Introduction

Science is all around us. Science affects how ingredients interact and can determine our culinary success. Discovering Science in the Kitchen is suitable for members with some knowledge of working in the kitchen.

This project consists of 14 Skill Builders; members complete Skill Builder 1 and five Skill Builders of their choice. You can even take this project again next year to try the other experiments.

Meet Andy!
Andy is an apron that has taste tested a lot of good food. Andy will help you cook your way through this 4-H project. Andy has important tips to keep in mind and great fun facts and trivia for you.

More Eats!
This More Eats! box will appear throughout the manual. Check out the website link ideas wherever you see More Eats! These links will lead you to fun online content to help you with your 4-H project.

Learning is 3D!
To help you get the most out of your learning, each project meeting has the following parts:
- Dream it! Plan for success
- Do it! Hands on learning
- Dig it! What did you learn?

Table of Contents

<table>
<thead>
<tr>
<th>Table of Contents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Project Summary</td>
<td>2</td>
</tr>
<tr>
<td>Skill Builder 1: The PEOE Inquiry Technique</td>
<td>4</td>
</tr>
<tr>
<td>- Chocolate Chip Cookies</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 2: Solid, Liquid, Gas</td>
<td>7</td>
</tr>
<tr>
<td>- Butter &amp; Ice Cream</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 3: Microorganisms - Yogurt</td>
<td>9</td>
</tr>
<tr>
<td>Skill Builder 4: Coagulation - Cheese</td>
<td>11</td>
</tr>
<tr>
<td>Skill Builder 5: Fermentation - Friendship</td>
<td>13</td>
</tr>
<tr>
<td>Bread</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 6: Carbonation - Root Beer</td>
<td>15</td>
</tr>
<tr>
<td>Float &amp; Ginger Ale</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 7: Density Dressing - Salad</td>
<td>17</td>
</tr>
<tr>
<td>Dressing</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 8: Density Dessert</td>
<td>20</td>
</tr>
<tr>
<td>- Impossible Pie &amp; Chocolate Flan Cake</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 9: Explore Senses - Apple Pie</td>
<td>23</td>
</tr>
<tr>
<td>Skill Builder 10: Incorporation of Air</td>
<td>25</td>
</tr>
<tr>
<td>- Meringue Cookies &amp; Chocolate Fluff</td>
<td></td>
</tr>
<tr>
<td>Skill Builder 11: pH - Green Eggs</td>
<td>27</td>
</tr>
<tr>
<td>Skill Builder 12: Crystallization - Rock Candy</td>
<td>30</td>
</tr>
<tr>
<td>Skill Builder 13: Caramelization - Rocks Corn &amp; Sponge Toffee</td>
<td>32</td>
</tr>
<tr>
<td>Skill Builder 14: Polymers &amp; Gelatin - Gelatin Pinwheels &amp; Fruit Gummies</td>
<td>35</td>
</tr>
<tr>
<td>Showcase Challenge</td>
<td>37</td>
</tr>
<tr>
<td>Portfolio Page</td>
<td>39</td>
</tr>
</tbody>
</table>
What Skills Will You Learn?

Each section or Skill Builder (or Builder) in this project has activities that will help your project group learn to do by doing while learning new skills and having fun!

To complete this project, you must:
- Complete the activities in each Skill Builder OR a similar activity that focuses on the same skills, as you and your leader may plan other activities.
- Plan and complete the Showcase Challenge.
- Complete the Portfolio Page.
- Participate in your club’s Achievement (See the inside back cover for more information about 4-H Achievements).

<table>
<thead>
<tr>
<th>Skill Builder 1</th>
<th>Members will be able to...</th>
<th>Activities</th>
<th>Page</th>
<th>ü</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn the PEOE Inquiry Technique</td>
<td>Cookie Comparison</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Apply the PEOE Inquiry Technique</td>
<td>The Perfect Chocolate Chip Cookie</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Read a recipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Experiment with ingredients and methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder 2</td>
<td>Solid, Liquid, Gas</td>
<td>The Amazing Water Experiment</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>• Identify the different phases of matter</td>
<td>Ice Cream in a Bag</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Explain why matter changes states</td>
<td>Butter</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Describe freezing and melting points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder 3</td>
<td>Microorganisms</td>
<td>Glo Germ Kit</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>• Understand where and how bacteria grow</td>
<td>Yogurt</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Explain why incubation is important</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder 4</td>
<td>Coagulation</td>
<td>Curdle Milk</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>• Explain why coagulation is important in cheese making</td>
<td>Fromage blanc</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Name different types of cheeses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder 5</td>
<td>Fermentation</td>
<td>Balloon Blow-up</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>• Use proportions</td>
<td>Sourdough Starter</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Understand the process of fermentation</td>
<td>Friendship Bread</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Describe other food products of fermentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder 6</td>
<td>Carbonation</td>
<td>Citrus Reaction</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>• Explain the process of carbonation</td>
<td>Ginger Ale</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Understand why some reactions are bigger than others.</td>
<td>Root Beer Float</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder 7</td>
<td>Density Dressing</td>
<td>Density Column (Part A)</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>• Understand emulsions</td>
<td>Salad Dressing</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Explain why salad dressing separates</td>
<td>Salad Creation</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill Builder</td>
<td>Members will be able to...</td>
<td>Activities</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
</tbody>
</table>
| Skill Builder 8 | Density Dessert  
- Explain why density is important in this recipe  
- Describe why people find these recipes appealing | Density Column (Part B)  
- Impossible Pie  
- Magic Chocolate Flan Cake | 20 21 22 |
| Skill Builder 9 | Explore Senses  
- Identify human senses  
- Explain how we taste food | Flavour Cover-up  
- Mock Apple Pie | 23 24 |
| Skill Builder 10 | Incorporation of Air  
- Describe how air is incorporated into foods  
- Explain the effects of air in baking | Meringue Mix Up  
- Meringue Cookies  
- Chocolate fluff | 25 26 26 |
| Skill Builder 11 | pH  
- Name acidic and basic foods  
- Explain how acidity and alkalinity are measured  
- Demonstrate how red cabbage juice is a pH indicator | Red Cabbage Juice pH Scale  
- Red Cabbage Juice pH Test  
- Green Eggs | 27 28 29 |
| Skill Builder 12 | Crystallization  
- Define crystallization  
- Explain why rock candy grows | Saturation  
- Rock Candy | 30 31 |
| Skill Builder 13 | Caramelization  
- Understand what affects the colour of caramel  
- Explain how baking soda makes caramel become light and foamy | Caramelization Word Search  
- Sponge Toffee  
- Caramel Corn | 32 33 33 |
| Skill Builder 14 | Gelatin and Polymers  
- Understand where gelatin comes from  
- Explain how polymers are formed | Slime  
- Gelatin Pinwheels  
- Fruit Gummies | 34 36 36 |

