

Independent Physical Science Lab (.5 to 1 credit, 2 credit max)

We're taking it back to old school. Do you remember these STEM labs from back in the day? If so, improve on what you put together in your younger days. If not, have fun!

Crystal Garden(adapted from <https://engineering.oregonstate.edu/momentum/k12/>)

This garden produces very nice, broccoli-like salt crystals from readily available ingredients.

They tend to be *fragile*...but pretty

Supplies:

- container – plastic (clear polystyrene) to-go dishes work well
 - Several small pieces of porous material to grow on per container – sponges, clay pot pieces, BBQ Briquettes, etc.
 - Water
 - Ammonia
 - Laundry Bluing (such as Mrs. Stewart's Liquid Bluing...careful it stains!)
 - Salt
 - 1 small paper cup to mix ingredients (Dixie Cup)
 - 1 plastic spoon
 - Food Coloring (optional)
1. Begin by mixing 2 tablespoons of salt with 4 tablespoons of water, stirring to dissolve as much salt as possible.
 2. Next add 2 tablespoons each of ammonia and laundry bluing, again mixing as you go. The mixture will be a blue, watery sludge.
 3. Pour the sludge, liquid and extra salt, on top of the porous substrate in the plastic dish. Make sure to get all the salt out of the mixing cup and onto the porous items in the plastic dish (Note: If you use a sponge, wet it first and squeeze dry for better sludge absorption). All the salt may not go into solution; this is okay as long as you pour the extra salt on top of the items in the dish. The porous materials in the dish will not immediately soak up all the liquid; this is okay. The crystals will naturally grow white, like the salt.
 4. If you want colored crystals, add a drop or two of food coloring on each item in the dish. The crystals will grow that color.
 5. Allow the container to sit open to the atmosphere overnight. By the next day, crystals should have formed on the items in the dish and your **crystal garden** should be starting to bloom.
 6. You can keep the garden "in bloom" by adding 2 more tablespoons of salt on the second day, then half batches of the whole mixture from time to time. Make sure to pour the liquid into the base of the container and not on top of the already formed crystal blooms, as it will dissolve them and you will have to start all over...which is also a lot of fun!

The garden is formed by the salt after the water and ammonia evaporate away. The ammonia helps to speed the evaporation of the liquid from the mixture. The laundry bluing helps to form crystal blooms instead of crystal chunks or plates. The bluing solution is actually a colloidal

suspension; it has very small particles that will not dissolve, but are held up and separated by the liquid.

*You could experiment by leaving out the ammonia or bluing, or changing the ratios in the recipe.

Don't document your process and findings through photos or video shared on Google slides or in live meetings.

Make your own Volcano

Supplies:

A volcano made of clay, papier mache, plaster or even outdoor soil

Small container: old baby food container or pill bottle

Vinegar

Liquid dishwashing soap

Red and yellow food coloring(optional)

A tablespoon

Instructions

1. Go outside or prepare for some clean-up inside
2. Put the container into the volcano at the top
3. Add two spoonfuls of baking soda
4. Add about a spoonful of dish soap
5. Add about 5 drops each of the red and yellow food coloring
6. Add 2 tablespoons of the vinegar into the container and watch your volcano come alive.

Document your process and findings through photos or video shared on Google slides or in live meetings.

Protect the Egg (adapted from <https://www.phys.vt.edu/outreach/projects-and-demos>)

Build a structure that will protect a raw egg from breaking when dropped from 12 feet or higher

Supplies:

- Tape
- Building materials
- 1 egg
- Scissors
- Floor covering (Ex: Newspaper, Tarp)

Recommended building materials:

- No more than 2 balloons
- No more than 2 small paper cups
- 4 straws
- cellophane
- rubberbands
- popsicle sticks

Instructions

Plan and sketch out your design after you decide which materials you will use for your build. Build your egg drop container. Drop your egg from a height of 12 feet or more. Record your observations. **Document your process and findings through photos or video shared on Google slides or in live meetings.**

Physics Behind the Demo

The egg hitting the ground is a collision between the Earth and the egg. When collisions occur, two properties of the colliding bodies are changed and/or transferred: their energy and momentum. This change and transfer is mediated by one or many forces. If the force is too strong, it can cause the shell of the egg to crack and break.