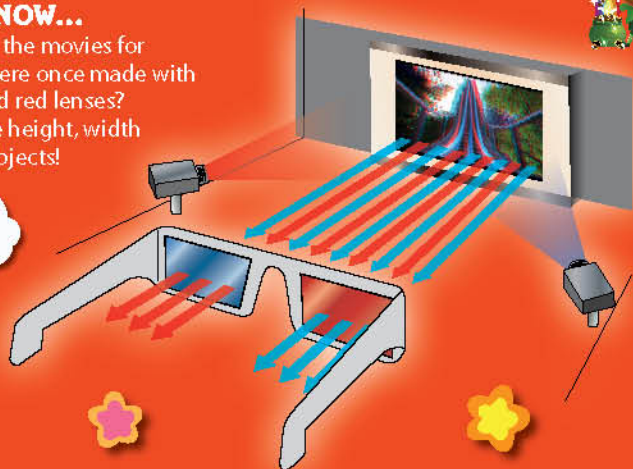
2. Now look at the drawings on the next page with your glasses.

What happens?

Each drawing consists of 2 images: one red and one blue. Looking at each image with these glasses, the red lens "hides" the shades of blue. And the blue lens "hides" the shades of red. As a result of this, only one of our eyes perceives each of the colors. When trying to merge the 2 images, our brain overlaps both colors, giving a slight sensation of depth of field, known as **the 3D effect** (3 dimensions).

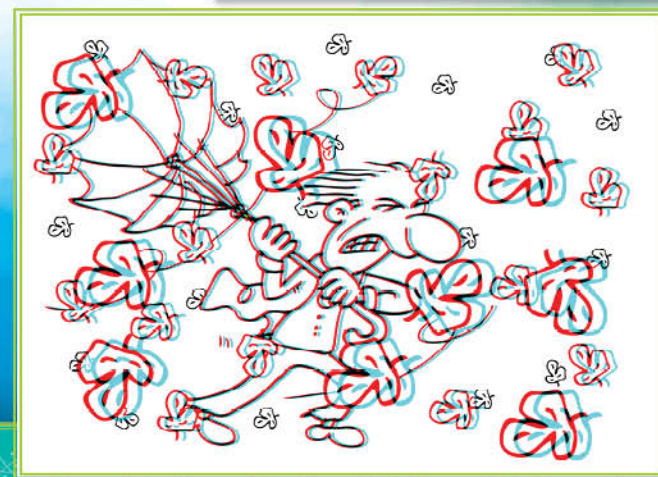
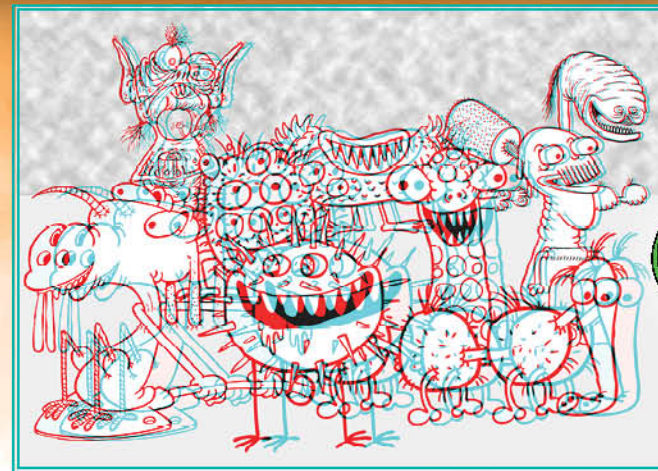
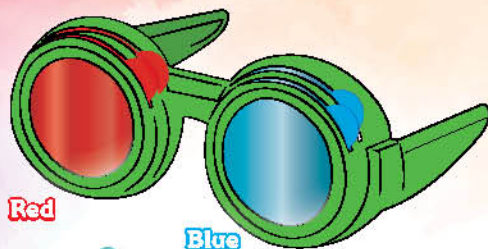
DID YOU KNOW...

glasses used at the movies for the 3D effect were once made with special blue and red lenses? You can see the height, width and depth of objects!



How to make it:

1. Start by placing the blue lens in one eyepiece of the glasses and the red lens in the other.



Green is the color of:





2.2. RAINBOW LAB



Themes: Create rainbows without rain.