When you successfully complete your builders, you will showcase what you have learned.

| Showcase & Portfolio | Explain success in using the skills listed above | Showcase Challenge  
- My Portfolio Page | 37 39 |
Skill Builder 1: The PEOE Inquiry Technique

Andy Says....
Understanding science is the key to successful baking. Everyone loves chocolate chip cookies. Many factors will affect how tasty your chocolate chip cookies are.

SKILLS CHECKLIST
- Apply the PEOE Inquiry Technique
- Experiment with ingredients and methods

Important words
Watch for these important words throughout this Skill Builder: Characteristics, Experiment, Predict, Observe

Dream it!
Describe the characteristics of a poor and a delicious chocolate chip cookie.

<table>
<thead>
<tr>
<th>Poor Chocolate Chip Cookie</th>
<th>Delicious Chocolate Chip Cookie</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Do it!

The Perfect Chocolate Chip Cookie
Baking often seems like an art. Actually a lot of chemistry is involved. Bakers use the PEOE technique to improve their end product. A good scientist makes predictions of what will happen when they change the recipe. Taking a moment to think about what may happen and to explain what can help a chef avoid disaster can lead to delicious dishes. It is also important that you observe the product as it is baking and once it is finished. A chef must explain what went wrong in an unsuccessful attempt or identify a secret ingredient or method when a wonderful product results.

A basic chocolate chip cookie recipe is included on the following page. Use this chocolate chip cookie recipe 3 different times, making a change in an ingredient or method each trial. Record all differences between recipes on the chart below the recipe. It is important that you note your methods and are precise in your measurements. Once you find your delicious cookie recipe you will want to make them again. It is important that you record your revised recipe carefully so you can make them again.
Chocolate Chip Cookies

**Ingredients**
- 1 cup (250 mL) all-purpose flour
- 1/4 tsp (1 mL) salt
- 1/4 cup (50 mL) granulated sugar
- 1/2 cup (125 mL) light brown sugar
- 1/2 cup (125 mL) chocolate chips
- 1 tsp (5 mL) baking soda
- 1/2 cup (125 mL) butter
- 1 tsp (5 mL) vanilla extract
- 1 egg

**Directions**
1. Heat oven to 350°F (180°C).
2. Cream butter, sugars, egg, and vanilla together until light in texture.
3. Combine flour, baking soda, and salt. Add to creamed mixture; mix well.
4. Stir in chocolate chips.
5. Drop by spoonfuls onto greased baking sheet.
6. Bake in centre of preheated oven for 9 to 14 minutes or until light golden. Cool 10 minutes, then transfer to racks and cool completely.

Your leader will describe the purpose of each ingredient and the effects of increasing or decreasing that ingredient. You may also wish to view the following video to better understand the science behind cookies by visiting https://www.youtube.com/watch?v=n6wpNhyreDE.

Some variations may include:
- amount of flour
- egg white, egg yolk, or both
- mixing method
- cooking temperature
- amount of sugar
- type of sugar
- type of pan
- temperature of butter
- amount of baking powder/soda
- number of chocolate chips
- cooking time
- temperature of dough

<table>
<thead>
<tr>
<th>Cookie Trial</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changes to the Ingredients or Method</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Predict</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Explain</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Observe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Explain</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rating /10</strong></td>
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<td></td>
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</tr>
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</table>
Andy’s Fun Fact

Chocolate chip cookies were first created in the 1930’s by Ruth Wakefield who ran the Toll House restaurant in Whitman, Massachusetts. It grew to be the most popular dessert in the USA.

Dig it!

Why is science important to bakers and chefs?

Did you bake perfect chocolate chip cookies?

What ingredient or method had the greatest effect on the success of the cookies?

Include a picture of your cookies.

More Eats!

Manitoba’s Food Development Centre in Portage la Prairie is a one stop shop for food research and product development. They are an internationally recognized centre of excellence that brings new and innovative products to market. The Food Development Centre helps anyone with a great idea with access to world-class expertise, pilot plant facilities and research. Clients range from first-time entrepreneurs to global corporations. Check them out at https://www.gov.mb.ca/agriculture/food-and-ag-processing/food-commercialization/food-development-centre/
Skill Builder 2: Solid, Liquid, Gas

Andy Says....
Food can be solid or liquid. Some foods such as milk can be converted into solid butter or ice cream. These treats are the result of changes in solids, liquids, and gases.

Dream it!
What items in this room are a solid, a liquid or a gas? Water can be all three. In this activity you will explore how this occurs.

