

Rainbow Reactions

Rainbow in a Glass from Anne Helmenstine @ Thought Co.; Magic Milk Science Experiment from Cool Science Experiments Headquarters



Background:

Science comes in all colors, shapes, and sizes! Did you know that you can take ordinary milk and use science to turn it into a rainbow of crazy colors? Or that by combining 2 simple ingredients, you can make a dazzling color explosion? Not every experiment uses lots of different chemicals or tools to create something new. So let's explore the diversity of science with these fun, at-home DIY experiments!

Materials:

Experiment 1 – Rainbow Density Column

- Sugar
- Water
- Food Coloring
- Tablespoon
- 5 glasses or clear plastic cups

Experiment 2 – Magic Rainbow Milk Science Experiment

- Milk (preferably Whole or 2%)
- Food Coloring
- Dish Soap
- A shallow dish or bowl

Experiment 3 – Rainbow Chemical Reaction

- Baking Soda
- Vinegar
- Tablespoon
- Food Coloring
- 6 glasses or clear plastic cups
- A plastic tray or placemat



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Experiment 1 – Rainbow Density Column

Procedure:

1. Line up 5 glasses or cups. Add 1 tablespoon of sugar to the first glass, 2 tablespoons to the second glass, 3 tablespoons to the third glass, 4 tablespoons to the fourth glass, and leave the last glass empty.
2. Next, add 3 tablespoons of water to each of the first 4 glasses. Stir the sugar and water together to make a solution. If the sugar does not dissolve in any of the four glasses, then add one more tablespoon of water to each of the four glasses.
3. Add 2 – 3 drops of red food coloring to glass 1 (that's the glass with 1 tablespoon of sugar). Add yellow food coloring to the 2nd glass, green to the third glass, and blue to the fourth glass. Again, stir together the solutions.
4. Now use the different density solutions to make a rainbow! Fill the last glass (the empty one) about $1/4^{\text{th}}$ full of the blue solution.
5. Carefully layer some green solution on to the blue solution. Do this by putting a spoon in the glass, just above the blue layer, and pouring the green solution slowly over the back of the spoon. If done correctly, the blue solution will not be disturbed. Add green solution until the glass is about half full.
6. Now layer the yellow solution above the green solution using the same processes as in step 5. Fill the glass to $3/4^{\text{th}}$ of the way full.
7. Finally, layer the red solution above the yellow liquid in the same way as steps 5 and 6. The glass the rest of the way.

What does your Rainbow Density Column look like? Draw and color a picture:



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If you stir the rainbow, what happens to your solution?

How do you think your rainbow would look if you used a bowl rather than a glass or cup? What other ways could you make this layered rainbow?

If all the solutions are the same chemical (water and sugar), why don't they all combine? What makes them different from each other?

Experiment 2 – Magic Rainbow Milk Science Experiment

Procedure:

1. Pour some milk into a shallow dish or bowl until the milk covers the bottom.
2. Add some drops of food coloring on the milk. You can use a variety of colors, just be sure to add 3-4 drops of each color.
3. Add a drop of dish soap into the center of the milk.
4. And that's it! Watch in amazement as the colors dance across the surface of the milk!



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Draw a picture of what your bowl with milk and food color looked like before and after you added the dish soap.

Before Adding Dish Soap

After Adding Dish Soap

Experiment 3 – Rainbow Chemical Reaction

Procedure:

1. Place the 6 glasses or plastic cups on a plastic tray or place mat (be aware, this will get a little messy!)
2. Scoop a tablespoon of baking soda into each glass.
3. Add red food coloring to glass 1. To make orange, add 1 drop of red food coloring and 2 drops of yellow food coloring into glass 2. In glass 3, add yellow food coloring. Next, add green food coloring to glass 4 and blue food coloring to glass 5. Last but not least, create purple by adding 1 drop of blue food coloring and 1 drop of red food coloring into glass 6.
4. Then, take a small cup of vinegar and very carefully and slowly pour it into your glasses one by one. An instantaneous reaction should occur!

What observations did you make of the quick chemical reaction occurring in front of you?

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Describe what your experiment looked like before and after you added the vinegar.

Can you separate the baking soda and vinegar after the experiment? What happened? What new chemicals were created from the reaction?

What other colors could you create with your food coloring to see explode during the reaction? Try mixing the food coloring colors to create an even bigger rainbow!



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Extensions:

- Try making a layered density column that you can drink! Try substituting unsweetened soft drink mix for the food coloring, or four flavors of a sweetened mix for the sugar plus the food coloring!
- Instead of using dish soap, try using hand soap or other cleaning liquids in your magical milk experiment! Do you have the same outcome?
- In your rainbow reaction, make more colors to add to your rainbow by combining food coloring together. What colors can you create?

Other resources:

<https://www.thoughtco.com/rainbow-in-a-glass-density-demonstration-604258>

<http://coolscienceexperimentshq.com/magic-milk-science-experiment/>

<https://www.stevespanglerscience.com/lab/experiments/milk-color-explosion/>

<https://www.makeandtakes.com/baking-soda-and-vinegar-science>