IMHOTEP'S
LEGACY ACADEMY

Mixing Things Up

Grade 7 Activity Plan

Reviews and Updates

REVIEWER	ACTIONS/COMMENTS	DATE
Esther Bonitto	First draft of activity	24/07/19

Mixing Things Up

Objectives:

1. To identify the difference between heterogeneous and homogeneous mixtures
2. To understand and identify the difference between hydrophobic and hydrophilic molecules
3. To understand polarity and non-polarity

Keywords/concepts: heterogeneous, homogeneous, hydrophilic, hydrophobic, mixtures, non-polar, non-polarity, polar, polarity

Take-home product: Tie-dye T-shirts

Curriculum Outcomes:
Grade 7: (209-6, 307-2)
Grade 9: (307-13)

Segment	Details
African Proverb & Cultural Relevance (5 min)	"Truth is like oil. No matter how much water you pour on it, it will always float." **~Nigerian Proverb**
Demo 1: Colorful Rain (5 min)	Drop multiple colors of food coloring into a beaker of oil, and stir vigorously. Pour oil into a beaker of water and observe the differences between heterogenous/homogenous mixtures, and non-polarity/polarity.
Activity 1: Colorful Milk (10 min)	Pour several drops of different food coloring into a bowl of milk and add drops of soap to observe hydrophobic interactions.
Demo 2: Food Coloring on Wood Vs. Wax Paper (5 min)	Pour food coloring over both wood paper and wax paper to demonstrate hydrophilic and hydrophobic interactions.
Activity 2: Making Tie-Dye T-shirts (30 min)	Use plain white T-shirts to allow kids to make their own colorful Tie-Dye design, while demonstrating hydrophilic interactions.
Post-test (5 min)	Aid students in the completion of a Crossword Puzzle, encouraging them to finish it quickly, as the first student to finish will get to pick out a prize from the *Chemist Chest*

Suggested Interpretation of the Proverb: No matter how many lies people spread about someone or something, the truth will always be revealed in the end. The truth cannot mix with lies just like oil cannot mix with water. The truth always prevails!
https://twitter.com/bbcafrica/status/949883404698472448

Cultural Relevance:

Alice Ball (1892-1916) was an African American chemist, who developed a method that allowed an oil-like, hydrophobic substance to be absorbed by the body, which is largely hydrophilic. This oily substance was the most effective treatment for leprosy, a skin disease, until the 1940s.
https://en.wikipedia.org/wiki/Alice_Ball

BACKGROUND INFORMATION

Mixtures surround us everyday. From chocolate chip cookies and milk to concrete to perfume, mixtures are found in solids, liquids, and gases. Let's explore different chemical properties that mixtures can take on, and have fun visualizing how this effects the way they interact with other mixtures and substances.

Heterogenous Mixture: A mixture of two or more substances that are not uniform. You can see separate components in a heterogenous mixture.

Homogenous Mixture: A mixture of one or more substances that are uniform. You only see one medium.

Hydrophilic Molecules: Molecules that "love" or are attracted to water. Food coloring and water will mix because food coloring is hydrophilic.

Hydrophobic Molecules: Molecules that "fear" or repel water. Oil and water don't mix because oil is hydrophobic.

Polar Molecules: Molecules that have an overall positive or negative charge. Water molecules are polar.

Non-polar Molecules: Molecules that have little to no charge. Non-polar molecules and polar molecules don't mix together; this shows the hydrophilic/hydrophobic interactions at a deeper level.

Demo 1: Colorful Rain

Source:

- https://www.youtube.com/watch?v=UOz0E_VCJJs

Purpose: *to observe the difference between heterogenous and homogenous mixtures, and the difference between polarity and non-polarity*

Item	Quantity (for mentor)
Water	150 mL
Oil	150 mL
Beakers	2
Food coloring (multiple colors)	3
Spoon	1

Procedure:

1. Pour 150 mL of water into one beaker, and 150 mL of oil into another.
2. Drop 4-5 drops of each color of food coloring (should use at least 3 colors) into the beaker containing oil.
3. Is this a heterogenous or homogenous mixture? Why aren't the food coloring droplets dissolving in the oil? (Polar/non-polar)
4. Stir the oil vigorously to "mix" the food coloring in. The oil should become a blackish color, as the food coloring droplets have multiplied.
5. Pour the oil into the beaker containing water. After ~30 seconds, you should see the food coloring droplets falling into the water, trailing streaks of color behind. Use this as another opportunity to explain non-polarity versus polarity. Remember, like dissolves like!

