

# Teacher's Notes for Lower Elementary Experiments

## Acids and Bases

### Experiment 1

Many acidic foods taste sour, while the basic foods are bitter. There are not many basic foods, but many household cleaners are base.

### Experiment 2

Prepare the solutions ahead of time for the children. With the powdered substances, mix 5 mL of each with distilled water, as tap water will affect the reactions. Crush the aspirin tablet and mix it with the distilled water. Make sure to label each substance. Give the children the chart to fill out their predictions. Acids will turn the litmus red, while bases will turn the paper blue. Neutrals will have no effect on the paper.

### Experiment 3

The solution of lemon juice will work the best because it is the most acidic. The copper from the pennies oxidizes and becomes tarnished. When the tarnished pennies are placed into an acidic solution, the acid reacts with the oxidation and cleans the pennies.

### Experiment 4

The cup with the vinegar and salt will yield the shiniest pennies after the 10 minute observation. However, overnight, the cup with the Cola-Cola will produce the shiniest pennies of all. Soft drinks are very acidic.

# Acid, Base, or Neutral Solutions

Name of solution	Prediction acid, base, neutral	What happened to the paper? <span style="margin-left: 20px;"><u>red</u></span> <span style="margin-left: 20px;"><u>blue</u></span>	Actual acid, base, neutral
1. _____			
2. _____			
3. _____			
4. _____			
5. _____			
6. _____			
7. _____			
8. _____			
9. _____			
10. _____			

Conclusion

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Conclusion

## **Teacher's Notes for Chemical Changes**

### **Lower Elementary Experiments**

#### **Experiment 1**

The chemical change is indicated by a color change as well as an odor change. The vitamin C inhibits the change the most because it stops the air from reaching the fruit.

#### **Experiment 2**

The vinegar reacts with the copper and oxygen to oxidize. The clay does not allow the air to get to the copper, so this part of the penny will not oxidize.

#### **Experiment 3**

The raw potato contains the enzyme catalase. Enzymes are chemicals found in living cells. Their purpose is to speed up the breakdown of complex food chemicals into smaller, simpler, more usable parts. Catalase from the potato's cells causes the hydrogen peroxide to quickly break apart into water and oxygen gas.

#### **Experiment 4**

Milk is a mixture of liquids and very tiny particles that are spread throughout the liquid. Vinegar causes the small, undissolved particles to clump together, forming a solid called curd. The liquid portion is referred to as whey.

# **Teacher's notes on Physical Change Experiments**

## **Lower Elementary**

### **Experiment 1**

The changes occur on the surface of the ice cube since that is the part that is exposed to the warmer air. So observations that should be noted are that the ice cube becomes more transparent as it melts. The energy involved is supplied by the warm air. Of course this is reversible by placing it back into the freezer, where there is also more energy transference.

### **Experiment 2**

As the solution evaporates, there is a freeing of ions molecularly. This allows the solid to reform in the shape of crystals. The jar cannot be stirred or moved, as this will break the fragile, beginning crystals, and not allow them to grow on the string.

### **Experiment 3**

The water is filtered as they pass through smaller and smaller particles. This is an efficient system, since the water can flow through the smaller layers, while the larger particles are being filtered by the larger layers on the top.

### **Experiment 4**

A mixture is a combination of two or more substances that can be easily separated. The sum of the two separate substances will equal the weight of the initial mixture.

# Teacher's Notes for States of Matter

## Lower Elementary

### Experiment 1

The rice and ping-pong ball are not the only states of matter. In this case, there is also air trapped inside the jar and between the rice grains. When the jar is shaken, the rice grains get closer together, and push the ping-pong ball up. No two pieces of matter can occupy the same space at the same time.

### Experiment 2

Both the marbles and water are matter and cannot occupy the same space at the same time. The rise in the water level is equal to the volume of the marbles.

### Experiment 3

The three states are that the wax is a solid, the melted wax is a liquid, and the smoke is a gas. The states change due to a change in temperature, both in the heating and cooling of the wax.

### Experiment 4

The 250 mL of salt is not solid throughout, there are spaces in between. The water moves into these space and, therefore, the total volume is less than 500 mL.