The Amazing Water Experiment!

**Ingredients and Materials (Yields: 3-4 servings)**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>1/2 cup (125 mL) sugar</td>
<td></td>
</tr>
<tr>
<td>1 cup (250 mL) half and half cream</td>
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<tr>
<td>1 cup (250 mL) whole milk</td>
<td></td>
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<tr>
<td>1/2 tsp (2.5 mL) vanilla extract</td>
<td></td>
</tr>
<tr>
<td>1/2 cup (125 mL) coarse salt</td>
<td></td>
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<tr>
<td>Enough ice to fill large Zip lock bag half full</td>
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</tr>
<tr>
<td>1 large Zip lock bag</td>
<td></td>
</tr>
<tr>
<td>1 medium Zip lock bag</td>
<td></td>
</tr>
<tr>
<td>mittens</td>
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</tbody>
</table>

**Do it!**

**Ice Cream in a Bag**

**Directions**
1. Mix sugar, half and half cream, milk, and vanilla in medium Zip lock bag.
2. Tightly seal the bag and tape over the opening with duct tape.
3. Fill the large Zip lock bag half full with ice. Add salt.
4. Place the small bag in the ice mixture inside the large bag so that it is surrounded by ice. Tightly seal the large bag.
5. Wearing mittens, shake the bag vigorously for 5 minutes.
6. Remove the small bag and enjoy!
**Butter**

*Ingredients and Materials*
- 1/4 cup (60 mL) heavy whipping cream
- Small clear container with a lid
- 1/4 tsp (1 mL) salt

*Directions*
1. Allow the cream to warm to room temperature (5 hours).
2. Add cream to container. There should be an air space in the container. Seal the lid tightly.
3. Shake vigorously for several minutes.
4. When a hardened ball forms, pour off the liquid buttermilk.
5. Keep shaking until no more liquid separates.
6. Add salt.
7. Enjoy on a slice of bread or crackers. Be sure to taste the buttermilk as well.

Predict that I will need to shake the cream for ____ minutes to make butter.

I shook the cream for ______ minutes.

The butter becomes solid because ______________________________________________________

---

**Andy Says…**

Butter was first manufactured over 4,000 years ago. Today, the Notre Dame Creamery in Notre Dame de Lourdes, Manitoba makes and sells butter to Manitobans.

http://www.notredamecreamery.com/

**Andy Says….**

Unsalted butter is used in baking as it is easier to add salt than it is to estimate the amount of salt in the butter. Salted butter is used in cooking and contributes as a small amount of seasoning. Salted butter also has a slightly longer shelf life.

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**More Eats!**

Cornell Creme handcrafts delicious artisan ice cream using milk and cream straight from their family farm Cornell Dairy near Anola, Manitoba. It is the first Manitoba dairy producer-processor in Manitoba. Their flavours include: natural vanilla bean, raspberry white chocolate, lemon meringue, velvety chocolate truffle, malty ale pail and strawberry. Visit their website at http://cornellcreme.com/

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**Dig It!**

How does temperature affect the movement of particles?

How are ice cream and butter similar?

How are the processes of making butter and ice cream different?
Dream it!

Microorganisms are living things such as bacteria, fungi and algae. Our bodies are full of bacteria. The bacteria in our bodies weigh approximately 4 pounds. A bacteria called Probiotic lives in our intestines and helps us to digest our food. Foods that we eat with “good” bacteria include such things as yogurt and blue cheese. Can you think of any others?

Some bacteria such as Listeria, E coli, Salmonella and Clostridium can cause food borne illnesses. When handling food the first step is washing your hands. Dirty hands are a big part of how “bad” bacteria spreads and makes people sick.

Explore the best way to wash your hands before cooking by borrowing the Glow Germ kit from your local MAFRD office or contact 204-726-6613.

GLO-GERM KIT – This resource demonstrates the presence of germs and shows effective hand washing and food handling techniques using either oil or powder and an ultra violet light.

How well do you wash your hands? What parts do you miss? How long should you wash your hands before working with food?

Andy Says…

Probiotic bacteria, such as Lactobacilli acidophilus, live in the intestines and improve digestion. They can provide antimicrobial action against Listeria, Salmonella, E. coli and other harmful bacteria.
Andy Says...
The word ‘yogurt’ comes from the Turkish word ‘yoğurt’ meaning ‘to thicken’. The oldest yogurts were produced almost 4500 years ago by wild bacteria. Ancient Indian records refer to yogurt and honey as ‘the food of the gods’.

Andy Says...
Greek yogurt, also called strained yogurt or yogurt cheese, has been strained to remove its whey (liquid). Straining also removes some of the sugar. Greek yogurt is thicker in consistency and sour in comparison to regular yogurt.

Dig it!
What are some features of microorganisms?

Why is incubation of the bacterial culture important in yogurt making?

How is Greek yogurt different than regular yogurt?

Do it!
Yogurt

**Ingredients and Materials (Yield: 8 cups)**
- 8 cups (2 L) whole milk
- 1/4 cup (60 mL) plain yogurt (without sugar)
- Large glass jar with a lid

Observe what happens while the jar is in the oven. Record your observations.

Directions
1. Warm whole milk in saucepan until baby bottle warm.
2. Add yogurt and stir.
3. Pour into large glass jar and put on lid.
4. Place in unheated oven with light on for 16-24 hours.
5. Strain through layers of cheesecloth or a thin cotton dish towel until desired consistency is reached (4 hours to make Greek yogurt).
6. Sweeten with jam, honey, or fruit.

More Eats!
For more yogurt recipes go to [www.allrecipes.com](http://www.allrecipes.com)
Skill Builder 4: Coagulation

Andy Says....
Cheese can make anything taste better. There are hundreds of cheeses to choose from around the world. Cheese is made by changing a liquid to a thickened mass.

