Thursday 2nd July 2020

Milk Rainbow

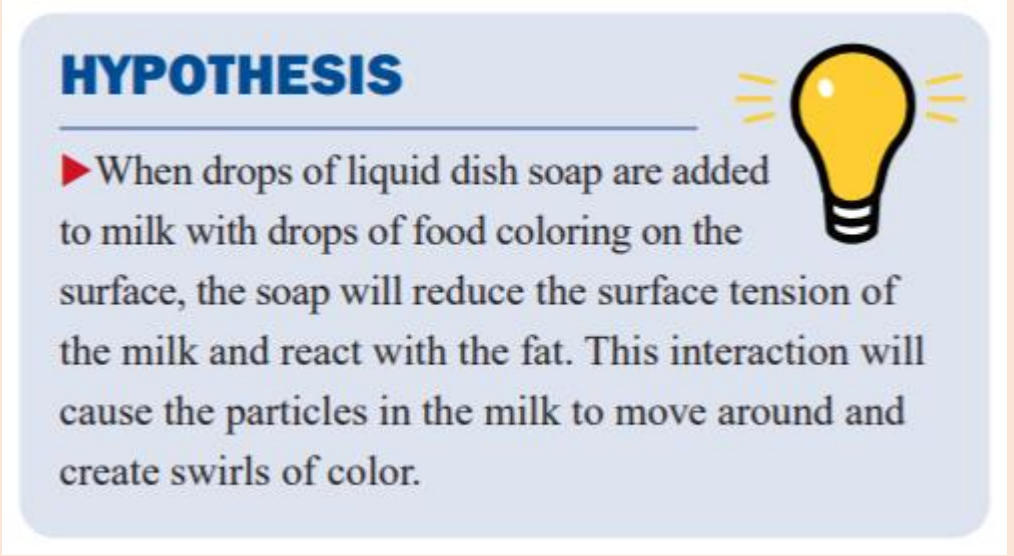
States of Matter

- Solids have a definite volume and a definite shape. Examples of solids are chairs, books, and trees.
- Liquids have a definite volume but no definite shape. Examples of liquids are water and orange juice.
- Gases have no definite shape and no definite volume. Examples of gases are the oxygen we breathe and the helium that fills balloons.
- Along with differences in shape and volume, the different states of matter have other unique properties. For example, surface tension is a property of liquids that describes the attraction of liquid particles at the surface.

- The strong attraction of particles at the surface of the liquid creates a surface “film” that makes moving an object through the surface of a liquid more difficult than moving the object when it is completely submerged in the liquid e.g when you are swimming it is quicker the more of you that is submerged!

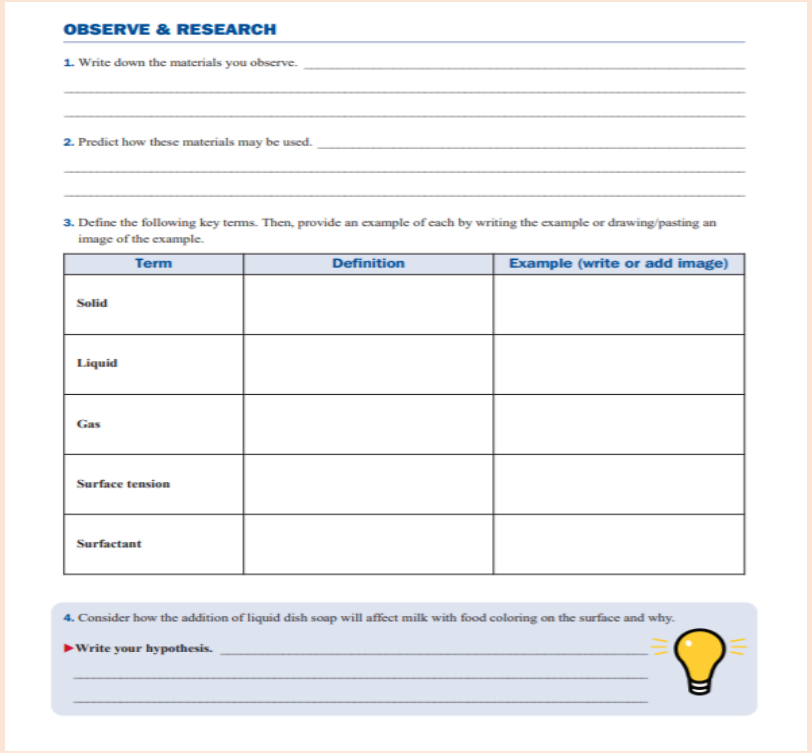
- In the experiment we will try today, the high surface tension of milk supports the dye molecules on the surface and keeps the dye relatively centralized. (The tendency to keep a low surface area minimizes the distance that the dye will spread across the milk's surface.)

