Watch The Stars Come Out

(GPN # 29)

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Program Description: Visiting Ellis Island, the port of entry for millions of immigrants who came to America with hopes and dreams for a better life, is a trip back into the past. LeVar explores the purpose of the island and then visits the Statue of Liberty where he climbs to the top to see how this important symbol is being restored.

Pretty As A Penny

Key Words: metals, copper, chemical reactions.

Concept: Copper metal can be changed by a chemical reaction.

In the case of the Statue of Liberty, the formation of the green layer of copper sulfate has helped preserve it. Because the copper sulfate is less reactive to gases in the air than copper is, this patina works as a protective layer over the copper which is still below it. When shiny copper metal on new pennies or the young Statue of Liberty is exposed to air, it slowly changes to a dark brown or black, and a patina layer forms in time. The dark brown or black tarnish is copper oxide which can easily be removed.

Materials: Vinegar, small plastic bowl, salt, spoon, old pennies, water, craft stick (optional), oil-based modeling clay (optional).

1. Pour about one-half cup of vinegar into a small plastic bowl.

2. Add one teaspoon of salt to the vinegar and stir until all the salt is dissolved.

3. Place an old brown penny into the vinegar and stir gently with a spoon for just a minute or two. (You can also use this solution to clean the pennies from the A Penny Of A Different Color activity.)

4. Remove the penny and rinse it with water. Notice the change in the appearance. (The copper oxide tarnish is removed as it reacts with the acid in the vinegar. This chemical reaction actually removes a thin layer from the penny leaving shiny copper exposed. If enough copper is removed from the surface of a penny in this way, the gray zinc metal underneath the copper will become visible.)

Extension: Attach a penny to the end of a craft stick using oil-based clay. Hold the craft stick so the penny is only halfway in the vinegar. Do this for about a minute, then remove the penny and rinse with water. The portion of the penny that was in the vinegar will be much brighter than the other half.

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A Penny Of A Different Color

Key Words: metals, copper, chemical reactions, color change.

Concept: One sign of a chemical reaction is a color change.

When the Statue of Liberty first arrived from France in 1886, it was a deep brown copper color. Those looking at the Copper Lady today will note that it is no longer brown, but light green. The green coating is a layer called patina that has formed as the copper reacted with gases in the air.

Materials: Pennies, white paper towels, vinegar, small plastic plates, small cups.

1. Discuss how the Statue of Liberty and a penny are both covered with a metal called copper. (Pennies are made from zinc and coated with a layer of copper.) The color of the Statue was once the same as a penny, but that has been changed by chemical reactions. Students can experiment with pennies to see this change.

2. Have small groups of students fold a paper towel in half twice and place it on a small plate.

3. Give each group a small cup containing about two tablespoons of vinegar. (They will need enough vinegar to soak the towel but not flood the plate.) Ask them to pour the vinegar on the paper towel.

4. Have them place several pennies on the vinegar soaked paper towel, press them down against the towel, and then turn them over. Have them place several pennies on a separate paper towel and plate with no vinegar—this will be their control group. Leave the pennies overnight.

5. The next day, have them look at the pennies and compare the color of the control group to the pennies on the paper towel soaked with vinegar. How have the pennies changed? (The pennies exposed to the vinegar will have turned green, especially around the edges.) What caused the change? (A chemical reaction has taken place. The copper has reacted with the vinegar to form a green compound—the copper and vinegar reacted to form copper acetate. The green on the Statue of Liberty is copper sulfate.)

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Iron Out Your Problems

Key Words: metals, iron, chemical reactions, rust, corrosion.

Concept: Iron can be changed by a chemical reaction.

During the restoration of the Statue of Liberty it was discovered that some of the iron framework inside the statue that supports the copper panels needed to be replaced because of corrosion, which is a combination of rusting and etching. The iron had slowly reacted with oxygen in the air to form iron oxide, or rust. Some of the metal was also chemically etched away by moisture. This corrosion made the iron bars weak and brittle. They replaced all two thousand iron bars with stainless steel ones, which should give the statue strong, rust-free support for the next one thousand years.

Materials: Steel wool (without soap), water, vinegar, white paper towels, plastic bowls, craft sticks.

1. To see how steel wool can be corroded, pour about 1/2 cup of vinegar into one bowl, and about 1/2 cup of water into another. Divide a pad of steel wool into three fairly equal balls.

2. Place one ball of steel wool in the bowl of vinegar, another in the bowl of water, and leave one dry. Roll the balls around in the liquid, and then allow them to soak for several minutes.

3. Remove the steel wool using a clean spoon for each one, and place each ball on a labeled paper towel. After about 24 hours, examine the balls. Are there signs of brown rust? Which ball has the most? (The ball soaked in vinegar.) Which has the least? (The ball left dry.)

4. Use craft sticks to pull the steel wool balls apart. Notice how easily the corroded steel wool crumbles. Discuss the importance of replacing the iron framework in the Statue of Liberty. (The Statue of Liberty had an additional problem. Wherever the iron and copper metals touched, the corrosion of both metals was speeded up. Alexandre Gustave Eiffel, the man who later built the Eiffel Tower, designed the framework inside the statue. He tried to keep the reaction between the two metals from happening by placing padding between them, but over the years the padding decayed allowing the copper and iron to touch in many places.)

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