Dream it!

In scientific terms, adding an acid to cause proteins to tangle into curds is called coagulation. In the kitchen, it is often called curdling. Adding an acid to milk will result in curds and whey. Curdling is a good thing when making cheese. It is considered a bad thing when making sauces and custards.

Dream it!

Skill Builder: Protein, Coagulate

Important Words
Watch out for these important words in this Skill Builder: Protein, Coagulate

SKILLS CHECKLIST
- Explain why coagulation is important in cheese making
- Name different types of cheeses

Curdle Milk

Directions
1. Put 1/4 cup ((60 mL) milk in each bowl
2. In 1st bowl add 1 tsp (5 mL) of vinegar, in 2nd add 1 tsp (5 mL) of lemon juice, in 3rd add 1 tsp (5mL) of orange juice, in 4th add 1 tsp (5mL) of apple juice and in the 5th add 1 tsp (5mL) of mineral water.
3. Stir each bowl and observe what happens.
4. What was most successful? What was the least?
5. Heat the Lemon juice bowl for a few seconds in the microwave to warm up the milk. What do you observe?

Ingredients
1 1/2 cup (375 mL) whole or 2% milk
vinegar
lemon juice
orange juice
apple juice
mineral water
5 microwavable small bowls

Andy Says....
Bothwell Cheese is made in New Bothwell Manitoba. Everyday the cheese plant produces 15,000 kg of cheese. Bothwell Cheese make more than two dozen varieties using locally sourced ingredients and processes. They even sell cheese curds named Squeak’rs!

This Builder will take 5 HOURS to complete!

More Eats!
Visit the Dairy Farmers of Manitoba website for more ideas and recipes. https://www.milk.mb.ca/dairy-recipes/
Do it!

Fromage blanc

Ingredients
- 4 cups (1 L) whole milk
- 1 cup (250 mL) active culture buttermilk
- 6 tsp (30 mL) lemon juice or vinegar
- 3/4 tsp (4 mL) salt
- Cheesecloth

Directions
1. Heat milk and salt until steaming (about 170°C or 75°C).
2. Remove from heat. Add buttermilk. Add lemon juice by the teaspoon until milk curdles.
3. Stir very briefly to combine. Let curdled milk stand 2 hours.
4. Pour into strainer lined with 4 layers of cheesecloth. Scrape down sides and let stand 2 hours.
5. Tie cheesecloth into a pouch and hang from wooden spoon across pot until excess liquid has drained.
6. Use immediately or refrigerate up to 2 weeks.

Predict what would happen if the milk was not heated to the correct temperature.

Andy Says...

A ‘cheesemonger’ is a tradesperson who specializes in cheese and butter.

From Farming History...

What colour is your favourite type of cheese? Cheese used to appear in different colours depending on the time of year it was produced. In spring and summer, cattle feed on fresh grass. The beta-carotene and vitamin D they consumed resulted in a more desirable yellow cheese. In the fall and winter, cattle fed on hay and pale white-yellow cheeses were produced. Now, most cheeses are coloured with dyes.

Dig it!

What is coagulation? What causes the milk to curdle?

What part of milk is retained in cheese?

Was your cheese making activity successful? What would you change next time?
Skill Builder 5: Fermentation

Andy Says....
Let’s get started making Friendship bread using a sourdough starter. Yeast participate in the fermentation process to provide biological leavening.

SKILLS CHECKLIST
- Use proportions
- Understand the process of fermentation
- Describe other food products of fermenta-

Important Words
Watch for these important words in this Skill Builder: Starter, Sourdough, Proportion

Andy’s Fun Fact . . .
A sourdough starter is also referred to as a mother, pre-ferment, levain, chief, chef, or head. The starter is composed of flour, water, yeast, and Lactobacilli bacteria.

Dream it!
Balloon Blow-up

Ingredients/Supplies
1 package of dry yeast
50 ml sugar
2 cups each of room temperature, warm and ice water
2 balloons
2 small plastic pop bottles
funnel
3 large glass containers
liquid measuring cup
mixing spoon
food thermometer
watch

Directions
1. Fill in the prediction table.
2. Dissolve the sugar and yeast into the 2 cups of room temperature water (21°C).
3. Pour half of the solution into each of the pop bottles.
4. Quickly stretch a balloon over the top of each bottle.
5. Place each bottle into a large glass container.
6. Pour the ice water into one container and the warm water into the other.
7. Record your balloon observations in the results table.

This Builder will take 10 days to complete.

Prediction Table
I predict that the warm / room temperature / cold (circle one) water will make the balloon ________ than the warm / room temperature / cold (circle one) water will.

Results Table
<table>
<thead>
<tr>
<th>Time</th>
<th>Ice Water</th>
<th>Warm Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td></td>
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<tr>
<td>30 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Do it!

Friendship Bread Starter

*Ingredients and supplies*
- 1 package of active dry yeast
- 1/4 cup warm water (43°C - 49°C)
- 1 cup (250 mL) white sugar
- 1 cup (250 mL) all purpose flour
- 1 cup (250 mL) milk
- Gallon zip lock bag

*Directions*
1. Dissolve yeast in water, let stand 10 minutes.
2. Combine sifted flour and sugar together. Mix well so flour is not lumpy.

Put starter in a gallon zip lock bag (Do not refrigerate).

Watch the starter very closely at first and let the air out of the bag as needed. It will bubble and ferment a lot the first day. This is day 1. Mark the date on the bag. Follow instruction for the next 9 days.

