family science night

Kitchen Chemistry

Not just another boring pizza!

Take the Science World approach to a family evening at home with Homemade Ice Cream, sparkling crystals and a whole lot of stirring learning. In this package, you'll find everything you need to know about creating a chemistry adventure night for your family, right in your own kitchen.

Tell us about or show us your Family Night **familynight@scienceworld.ca**

This package includes the following:

- **Movie suggestion:** Ratatouille
- **Recipes:** Homemade Ice Cream, Pavlova (Meringue)
- **Shopping List:** Everything you need to shop for your Family Science Night!
- **Try This At Home science activities:** Colourful Cabbage Concoctions, Crystal Chemistry, Swirling Milk
- **Web Game:** Nutrient Roundup Science World's FREE online game http://scienceworld.ca/teachers_outreach/play_online/bw_games.htm

Shopping List

Recipes

- ○ 2% milk
- ○ Whipping cream
- ○ Sugar
- ○ Vanilla
- ○ Salt
- ○ 1L and 4L resealable freezer bags
- ○ Eggs
- ○ Superfine sugar
- ○ Cornstarch
- ○ White vinegar
- ○ Fruit

Try this at Home activities

- ○ Red cabbage
- ○ Pipe cleaners
- ○ Borax
- ○ Homogenized milk
- ○ Food colouring
- ○ Dish soap

Recipes on next page...

Recipes

Homemade Ice Cream

Makes 1 serving

100 mL 2% milk

100 mL whipping cream

50 mL sugar

1 mL vanilla or vanilla flavouring

100-175 mL salt

500 mL ice cubes

1 L (1 quart) resealable freezer bag

4 L (1 gallon) resealable freezer bag

1. Add sugar, milk, whipping cream, and vanilla to the smaller resealable freezer bag. Seal the bag securely.
2. Put the ice cubes into the larger resealable freezer bag.
3. Add salt (sodium chloride) to the bag of ice.
4. Place the sealed smaller bag inside the larger bag of ice and salt. Seal the larger bag securely.
5. Gently rock the large bag from side to side. It's best to hold it by the top seal or to have gloves or a cloth between the bag and your hands—the bag may be cold enough to damage your skin.
6. Continue to rock the bag for 10–15 minutes or until the contents of the smaller bag have solidified into ice cream. (The worst case scenario is that you end up with more of a milk shake than an ice cream.)
7. Remove the small bag, open it, serve the contents into cups with spoons and ENJOY!

What's happening:

At 0 degrees Celsius, a couple of things can happen to H_2O. On the warm side, ice can change to water, in a process called melting. On the cold side, water can turn to ice, in a process called freezing. 0 degrees is the freezing point if you're cooling down water and it's the melting point if you're warming up ice.

How does salt change things? When salt dissolves in water, it warms the water up to the point where the water is just a little harder to freeze. This is another way of saying that it lowers the freezing point—the water has to get colder than 0 to freeze. The more salt you add, the colder the salt-water-ice mixture can get before it just turns into a block. And the colder this mixture is, the colder you can make the mixture of water and milk fat, freezing it into something yummy.

Did you know?

Salt is put on roads and sidewalks so that it's harder (it requires a lower temperature) for water to turn into slippery ice!

Recipes continued on next page...

Pavlova

Serves 6-8

4 egg whites, at room temperature

1 cup superfine sugar

2 tsp cornstarch

1 tsp white vinegar

1 tsp vanilla

1 cup heavy whipping cream

1 cup chopped fruit

- Preheat oven to 250°F
- To create the meringue shell, beat the egg whites with a whisk or electric mixer on medium-high speed until they hold soft peaks. Start adding the sugar, one tablespoon at a time, and continue to beat until the meringue holds very stiff peaks.
- Sprinkle the vinegar, cornstarch and vanilla over the top of the meringue and fold in.
- Line a baking sheet with parchment paper and draw an 18–20 cm circle on the paper. Gently spread the meringue inside the circle drawn on the parchment paper, smoothing the edges, making sure the edges of the meringue are slightly higher than the center (to make a bowl shape).
- Bake for 1 hour or until the outside is dry and takes on a very pale cream color. Turn the oven off, leave the door slightly ajar, and let the meringue cool completely in the oven. You can even leave it overnight.
- Whip the cream until soft peaks form. Spoon in to the baked meringue, top with fruit and serve immediately.

What's happening:

The physical stress of beating egg whites creates foam. The act of the whisk or beater moving through the egg white causes the protein molecules in the egg to uncurl, allowing the air bubbles being mixed in to become trapped. Adding an acid (like vinegar) increases the stability of the foam, whereas adding sugar helps the meringue hold its shape while it's drying and cooking. Egg whites can foam to up to eight times their original volume!

SCIENCE WORLD BRITISH COLUMBIA

try this at home

Colourful Cabbage Concoctions

Test the pH of various substances in your kitchen, and be wowed by the amazing changing colours of cabbage juice!