Activity 1: Colorful Milk

Source:

- https://carrotsareorange.com/science-activity-with-milk-and-food-coloring/

Purpose: *to observe hydrophobic, non-polar, and polar interactions*

Item	Quantity
Bowl	10
Milk	4 L
Food coloring (multiple colors)	3
Dish soap	1 bottle
Q-tips	10

Procedure:

1. Pour 250 mL of milk into a medium-sized bowl.
2. Add several drops of multiple colors of food coloring.
3. Take a Q-tip and dip it into a tsp of dish soap.
4. Dip the Q-tip into the middle of the food coloring in the bowl of milk.
5. Why does the food coloring move away when the soap is added? Would the same thing happen if we used a drop of water instead of soap?

Demo 2: Food Coloring on Printer Paper Vs. Wax Paper

Purpose: *to observe that hydrophilic things attract, and hydrophobic things repel*

Item	**Quantity (for mentor)**
Printer paper	1 sheet
Wax paper	1 sheet
Food coloring (any color)	1

Procedure:

1. Place 3 drops of food coloring onto the piece of printer paper.
2. Place 3 drops of food coloring onto the piece of wax paper.
3. How does the food coloring react with each type of paper? Why does this happen?

Activity 2: Making Tie-dye T-shirts

Sources:

- https://www.youtube.com/watch?v=PbjWkiQ5DtI
- https://www.wikihow.com/Tie-Dye-with-Food-Coloring
- https://www.youtube.com/watch?v=dIB6XJamVg0
- https://www.westminster.edu/about/community/sim/documents/STie-dyechemistry_000.pdf

Purpose: *to observe hydrophilic interactions in a fun and interesting way*

Item	**Quantity**
Plain white T-shirts (various sizes)	10
Bowls	10
Lemon juice	2L
Water	4L
Rubber bands	40
Gloves	11 pairs
Food coloring (multiple colors)	30
Squeeze bottles	10
Salt	1500g

TO BE DONE BY MENTOR at least 1 hour before activity:

1. Place T-shirts into separate bowls, with each containing 120 mL of water and 120 mL of lemon juice. Soak the shirts for 1 hour.

Procedure:

2. Wring out shirts when students arrive, which must still be damp for tie-dying. ***Allow shirts to soak until students are ready to tie-dye them***
3. Twist each shirt into spiral. Students may need help with this. Secure into 8 parts, using 4 rubber bands. (Other patterns are possible, roll shirt into a tube shape and create 5 different sections using 4 rubber bands).
4. Each shirt should have at least 2-3 colors for a multi-color effect. Pour 120 mL of water into a squeeze bottle and add ~8 drops of food coloring to the bottle and shake to mix.
5. Squeeze bottle over shirt in the desire pattern. To make a spiral pattern, squeeze different colors onto each section of the spiraled shirt. Flip over to tie-dye the back of the shirt.
6. Place shirt into Ziploc bag and seal. Students will take home shirt and leave it in the bag for at least 8 hours.
7. Tell students to remove rubber bands and mix 150 g of salt in a bowl with 120 mL of water. Rinse the shirt in this mixture, then rinse the shirt in cold running water until the water runs clear.

8. Allow to air-dry. If cotton was used, the shirt may be placed in the dryer. Wash the shirt separately the first 3 times so that it does not stain other clothes.

9. Why does the food coloring stay on the shirt? Would this work if the shirt was made of wax, or polyester? Explain.

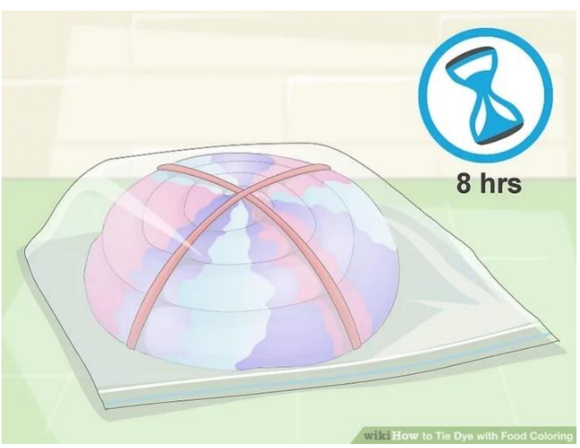
Soak in lemon juice & water mixture.