Day 2 Let air out and mash the ingredients in the bag.
Day 3 Let air out and mash the ingredients in the bag.
Day 4 Let air out and mash the ingredients in the bag.
Day 5 Let air out and mash the ingredients in the bag.
Day 6 Add to the bag: 1 cup (250 mL) each of flour, sugar and milk. Mash the ingredients in the bag.
Day 7 Let air out and mash the ingredients in the bag.
Day 8 Let air out and mash the ingredients in the bag.
Day 9 Let air out and mash the ingredients in the bag.
Day 10 Follow the Day 10 directions

Check out the video at https://www.youtube.com/watch?v=iy8Jpc78Xoc

Day 10 Directions:
1. Pour the entire bag into a non-metal bowl.
2. Add 1 1/2 cup (375 mL) each of flour, sugar and milk
3. Measure out equal portions of 1 cup (250 mL) each into 4-7 1-gallon zip lock bags.
4. Keep two bags for yourself. Bake a loaf of friendship bread with one. With the second bag begin the 10 steps over again starting on day 1. You can keep starter for many years doing this. Every 10 days you will be baking bread.
5. Give the other bags to friends along with the 10 starter steps and a recipe to make Friendship Bread.

Friendship Bread

*Ingredients*
- 1 cup (250 mL) starter
- 1/4 (60 mL) cup oil
- 2 tsp (10 mL) vanilla
- 4 eggs
- 2 cups (500 mL) flour
- 1 tsp (5 mL) baking soda
- 1 tsp (5 mL) baking powder
- 102 gram package instant vanilla pudding

*Topping*
- 1/4 cup (60 mL) brown sugar
- 4 tsp (20 mL) cinnamon

*Directions*
1. Add all ingredients to starter. Mix well
2. Mix together brown sugar and cinnamon.
3. Grease 2 loaf pans.
4. Pour 1/4 of batter into each pan.
5. Sprinkle 1/4 of topping in each loaf.
6. Add remaining batter and sprinkle remaining topping.
7. Swirl knife through batter to give a marbled effect.
8. Bake 1 hour in 325 °F oven or until baked through.

Dig it!

Why are bacteria important in the production of food?

Name some other foods that are produced by fermentation?

What other foods could you make with your starter? Try it!

More Eats

More recipes can be found at http://www.friendshipbreadkitchen.com
Skill Builder 6: Carbonation

Andy Says....

Our ancestors made their own soda drinks at home. In this Skill Builder, you will learn about the ingredients and processes involved in making a fizzy drink.

Dream It!

Carbonation is the process of dissolving carbon dioxide, a molecule consisting of one carbon and two oxygen atoms, in a liquid. Generally this solution forms under high pressure. When the pressure is released, some carbon dioxide is released too. You can observe this when opening a can of soft drink. Check out the video How It’s Made Soft Drinks at https://www.youtube.com/watch?v=Mb9IDNOsHhE.

Citrus Reaction

Ingredients
- Lemon
- Orange
- Lime
- Grapefruit
- Baking soda

Directions
1. Cut the fruit into manageable pieces for squeezing.
2. Use your sense of smell before you begin experimenting. Compare this observation to the final product.
3. Squeeze your fruits into small separate containers. Label each container.
4. Add 1/2 teaspoons (2.5 mL) of baking soda to each juice. Stir. Continue adding baking soda 1/2 tsp (2.5 mL) at a time to the juices until the reaction stops.
5. Also try adding baking soda to a slice of unsqueezed fruit for comparison.

Using all of your senses is a great way to make scientific observations.

Do not drink/eat anything during this experiment.

I predict ___________________ because ___________________.

_____________________________ happened because ___________________.

This Builder will take 5 HOURS to complete!

Important Words
Look for these important words in this Skill Builder: Carbon Dioxide, Citrus Fruit, Reaction

SKILLS CHECKLIST
- Explain the process of carbonation
- Understand why some reactions are bigger than others.

Dream It!

Dream It!

Dream It!

Dream It!

Dream It!

Dream It!

Dream It!

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Dream It!

Dream It!

Dream It!
Do It!

Ginger Ale

Ingredients
- 6 cups (1.5 L) water
- 3 tbsp (45 mL) lemon juice
- 2 tbsp (30 mL) dry active yeast
- Grated ginger root
- 1 cup (250 mL) white sugar

Directions
1. Fill a 2 L pop bottle with 1.5 L of room temperature water.
2. Add lemon juice, dry active yeast, a small amount of grated ginger root, and white sugar.
3. Screw the lid on tight and shake vigorously for 30 seconds.
4. Let sit for 4 hours.

I predict _______________________________ because __________________________________.

____________________________________happened because ____________________________.

Root Beer Float

Ingredients
- Vanilla ice cream
- Root beer (or any other soft drink such as Ginger Ale above)

Directions
1. Spoon a scoop or two of vanilla ice cream into a tall glass.
2. Slowly pour root beer into the glass, allowing the foam to rise and recede before adding more root beer.
3. Serve with straws and spoons.

Try adding the ice cream and root beer in reverse order. Is the amount of carbon dioxide produced affected? Why?

Dig it!

How does carbon dioxide form in carbonated beverages?

Why does foam form on top of a root beer float?

What will happen to the reaction if you use a greater volume of ingredients?

More Eats!

Check out the How It’s Made Soft Drink video at https://www.youtube.com/watch?v=_oqyTKmlpxk
Skill Builder 7: Density Dressing

Andy Says....

Have you ever wondered why some objects float and others sink when placed in a liquid? The solubility of a substance indicates whether it will dissolve and mix with another substance.

Dream it!