What you need:

- The assistance of an adult
- Red cabbage
- Heat proof bowl or cup
- Boiling water
- Sharp knife
- Various household substances, for example: lemon juice, baking soda, vinegar, pop, soap, milk, etc.
- Clear glasses or plastic cups

What to do:

To make the cabbage juice:

1. Ask an adult to help you.
2. Coarsely chop about 1 cup of red cabbage, and add to the heat proof container.
3. Pour boiling water over the cabbage until well submerged.
4. Allow to cool, and then strain to remove cabbage pieces, reserving liquid.
5. Refrigerate cabbage juice until you're ready to use it.

To test substances:

1. In a clear container (plastic cup or glass), add about 50mL of one of the substances you wish to test. (For baking soda or other dry materials place about 1 tsp and top up with water).
2. Add about 1 tbsp of cabbage juice to the test substance and observe.
3. Try other substances, making sure to always start with a clean cup.

What's happening:

Acids are a group of chemicals that contain hydrogen and have a sour taste. Lemon juice and vinegar are both acids. Bases are the opposite of acids; they contain a chemical unit call hydroxide and feel slippery when we touch them. Baking soda and soap are bases. Cabbage juice contains a special molecule called anthocyanin, which gives red cabbage its colour. Anthocyanin is also found in blueberries, grapes and lots of other plants. When anthocyanin comes in contact with the hydrogen in an acid it turns pink, and when it comes in contact with hydroxide in a base it turns blue/green. We refer to cabbage juice as a pH indicator because it can tell us if a substance is acidic or basic. Other pH indicators are litmus paper and phenolphthalein.

SCIENCE WORLD BRITISH COLUMBIA

try this at home

Crystal Chemistry

What you need:

- String
- Wide mouth jar
- White pipe cleaners
- Blue food coloring (optional)
- Boiling water (with adult help)
- Borax (available at grocery stores in the laundry soap section)
- Pencil

What to do:

1. Cut a white pipe cleaner into three equal sections.
2. Twist the sections together in the center so that you have a "six-sided" star shape that will form the frame for your snowflake. If your points are not even, trim the pipe-cleaner sections to the same length.
3. Now attach string along the outer edges to form a snowflake pattern. Attach a piece of string to the top of one of the pipe cleaners and tie the other end to a pencil (this will act as a hanger).
4. With a grown-up's help, fill a wide mouth jar with boiling water. Mix Borax into the water one tablespoon at a time. Use three tablespoons of Borax per cup of water. Stir until dissolved (don't worry if there is powder settling on the bottom of the jar). If you want you can add a little blue food coloring to give the snowflake a bluish hue.
5. Insert your pipe cleaner snowflake into the jar so that the pencil is resting on the lip of the jar and the snowflake is freely suspended in the borax solution.
6. Wait overnight and by morning the snowflake will be covered with shiny crystals.
7. Hang in a window as a sun-catcher or use as a wintertime decoration.

What's happening:

By adding Borax to water, the crystals dissolve and the Borax goes into solution; when as much Borax has been dissolved into a solution as possible, the solution is then saturated.

The saturation point is different at different temperatures; the higher the temperature, the more Borax that can be held in solution. But when the Borax water begins to cool, there is more Borax in solution than is normally possible. The solution is supersaturated. This supersaturation is not sustainable, and the borax molecules begin to crystallize back in to their solid form.

Now try this

Try substituting salt or sugar for the Borax and compare the crystals that they make.

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try this at home

Swirling Milk

An explosion of colour uncovering the scientific secrets of soap.

What you need:

- Homogenized Milk (at room temperature)
- Aluminum pie plate
- Food colouring
- Dish detergent/liquid soap
- Cotton swabs

What to do:

1. Pour room temperature milk in to the pie plate to completely cover the bottom. Allow it to settle.
2. Add up to 5 drops of food colouring to the milk (any combination of colours is okay). Keep the drops close together in the centre of the plate.
3. Dip the cotton end of the swab in to the soap. Place the soapy end of the swab in the middle of the milk and hold it there for 2 seconds.
4. Watch the reaction closely, noticing what happens right away, and what happens as it progresses.
5. Continue to experiment by adding another drop of soap. Experiment with placing the cotton swab at different places in the milk.

What's happening:

When the food colouring is placed on the surface of the milk, the drop remains intact with little spreading. The water-based food colouring does not mix with milk easily, because milk is a suspension of fat molecules in water and food colouring is a water-like dye. In general, fat and water do not mix.

Once the soap is added to the milk, it spreads over the surface and causes the food colour to move quickly thorough the milk, out to the edges of the plate. Since milk is mostly water, it has a surface tension like water. Liquid soap wrecks the surface tension by breaking the bonds between water molecules.

After the initial "zing" of the food colouring, swirling of colours ensues due to the chemical structure of soap. The fat-like end of the soap molecules join with the fat in the milk and as the soap spreads across the surface of the milk, more and more fat molecules are pulled by the spreading soap. When the fat molecules congregate, the water in the milk is pushed away, taking the food colouring with it. The movement of the milk decreases as the soap becomes "used up".

Now try this:

Try using skim, 1%, 2% or cream. Predict if each will react the same as the whole milk, and then test to see if you're right!

**This activity was adapted from Science World's Cookin' with Chemistry Engaging Science Workshop*