### Experiment 5

recipe for goop.

- 1/2 cup of cornstarch
- 1 cup of water
- food coloring
- zip-lock bag

Mix the water and coloring into the cornstarch and add extra water if necessary - the Goop should have a thick consistency. Goop is actually a colloid, a substance that is between a homogeneous mixture (a solution where the substances cannot be separated) and a heterogeneous mixture (substances can be separated out... as in pizza or salad). Glue is another type of colloid. This branch of study was initiated in approximately 1861 by Scottish scientist, Thomas Graham.

## **Experiment 6**

A liquid's resistance to flow is known as its viscosity. Pushing harder on a viscous liquid actually makes the liquid resist more, because the "holes" in the liquid, when pressed, make it harder for the molecules to move. Changing the temperature by heating, will make the liquid less viscous, while cooling it, will make it more viscous. (As slow as molasses in January, would be a good example!)

## **Experiment 7**

The heated water has more holes in it, even though the molecules in the liquid are more tightly connected. The sugar granules fit in between these holes.

## **Experiment 8**

The carbon dioxide produced by the reaction is heavier than air. The gas is invisible and will extinguish the flame. Carbon dioxide is also used as foam in fire extinguishers.

## **Experiment 9**

The molecules in the air are pressing against the bag. These molecules are pressing out, more than the student is pressing in. Therefore, the bag exhibits resistance.

## **Experiment 10**

The bottle is filled with air. Blowing into the balloon causes the molecules inside the bottle to move only slightly. There isn't enough room for the balloon to inflate.

## **Experiment 11**

The glass is filled with paper and air. The paper did not get wet because the air prevented the water from entering the glass.

## **Experiment 12**

When you blow into the bottle, the air pressure becomes unequal. There is also a slight vacuum at the neck of the bottle. As the pressure is equalized, the ball of paper is driven out.

CHEMICAL	STORE	PRODUCT
Acetic acid	Supermarket	Vinegar
Acetone	Drug store/hardware	Fingernail polish remover/paint solvent
Alcohol		
Ethanol	Hardware	Denatured alcohol
Isopropanol	Drugstore	Rubbing alcohol
Methanol	Hardware/Auto supply	Paint thinner/Gas line antifreeze
Antacid tablets	Drugstore	Any antacid tablets
Aluminum	Hardware/Craft Store	Wire, siding nails, flashing
Bobby pins	Drugstore	Metal bobby pins
Butane lighter	Supermarket/Drugstore	Butane lighter
Citric acid	Supermarket	Gatorade/Crystal Light
Copper	Hardware/Craft Store	Wire/Strips
Cornstarch	Supermarket	Any brand
Corn Syrup	Supermarket	Any brand
Cream of tartar	Supermarket	Any brand
Dishwashing liquid	Supermarket	Any brand
Gelatin dessert	Supermarket	Jell-O (citric flavors)
Glycerin	Drugstore	By name
Guar gum	Health food store	Any brand
Hydrochloric acid (HCl)	Hardware	Muriatic acid
Iodine	Drugstore	By name
Lead	Sporting Goods	Sinkers
Lighter fluid	Drugstore	By name
Magnesium	Sporting Goods	Light-weight frame Light-weight packframes
Oxalic acid	Auto supply	Radiator cleaner
Oils	Supermarket/Auto Supply/Drugstore	Cooking oils/Motor oils/Baby oil and Mineral oil
Paradichlorobenzene	Supermarket	Mothballs
pH indicator strips	Pet supply/Swimming pool supply	By name
Plaster of Paris	Hardware	By name
Powdered sugar	Supermarket	By name
Sodium Bicarbonate	Supermarket	Baking soda
Sodium Borate	Supermarket	Borax
Sodium Hydroxide	Supermarket	Drain cleaner
Sodium thiosulfate	Photography Store	Fixer, hypo
Sugar	Supermarket	By name
Waterless hand cleaner	Auto Supply	By name
White Glue	Craft Store/Supermarket	By name
Xylene	Hardware	Thinner/solvent
Zinc	Hardware	Hot-dipped galvanized nails