Density refers to how much each litre of a substance weighs. Liquids may form layers as a result of differences in density between the two substances. Substances that are less dense will float on top of liquids that are more dense. An emulsion forms as two normally insoluble (unmixable) liquids are mixed together through stirring or shaking. Over time, emulsions will separate to their individual components.

Density Column (Part A)

Look at the list of ingredients below to make a prediction:
I predict that __________________is the most dense substance and ___________________ is the least dense substance.

Ingredients
- Honey
- Corn Syrup
- Milk
- Liquid Dish Detergent
- Water (may be coloured)
- Vegetable Oil
- Rubbing Alcohol (may be coloured)

Directions
1. First, record your prediction of densities in the space above.
2. Add 1/4 cup (60 mL) of each liquid to a tall cylindrical glass container in the following order: honey, corn syrup, milk, liquid dish detergent, water, vegetable oil, and rubbing alcohol.
3. Observe what happens as you add each liquid.
4. Record your results in the space below.

If you have chosen to complete Skill Builder 8: Density Dessert, you may complete the Dream It! section on page 25 as a continuation of this activity.

Do not drink/eat anything during this experiment.

Following this activity, complete the sentence:
I observed that __________________ is the most dense substance and __________________ is the least dense substance.
Do it!

Salad Dressing

Ingredients
- 1/4 cup (60 mL) canola oil
- 2 tbsp (30 mL) lemon juice
- 2 tbsp (30 mL) honey
- 1 tsp (5 mL) Dijon mustard
- 2 tsp (10 mL) oregano

Directions
1. Place canola oil, lemon juice, and honey in a small bowl or jar with lid. Note the layers formed by these ingredients.
2. Add Dijon mustard and oregano.
3. Whisk or shake together.
4. Serve immediately or store in the refrigerator for up to three days.

Yield: 1/2 cup (125 mL)

Salad Creation

Make your own healthy salad to enjoy with your dressing. Record the list of the ingredients you chose to include.

Suggested Ingredients:
- Lettuce
- Spinach
- Cucumber
- Broccoli
- Cauliflower
- Mushrooms
- Peppers
- Tomatoes
- Carrots
- Celery
- Cranberries
- Nuts
- Sesame Seeds
- Sunflower Seeds
- Chick Peas
- Croutons
- Other

My Salad Creation:

____________________
____________________
____________________
____________________
____________________
____________________
____________________
____________________
____________________
____________________

I like this... I don’t like this... Next time I will change...

More Eats!

Visit www.CanolaEatWell.com for more recipes using canola oil.
Dig it!

What is an emulsion?

What happens when an emulsion sits undisturbed for a long period of time?

Which ingredients in a bottle of separated salad dressing are the most dense? Least dense?
Skill Builder 8: Density Dessert

Dream it!

Density refers to how much each litre of a substance weighs. Liquids may form layers as a result of differences in density between the two substances. Substances that are less dense will float on top of liquids that are more dense.

Density Column (Part B)

Ingredients
- Honey
- Corn Syrup
- Milk
- Liquid Dish Detergent
- Water (may be coloured)
- Vegetable Oil
- Rubbing Alcohol (may be coloured)
- Ping Pong Ball
- Soda Cap
- Beads
- Cherry Tomato
- Dice
- Popcorn Kernel
- Metal Nut/Bolt

Directions
1. Add 1/4 cup (60 mL) of each liquid to a tall cylindrical glass container in the following order: honey, corn syrup, milk, liquid dish detergent, water, vegetable oil, and rubbing alcohol.
2. Observe what happens as you add each liquid.
3. On the following page, make a prediction of where each object will come to rest when dropped into the Density Column.
4. Slowly add the objects in your predicted order of most dense (heaviest) to least dense.
5. Compare the outcome with your predictions.

<table>
<thead>
<tr>
<th>Object</th>
<th>Predicted Position</th>
<th>Actual Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ping Pong Ball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soda Cap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry Tomato</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popcorn Kernel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal Nut/Bolt</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Impossible Pie**

*Ingredients*
- 2 cups (500 mL) milk
- 1 cup (250 mL) flaked coconut
- 4 eggs
- 1 tsp (5 mL) vanilla extract
- 1/2 cup (125 mL) all-purpose flour
- 6 tbsp (90 mL) margarine
- 3/4 cup (180 mL) white sugar
- 1/4 tsp (1 mL) ground nutmeg

*Directions*
1. Place milk, coconut, eggs, vanilla extract, flour, margarine, and sugar in a blender. Mix well.
2. Pour into greased and floured 10” pie plate.
3. Sprinkle nutmeg on top.
4. Bake at 350°F (175°C) for 45 minutes.

Record your observations of what happened as this dessert baked. Be sure to use terms relating to density.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Andy Says...

For something refreshing, colourful and fun Google non-alcoholic layered drinks and give one a try.

Buy Manitoba.

**More Eats!**

When it comes to food & health... what's YOUR opinion?

The *Manitoba Consumer Monitor (MCM) Food Panel* is an online survey that asks questions about your opinions, preferences and experiences with food and health. The research findings will be shared with food growers, processors, developers and governments. Each survey takes only 15 minutes to complete, and will **guarantee a strong, healthier future for Manitobans**.

To see what they are finding out go to [http://www.mcmfoodpanel.ca/](http://www.mcmfoodpanel.ca/)
Magic Chocolate Flan Cake

Directions
1. Preheat the oven to 350°F (175°C). Grease a 12 cup non-stick bundt pan, taking care to grease all of the nooks and crannies. Pour the caramel sauce into the bottom of the pan.
2. In a medium bowl, prepare cake mix according to package directions using the water, oil and eggs. Pour the chocolate batter evenly over the caramel topping.
3. Add all the flan ingredients to a blender and process until smooth.
4. Slowly and carefully pour the flan mixture over the cake batter.
5. Coat a piece of foil with non-stick cooking spray. Cover pan coated side down, tightly with the foil.
6. Place the filled cake pan in a large roasting pan. Place the roasting pan in oven and carefully pour warm water into the roasting pan until it reaches halfway up the sides of the bundt pan.
7. Bake two hours or until toothpick in centre still has a few moist crumbs.
8. Remove the bundt pan from the roasting pan and place it on a wire rack. Cool 15 minutes. Remove foil and invert onto a serving plate. Cool 1 hour at room temperature. Chill 4 hours or overnight.

