Messing With Mixtures Teacher Notes

Part A: Hit the Trail!

Materials:

Small bag of trail mix for each group with 5 ingredients

Examples: Chex cereal, Cheerios, M&M candy, raisins, and peanuts

Caution: If any of your students has an allergy to nuts, be sure to substitute ingredients.

Balances for measuring mass

Notes:

• Each group gets only one bag! When they are finished with this part, they may eat the trail mix. They are not allowed to eat anything else except the M&Ms in Part B!

• The trail mix would be a heterogeneous mixture since you can see the parts of the mixture.

• When they find the mass of each item/part, the students need to weigh everything - this includes little pieces of cereal or the "skins" from the peanuts. If they don't, the final total will not equal 100%.

• They need to round their percentages to the nearest hundredth. I tell them to round it off so it is like money - dollars and cents. The final percentage should be close to 100% is they were accurate in measuring the mass of each part.

• Discuss products that provide information about percentages, such as canned juices and cocktail nuts.

Part B: Tasty Solution

Materials:

M&M Candy or other small candy - 3 pieces per student

Stop watch or other time piece

Notes:

• Have the kids tell you what they are going to do before you give them the M&Ms. Here's a summary:

1st piece - The candy should just sit on their tongue and dissolve. They may get extra spit built up to speed up the process, but cannot move the candy around.

2nd piece - They can flop the candy around with their tongue, but they are not allowed to chew it or smash it with their tongue.

3rd piece - They can chew the candy and move it around with their tongue. They shouldn't swallow it whole without breaking it up!

• Students will need a stopwatch, regular watch with a seconds hand, or a classroom clock. They should keep track of the time it takes to dissolve ONLY the candy shell and not the entire piece of candy.

• For #7, students should learn that if a substance is crushed or stirred it will speed up the dissolving rate. Have students brainstorm other methods for speeding up the dissolving rate.

Other Answers:

8 - Solute and solvents in solutions

Ocean water = Solute - salt, Solvent - water

Kool-Aid = Solutes - powder and sugar, Solvent - water

Antifreeze = Solute - ethylene glycol, Solvent - water
Lemonade = Solutes - lemon juice and sugar, Solvent - water
Soda Pop = Solute - syrup and CO_2 gas, Solvent - water
Air = Solutes - oxygen and other gases, Solvent - nitrogen
Gold jewelry = Solute - copper, Solvent - gold
Sterling Silver = Solute - copper, Solvent - silver

#9 - Water is called the "universal solvent."
#10 - A glass of very sweet Kool-Aid would have the most solute since it has the most sugar to dissolve.

Part C: Mystery Colors

Materials:

Several varieties of black markers - Must be water soluble
Coffee filters or filter paper
Pipe cleaners
Small beakers or glasses

Notes:

- Demonstrate the correct procedure as outlined on the student worksheet, then allow time for the students to test three different black markers.
- Students need to allow enough time for the water to reach the ends of the coffee filter or filter paper.
- If the ink spot touches the water, they need to redo that test.
- Once dry, hang up the filters and compare. Ask students to classify each chromatogram based on the colors they see.
- Discuss soluble vs. insoluble inks. Soluble inks are those that dissolve in water, while insoluble inks will not dissolve in water. Other solvents, such as rubbing alcohol and fingernail polish remover, may be used to separate the pigments in insoluble or permanent inks. Due to safety concerns, I do not recommend having students experiment with the other solvents.

Part D: See The Light

Materials:

Ziploc bags - 4 for each group
Salt
Flour
Kool-Aid powder
Dirt
Graduated cylinders
Flashlight(s)

Notes:

- Students should make sure they mix the materials thoroughly. The salt and Kool-Aid powder should dissolve. The flour and dirt particles should be spread throughout the water.
- They should be able to see that the light passes easily through the solutions (D-1 & D-3)), while it tends to scatter in the colloids (D-2 & D-4).
- One example of the Tyndall Effect is the scattering of headlights on a foggy night. The water molecules that are suspended in the air scatter the light to produce a hazy effect. Have the students identify other situations in which they can see the same effects.
- When they are finished, have them throw the bags away. The mixtures SHOULD NOT be dumped in the sink as the flour mixture and mud can cause clogs.

Messing With Mixtures

Name _____

Part A: Hit The Trail!

(1) Look at the mixture in Bag A. What do you see?

(2) Would this mixture be classified as a heterogeneous or homogeneous mixture? Give a reason for your answer.

(3) What is the total mass of your mixture? Be sure to subtract the mass of the ziploc bag. Record this amount in the "Mass of Mixture" column of the chart.

(4) Separate the parts of the mixture and find the mass of each group. Use the formula provided to calculate the percentage for each part of the mixture. Record your data in the chart.