Wring out when ready to start tie-dying.

Twist into spiral & secure with rubber bands. (Two shown here, use 4).

Squirt colors onto front & back of shirt.

Place shirt into Ziploc bag.



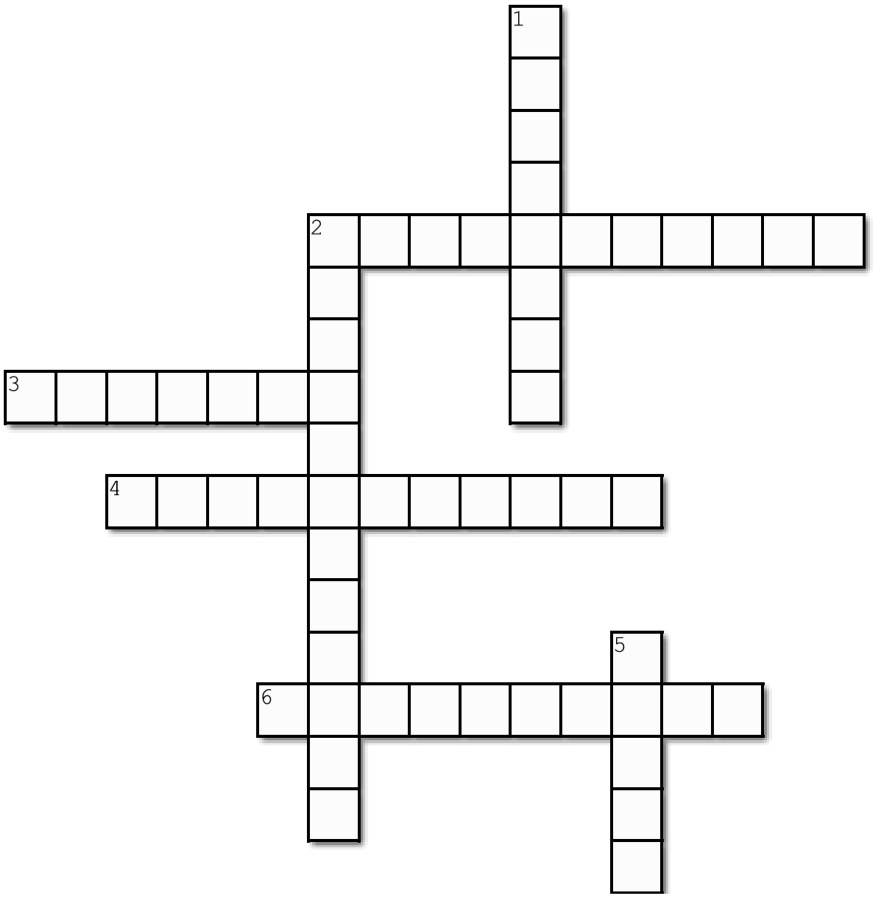
https://www.wikihow.com/Tie-Dye-with-Food-Coloring

Rinse shirt in saltwater solution, then with running water. Allow to air-dry, or place into dryer if the shirt is cotton.

Name: ______________________

Mixing Things Up

Complete the crossword puzzle below! Whoever finishes first will get to pick out a prize from the *Chemist Chest* :)



Across

2. Molecules that are water-loving

3. Combination of different substances

4. Molecules that are water-fearing

6. A mixture that is uniform

Down

1. Molecules with no charge

2. A mixture that is not uniform

5. Molecules with a charge

Item	Source (in-store)
Vegetable oil	Dollarama
Tie-dye kit	Dollarama
Milk	Walmart
Dish soap	Dollarama
Q-tips (cotton swabs)	Dollarama
Printer paper	Walmart
Wax paper	Dollarama
Plain white T-shirts	Walmart
Bowls	Dollarama
Lemon juice	Dollarama
Rubber bands	Dollarama
Gloves	Walmart
Squeeze bottles	Dollarama
Salt	Dollarama