Record your observations of what happened as this dessert baked. Be sure to use terms relating to density.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Dig it!

Why is it important for you as a baker to know about the effects of density?

Explain how you will describe the process of making these desserts to a friend.

What would you change if you made these desserts again?
Skill Builder 9: Explore Senses

Andy Says....
We enjoy our food by how it tastes. Flavour is a complex mixture of taste, smell, texture and temperature. In this builder you will explore the science of how our senses and the flavour of food work together.

SKILLS CHECKLIST
- Identify human senses
- Explain how we taste food

Dream it!
Your nose and mouth work together to deliver signals that your brain translates into the flavour of a food. Chefs and food scientists think about how one flavour in a dish is affected by other flavours. Finding the right balance is the key. Salt and sugar are often used to change the flavour of a dish.

Flavour Cover-up

Ingredients
- Tonic water
- salt
- 4 drinking glasses

Directions
1. Fill 4 glasses with the same amount of tonic water.
2. Line the glasses up and number them 1 through 4.
3. Put a pinch of salt in glass #2, half a teaspoon of salt in glass #3, and a whole teaspoon of salt in #4.
4. Take a sip or two of the unsalted tonic water in glass #1. Does it taste bitter?
5. Take sips of the other glasses of tonic water, and fill in the chart of how the bitter flavour changes as the amount of salt increases.
6. Try tasting from the glasses in reverse order starting at #4. Does it taste any different?
7. Next time you have a grapefruit, sprinkle salt on it instead of sugar. You will be surprised by the result!

Results Table
On a scale of 1-5 with 5 being very bitter and 1 being not bitter record your number for each glass

<table>
<thead>
<tr>
<th></th>
<th>First taste test</th>
<th>Second taste test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonic water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tonic water and pinch of salt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tonic water and 1/2 tsp (2.5 mL) of salt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tonic water and 1 tsp (5 mL) of salt</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Andy Says...
Processed foods often contain more salt than you’d think from tasting them. The salt is used to cover the bitter flavour of ingredients like preservatives that are used in processing.
Mock Apple Pie

Ingredients

Filling
- 2 cups (500 mL) water
- 3/4 cup (180 mL) granulated sugar
- 2 tsp (10 mL) cream of tartar
- 30 Ritz Crackers, whole
- 1 pie crust, box or make your own
- 1 tbsp (15 mL) lemon juice
- 1 tsp (5 mL) ground cinnamon

Topping
- 25 Ritz Crackers, crushed
- 1/2 cup (125 mL) packed brown sugar
- 1/2 tsp (2.5 mL) ground cinnamon
- 1/3 (80 mL) cup non-hydrogenated margarine, melted
- 2 cups (500 mL) whipped topping

Directions
1. Preheat oven to 400°F (205°C).
2. Filling: Mix water, granulated sugar, and cream of tartar in a large saucepan. Bring to boil on medium-high heat. Add crackers; simmer on medium-low heat for 5 minutes, stirring occasionally.
3. Line a 9” pie plate with crust as directed on package; fill with cracker mixture. Sprinkle with lemon juice and cinnamon.
4. Topping: Combine all remaining ingredients except whipped topping; sprinkle over filling.
5. Bake 15 minutes. Reduce oven temperature to 350°F (175°C); bake 20 minutes or until golden brown. Cool. Serve topped with whipped topping.

More Eats!
To try some new tastes check out Great Tastes of Manitoba at http://greattastesmb.ca/

Dig it!
Did you fool anyone with your Mock Apple Pie?
What would you change if you made this pie again?
How else can taste be affected by ingredients or cooking methods?
Dream it!

When air is added into foods it creates a light and fluffy end result. This is usually done by beating, whipping, folding or temperature.

**Meringue Mix Up**

Place the following steps to make meringue in order.

_____ Crack eggs.

_____ The beating process with add air to the whites causing them to increase in volume.

_____ Bake at 325°F (165°C). Air bubbles expand, steam evaporates, and proteins form stronger bonds.

_____ Separate egg white from yolk. Keep whites and discard yolks.

_____ Slowly add sugar while you continue to beat the eggs. Proteins will form a new, stronger arrangement.

_____ Beat egg whites to physically denature (untangle) the proteins.

_____ Enjoy the puffy, sugar-protein mesh of meringue.

**Andy Says...**

Beating the egg whites to make meringue can cause them to swell up to 8 times the volume of unbeaten eggs.
Do it!
Meringue Cookies

Ingredients
2 egg whites
1 pinch salt
1/4 cup (60 mL) white sugar
1 tsp (5 mL) vanilla extract
1 cup (250 mL) semi-sweet chocolate chips

Yield: 3 dozen cookies

Separate a small portion of meringue and continue beating. Record what happens.

Which cookie baking method was the most successful?

Directions
1. Preheat oven to 325°F (170°C).
2. Beat egg whites with salt until foamy.
3. Slowly add sugar, one tablespoon at a time, beating after each addition until the meringue stands in stiff peaks. Remove a small portion of meringue to experiment by overbeating.
4. Gently stir in vanilla and fold in chocolate chips.
5. Drop by teaspoonfuls on two lined baking sheets and place on sheet in preheated oven.
6. Bake half of your cookies for 2 minutes. Remove from the oven.
7. Bake half of the cookies for 2 minutes. Leave them in the oven and turn the oven off. Let cool in the oven for 2 to 3 hours. Remove.
8. Store in a cookie tin lined with paper towel.