EXPERIMENT 7

Rainbow rain

What you will need

Material included in the kit:



• Colorings



• Pipette droppers

Extra items you will need:

- Large tall cup
- Water
- Shaving cream or styling mousse/foam

Ask an adult to help you.

How to make it:

1. Pour water into a cup to about $\frac{3}{4}$ full.



2. Ask an adult for shaving cream or styling mousse to carefully make a cloud on the water surface. Let the foam settle a little.

3. Now, with the pipette droppers, place about 1 ml of each color (1 full pipette) in the foam cloud.



Scientist, don't forget to use a different dropper for each color!

What happens?

The water represents the **atmosphere** and the shaving cream or styling mousse represents **clouds**. When we pour the colorings over the foam, the cold air will cause extra pressure that will run through the foam and slip through the water, resulting in a rain-like effect (rainbow rain).

What do you observe, Scientist?



What makes it rain?

Clouds contain little drops of water. When clouds get heavier they fall as raindrops.



The water cycle

The water that circulates in our planet is always the same!

The world's water moves between lakes, rivers, oceans, the atmosphere and the land in an ongoing cycle called the **water cycle**.

As it goes through this continuous system, it can be liquid (water), gas (vapor) or solid (ice).

Condensation

Evaporation

Precipitation

Blue is the color of:



EXPERIMENT 8

Rainbow candies

What you will need

Material included in the kit:

- Pipette droppers

Extra items you will need:

- Warm water • Flat plate • Colored candy pieces (such as Skittles)

How to make it:

- 1 Place different colored candies in a circle on a plate.
- 2 Then, with the pipette dropper, add some warm water to the center of the plate.

What happens?

When you add water to the candy, the color of its coating begins to dissolve and you see a fantastic rainbow! Scientists call this process **chromatography**. By applying this technique to a secondary color, it is possible to break it down into the primary colors that constitute it.

ATTENTION: When you finish, dispose of all food items used during the experiment.

We can mix all the colors, but let's try to separate them!



EXPERIMENT 9

Rainbow paintings

What you will need

Material included in the kit:

- Origami sheets

- Pipette droppers

- Colorings

- Sponge

- Syringe

Extra items you will need:

- Coloring mixtures (from experiment 1)
- Flour • Small bowls • Extra paper
- Tablespoon • Water

- 5 Repeat the procedure with the remaining colorings and mixtures you prepared in experiment 1.

- 6 Have fun making great works of art on your colorful origami sheets or extra paper from home. To paint and make your drawings, you can use the sponge as a paintbrush (remember to clean it when you change paints).

ATTENTION: when you finish, dispose of all food items used during the experiment.

How to make it:

- 1 Put 2 tablespoons of flour in a small bowl.
- 2 Then, with the syringe add 20 ml of water.
- 3 Also add a few drops of coloring of your choice with the pipette dropper.
- 4 Now just mix it well with the spoon.



In this experiment you created a fantastic paint using only everyday ingredients!



Blue is the color of:





EXPERIMENT 10

Rainbow xylophone

What you will need

Material included in the kit:



• Colorings

• Pipette droppers

• Syringe

Extra items you will need:

- 7 Glass containers (same size)
- Metal spoon
- Water

How to make it:

1 Use the syringe to measure 25 ml of water and place it in one of the glass containers. You will have to take 2 measurements (i.e. 20 ml + 5 ml). This will be the Ti (B) note.



Attention, you will always have to use your control measurement - Ti (B) to fill the other glass jars.

Container	Note	Quantity of water (ml)
1	Ti (B)	25
2	La (A)	50
3	Sol (G)	75
4	Fa (F)	100
5	Mi (E)	125
6	Re (D)	150
7	Do (C)	175

2 Now fill the remaining glass containers according to the following table. Make the measurements with the help of the syringe.



3 With pipette droppers, use the colorings to give a different color to each musical note (each glass container). Use the colors of the rainbow! It will be really fun!



Do (C) Re (D) Mi (E) Fa (F) Sol (G) La (A) Ti (B)

DID YOU KNOW...

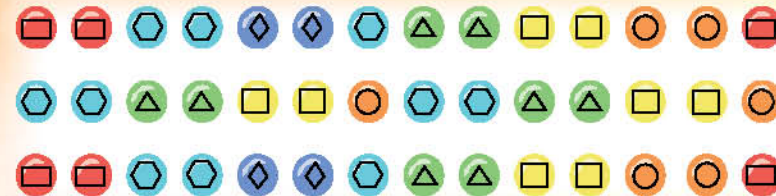
Sir Isaac Newton observed only 5 colors, and added two more just to make the analogy with the 7 musical notes!



