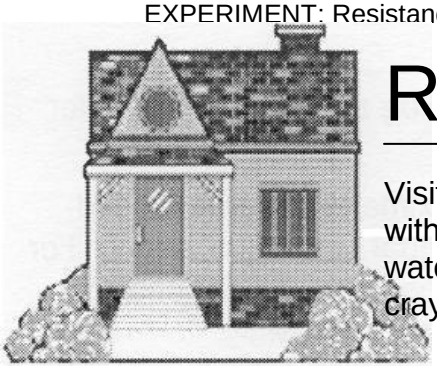

Resistance is Useful

Visitors investigate the effects of miscibility, by drawing on white paper with a white crayon, then painting over the “invisible” marks with watercolor paint. The paint does not cover the areas where there is crayon wax.

OBJECTIVES: Visitors learn how some chemicals do not mix.
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SCIENCE TOPICS	PROCESS SKILLS	VOCABULARY
	Comparing/Contrasting	Miscibility
	Controlling Variables	
	Inferring	
	Interpreting Data	
	Observing	

sistance is Useful

Procedure

1. Always wear safety goggles.
2. Get a piece of paper and a white crayon.
3. Using the crayon, draw a picture on your paper.
   Can you see your crayon marks?
   What do the marks feel like?
4. Take a foam brush from the water beaker, rub it in one of the watercolors, then paint over your entire paper with it.
   Can you see the crayon marks now?
   What happened to the paint in the areas where you drew?
5. Put your foam brush back into the water beaker, swishing it around a few times to rinse it off.
6. Try repeating the experiment, but use different colors of crayons and paint.
7. Place your paper(s) in the waste container if you do not want to keep t hem.

Can you make a picture by NOT coloring?

A Closer Look:

In this experiment, the wax resisted the colored inks. The marks you made with the wax stayed the same while the rest of the paper changed color. A resistant material protects the material underneath from the effects of dyes, chemicals, or other processes. It's like a stencil you can create right on the paper.

Wax is a good resist material because it can a smooth waterproof layer on a surface. make Wax resistance works with inks, dyes, and acids that are made with water. Other materials that can resist water include oil, rubber cement, and plastics.

Many different resistance techniques are used in arts and crafts, manufacturing, printing, microelectronics, and other industries. Chemical resistance can be used to etch huge signs or tiny circuits. Resistant materials can also be used to protect important documents (like paper money) because resistant ink would be invisible until the right test was used.

MATERIALS

- (with amounts to have on hand)
- paper samples- cut pieces about 2” square (keep ~100 on hand)
- white crayons (keep 10-12 on hand)
- watercolor paints
- foam “brushes”
- ~ 250 ml beaker
- waste container
- small plastic beaker

Setup/Takedown Procedures

ORIGINAL SETUP

- Label the plastic container “waste”.
- Label one 250 ml beaker “rinse water” in blue.
- Label one small box “paper” in white.
- Label small plastic beaker “crayons”
- Label foam swab “foam brush”

WEEKLY SETUP

- Collect materials from storage, if paper is low, cut more.

DAILY SETUP

- Set out the visitor instructions in a Plexiglas holder.
- Refill rinse water beaker with water.
- On a tray lined with a white mat, set out the following:
  - Labeled beaker of water
  - Labeled containers of paper, crayons and waste
  - Watercolor paints

- Rinse the foam brushes
- Recycle all used paper.

WEEKLY TAKEDOWN

- Rinse out brushes and paint trays.
- Return unused paper to a plastic bag
- Rinse and wipe the tray and leave it at the station.

RUNNING SUGGESTIONS

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EXTENSIONS

Discuss the applications of these chemical properties in everyday life.

Try dying other materials, like cloth or eggs. Wax-resist is the basis for batik, tye-dying, Ukrainian-style Easter eggs, and many other techniques.

Try melting the wax for better seal. Melted wax more easily fills in the pores and cracks of a surface, providing better protection form dye penetration.

Try etching – use a resist that protects the surface from your etchant. E.g. wax protects metal from acid. Use the metal plates to make prints, or etch all the way through thin metal for a cutout screen effect.

Safety & Disposal

Both crayons and watercolors are non-toxic

MATERIALS PREP