- In contrast, soap is a surfactant. A surfactant (or surface active agent) is a substance that has the ability to reduce the surface tension of a liquid. Therefore, when a drop of liquid dish soap is added to milk, the surface tension of the milk is reduced. As this occurs, the particles in the milk can move more freely and easily. In addition, the soap interacts with the fat and protein particles in the milk, causing the particles to move around. This action can be seen as the dye swirls through the milk.



TASK

- Complete the worksheet and follow instructions to carry out the experiment yourself. We chose this one because we hope it is all items you will have at home!



OBSERVE & RESEARCH

1. Write down the materials you observe. _____

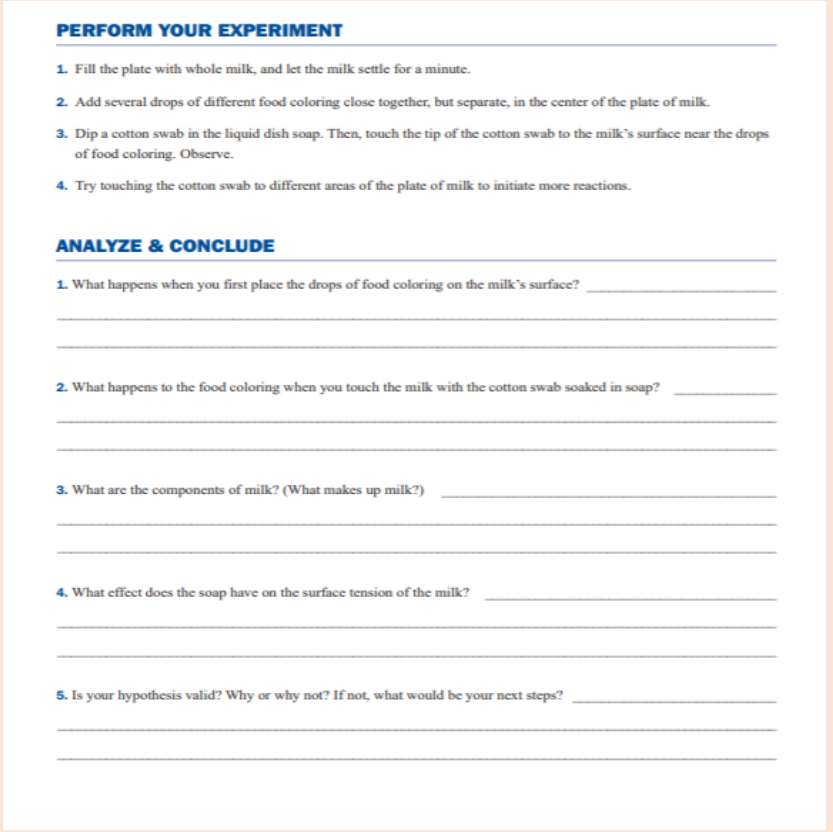
2. Predict how these materials may be used. _____

3. Define the following key terms. Then, provide an example of each by writing the example or drawing/pasting an image of the example.

Term	Definition	Example (write or add image)
Solid		
Liquid		
Gas		
Surface tension		
Surfactant		

4. Consider how the addition of liquid dish soap will affect milk with food coloring on the surface and why.

▶ Write your hypothesis. _____



PERFORM YOUR EXPERIMENT

1. Fill the plate with whole milk, and let the milk settle for a minute.
2. Add several drops of different food coloring close together, but separate, in the center of the plate of milk.
3. Dip a cotton swab in the liquid dish soap. Then, touch the tip of the cotton swab to the milk's surface near the drops of food coloring. Observe.
4. Try touching the cotton swab to different areas of the plate of milk to initiate more reactions.

ANALYZE & CONCLUDE

1. What happens when you first place the drops of food coloring on the milk's surface? _____

2. What happens to the food coloring when you touch the milk with the cotton swab soaked in soap? _____

3. What are the components of milk? (What makes up milk?) _____

4. What effect does the soap have on the surface tension of the milk? _____

5. Is your hypothesis valid? Why or why not? If not, what would be your next steps? _____

- Here is a video of the experiment in case you aren’t able to carry it out at home yourself!

https://www.youtube.com/watch?v=l2lpBITDsGk

EXPERIMENTAL PROCEDURE

1. Fill the plate with whole milk, and let the milk settle for a minute.

2. Add several drops of different food coloring close together, but separate, in the center of the plate of milk.

3. Dip a cotton swab in the liquid dish soap, and then touch the tip of the cotton swab to the milk's surface near the drops of food coloring. Observe the reaction.

4. Then, move the swab to different areas of the plate to initiate more reactions.