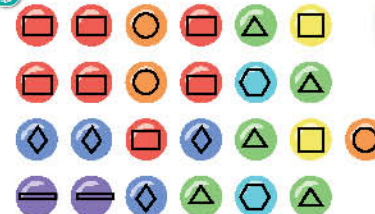
Twinkle, Twinkle Little Star



Play fun songs!



Happy Birthday song



What happens?

Different amounts of water make different sounds due to the vibration of the molecules.

Sound is the result of a vibration: the vibration of the particles present in the medium. These vibrations are captured by the sense of hearing, that is, by our ears!



Indigo is the color of:





EXPERIMENT 11

Rainbow projector

What you will need

Extra items you will need:

- Small mirror • Large bowl • Flashlight* • White sheet of paper • Water

*The result of this experiment is easier to observe if you use a non-LED flashlight.

- Turn on the flashlight and point it at the part of the mirror that is in the water. Guide the mirror so that its reflection—your rainbow—falls on the wall or sheet of paper.

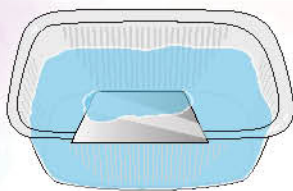


What happens?

The light of the flashlight acts in the same way as sunlight. Therefore, when it crosses the water it breaks down into its various colors—the colors of the rainbow. The mirror reflects the light and so the rainbow can be projected on a wall or wherever you want!

How to make it:

- Fill the bowl with water.
- Place the bowl on a table near a white wall or where you can place a white sheet to project the rainbow on it.
- Place the mirror in the water as illustrated.



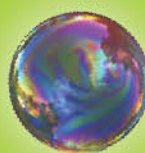
Watch your rainbow projected on the wall or sheet!



SUPER SCIENTIST:

Rainbows in soap bubbles and CDs

Look at a soap bubble! You can see the colors of the rainbow! Now hold a CD so that sunlight falls on it and watch! What happens?



EXPERIMENT 12

Rainbow on paper

What you will need

Extra items you will need:

- Clear drinking glass • Sheet of paper • Water • Light source (sun or flashlight)

How to make?

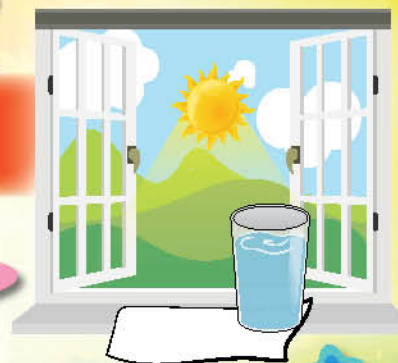
- Fill a clear drinking glass with water.
- Place the glass on a sheet of paper in front of a natural (sun) or artificial (flashlight) light source.

Watch how the light streaming through your glass splits into the colors of the rainbow!



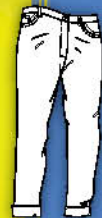
What happens?

The glass of water acts as a prism that separates sunlight into rainbow colors! You can see these colors on the white sheet of paper!



Visible light

The electromagnetic spectrum.



Indigo is the color of:





EXPERIMENT 13

Color symmetry

What you will need

Extra items you will need:

- Child-safe paints • Paintbrush
- Sheet of white paper

3. Fold the paper again, then press down and rub lightly so the paint transfers onto the other half of the paper.

4. Unfold the sheet slowly and let it dry.

How to make it:

1. Fold a sheet of paper in half and unfold it.

2. With the paints and paintbrush, make a painting, like a rainbow, on only one half of the paper, stopping at the fold.



If you want, use the paints you made in experiment 9!

How is your painting?



What happens?

The painting you made on one half of the paper shows up symmetrically on the other half. The more paint you use, the more it spreads and forms amazing images!