Name	Mass (g)	Mass of Mixture (g)	% of Mixture
FORMULA ➞ Mass of substance (g) ÷ Mass of mixture (g) x 100 Round final percentages to the nearest hundredth!			Total =

Part B: Tasty Solutions

(5) Read the steps below, then obtain 3 pieces of M&M candy from your teacher. You will need 3 pieces for each group member.

➥Step 1: Place one piece of candy in your mouth and allow it to dissolve without using your tongue or teeth to help! Record the time (in seconds) it takes for the candy shell to dissolve.

➥Step 2: Place another piece of candy in your mouth and allow it to dissolve using only your tongue to move it around. Record the time (in seconds) it takes for the candy shell to dissolve.

➥Step 3: Place another piece of candy in your mouth and allow it to dissolve using your tongue and teeth. Record the time (in seconds) it takes for the candy shell to dissolve.

Piece of Candy	Dissolving Time (s)
1st	
2nd	
3rd	

(6) In your solution, what was the solute and the solvent?

Solute =_____ Solvent = _____

(7) Explain the results of your experiment in terms of dissolving rate or the time it takes for a substance to dissolve.

(8) Identify the solute(s) and solvent in each solution. Underline the solute and circle the solvents. Remember that a SOLUTE dissolves in a SOLVENT!

Ocean water - Salt and water	Kool-Aid - Powder, sugar, and water
Antifreeze - Water and ethylene glycol	Lemonade - Water, lemon juice, and sugar
Soda Pop - Syrup, water, and CO_2 gas	Air - Nitrogen, oxygen, and other gases
Gold jewelry - Gold and copper	Sterling Silver - Silver and copper

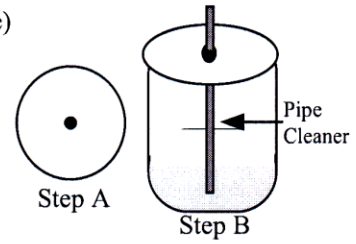
(9) What liquid is called the "universal solvent"?

(10) Which would have the most SOLUTE: a glass of very sweet Kool-Aid or a glass of barely sweet Kool-Aid? Give a reason for your answer.

Part C: Mystery Colors

(11) Follow the steps below to use chromatography to separate the pigments in black ink. You will need three black markers, three pieces of filter paper, a piece of pipe cleaner, and a small beaker of water.

(A) Use one of the markers to draw a circle (about the size of a dime) in the center of a piece filter paper.
(B) Insert one end of a pipe cleaner into the center of your ink dot. Place the other end into the water in the beaker.
(C) Allow time for the water to move up the pipe cleaner and separate the pigments in the ink.
(D) Repeat the first three steps to test the other markers.



(12) What happened to the black ink?

(13) What colors did you observe for each pen?

Pen 1 -

Pen 2 -

Pen 3 -

(14) Identify the solute and solvent for this experiment.

Solute = _____ Solvent = _____

(15) What do you think would happen if you used a permanent marker? Explain your answer.

Part D: See The Light

(16) Create 4 different mixtures by following the steps below.

Step 1: Mix 10 grams of salt with 100 mL of water in a ziploc bag. Label the bag as D-1.
Step 2: Mix 10 grams of flour with 100 mL of water in a ziploc bag. Label the bag as D-2.
Step 3: Mix 10 grams of Kool-Aid powder with 100 mL of water in a ziploc bag. Label the bag as D-3.
Step 4: Mix 10 grams of dirt with 100 mL of water in a ziploc bag. Label the bag as D-4.

(17) Shine a flashlight through each bag. What do you observe about each mixture?

D-1 = Salt & water ➞

D- 2 = Flour & water ➞

D-1 = Kool-Aid powder & water ➞

D-1 = Dirt & water ➞

(18) Read the following information from the Columbia Encyclopedia, then answer the questions.

One property of a colloid that distinguishes it from a true solution is that the particles in a colloid scatter light. If a beam of light passes through a colloid, the light is reflected or scattered by the particles in the colloid and the path of the light can be observed. When a beam of light passes through a true solution there is so little scattering of the light that the path of the light cannot be seen and the small amount of scattered light cannot be detected except by very sensitive instruments. The scattering of light by colloids, known as the Tyndall effect, was first explained by the British physicist John Tyndall.

(A) Which mixtures would be classified as colloids? _____ & _____

(B) Which mixtures would be classified as solutions? _____ & _____

(C) Name the solutes and solvents for the solutions.

Bag _____ → Solute = _____ Solvent = _____

Bag _____ → Solute = _____ Solvent = _____

(D) Describe a situation in which you would observe the Tyndall Effect.