EXTRA ACTIVITY

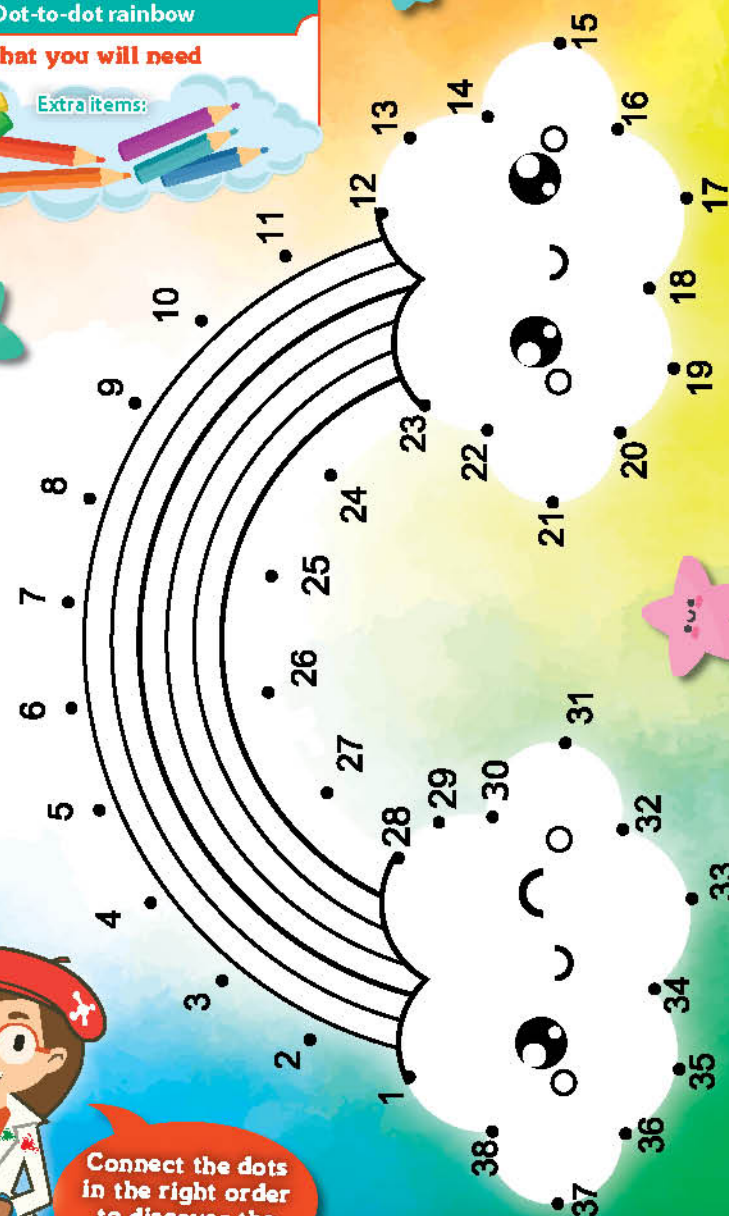
Dot-to-dot rainbow

What you will need

Extra items:



Connect the dots in the right order to discover the hidden image!



Violet is the color of:



SUPER SCIENTIST:

Paint a rainbow with yarn!

Ask an adult to wrap any kind of yarn around a rolling pin! Secure the ends tightly using tape. Then, add some of your favorite colors on the wrapped yarn and roll it on a piece of paper! You can also use your scientist scissors to grab some of the yarn and use it as a creative paint brush!

Wow! What an artistic and colorful painting!





3. SO TELL ME, WHAT'S AT THE END OF THE RAINBOW?

Some stories say that where the rainbow touches the earth there is treasure—
a pot of gold—but in fact, no one has ever discovered it!
Is it because there is no end?

The rainbow never ends!

Even though it looks like a bow in the sky, or even the letter "U" turned upside down, rainbows are actually full circles! We only see part of the circle, because we observe the rainbow from the ground.

Do you want to know another way to make your own rainbow?

Make your own rainbow outdoors!

On a sunny day, turn on a garden hose and create a mist with your thumb partially covering the opening, or use a regular sprayer and turn it to the mist setting.

Position the mist of water so that sunlight will pass through it directly. If the sun is behind you, a rainbow will appear in the mist of water droplets!

Color the pot of gold!

Scientist, did you enjoy this adventure around the world of colors and rainbows?

Through the rainbow I will sing.
To discover what life will bring.
The golden pot I want to find...
Or else I will lose my mind!

Violet is the color of:

Check out more COOL
experiments!



Science4you



Learn about these kits and more at www.playmonster.com!



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