Chocolate Fluff

Ingredients
2 cups (500 mL) chocolate chips
1 cup (250 mL) heavy whipping cream

Directions
1. In a mixing bowl add chocolate chips and set aside.
2. In a sauce pan over medium heat, heat whipping cream to a simmer and remove from heat.
3. Pour heated whipping cream over chocolate chips and allow to set for 2-3 minutes
4. Whisk together the chocolate and the whipping cream until smooth.
5. Refrigerate for 1 hour.
6. Remove from refrigerator and using a hand mixer beat until light and fluffy
7. Cover and refrigerate for 1 hour before serving

This Builder will take 3 Hours to complete!

Dig it!

Was your first attempt at making meringue successful?

What tips do you have for someone who has never made meringue?

What is your favourite way to enjoy meringue?
Do you enjoy sour foods? In this Skill Builder, sour foods will create the red portion of the rainbow of colour in this chemistry lesson.

**Dream it!**

Substances all around us are acidic, neutral, or basic (alkaline). Acids taste sour and bases taste bitter and feel slippery. Strong acids and strong bases can be very dangerous as they can burn your skin or mouth. It is important to use caution when handling these substances.

pH stands for the “power of Hydrogen”. A substance with a lot of hydrogen atoms is very acidic. A substance with few hydrogen atoms is very basic. The pH scale ranges from 1 to 14. 1-6 represent acidic substances, 7 is neutral, and 8-14 represent bases.

**Red Cabbage Juice pH Scale**

Red cabbage juice can act as a pH indicator, a substance that changes colour depending on the pH of the liquid to which it is added. Colour the scale below and indicate with arrows which end of the scale is the most acidic and which end of the scale is the most basic.

<table>
<thead>
<tr>
<th>Colour</th>
<th>Pink</th>
<th>Dark Red</th>
<th>Violet</th>
<th>Blue</th>
<th>Blue-Green</th>
<th>Green-Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate pH</td>
<td>1-2</td>
<td>3-4</td>
<td>5-7</td>
<td>8</td>
<td>9-10</td>
<td>11-12</td>
</tr>
</tbody>
</table>

**Andy Says...**

Red cabbage leaves contain pigments, coloured particles, called flavins. They have a pH of approximately 7 and will cause water to be coloured red, purple, or blue depending on how your water has been treated.
Red Cabbage Juice pH Test

**Materials**
- 3 leaves red cabbage
- 6 cups (1.5 L) water
- 3 tbsp (45 mL) of each test material (lemon juice, baking soda and water solution, vinegar, apple juice, pop, milk, dish detergent or liquid hand soap, laundry detergent, bleach, antacid (dissolved in water)

**Directions**
1. Coarsely chop cabbage leaves.
2. Place leaves and water in large casserole dish.
3. Microwave for 10 minutes, stirring occasionally.
4. Strain and collect the liquid from the cabbage.
5. Place a test material in a small dish. You may wish to prepare dishes of each material while heating the cabbage. Be sure to label each dish. Prior to each test, predict whether the substance is acidic, basic, or neutral. Record your prediction in the table below.
6. Add 2 tbsp (30 mL) cabbage solution to the test dish and observe the reaction.
7. Record your results in the table below.

<table>
<thead>
<tr>
<th>Test Substance</th>
<th>Prediction (Acid, Neutral, Base)</th>
<th>Observed Colour</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemon Juice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baking Soda</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinegar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple Juice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dish Detergent/Liquid Hand Soap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laundry Detergent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antacid</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Following the experiment, your leader will provide the pH value of each substance for comparison with your results.

The most acidic substance: _______________________________. Its pH was _______.

The most basic substance: _______________________________. Its pH was _______.

Do not consume any materials during this experiment!
Do it!

Green Eggs and Ham

Ingredients
- 1 egg
- 1 tbsp (15 mL) red cabbage juice pH indicator solution
- 1 or 2 slices breakfast ham

Is the egg white acidic or basic? _____________

The eggs looked ___________________________.

The eggs tasted ___________________________.

Directions
1. Crack the egg and separate the white from the yolk. Keep both parts as you will need them later.
2. Mix cabbage juice into the egg white.
3. Pour the white into the pan. Add the yolk. Cook.
4. Fry ham over high heat with a small amount of oil.
5. Enjoy!

Yield: 1 serving

“Try them, try them, and you may! Try them and you may, I say.” -Dr. Seuss, Green Eggs and Ham

Dig it!

Why is it important that you, as a scientist, record observations accurately?

Did you accurately identify the pH levels of your test substances?

Does the appearance of a food affect how it tastes?

More Eats

Manitoba Egg Farmers (MEF) represents nearly 170 regulated egg and pullet farmers. Egg farmers are the primary caregivers of 2.3 million hens in Manitoba that produce about 57 million dozen eggs each year. This represents 11% of Canada’s egg supply.

www.mbegg.mb.ca
Skill Builder 12: Crystallization

**Dream it!**

Many substances can be dissolved in liquids. Salt can be dissolved in a glass of water. When a small amount of salt is dissolved, we call it an unsaturated solution. When the maximum amount of salt is dissolved, the solution is saturated. If a solution contains more salt that what can normally be dissolved, the solution is supersaturated.

**Saturation**

<table>
<thead>
<tr>
<th>Ingredients and Materials</th>
<th>Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water</td>
<td>1. Measure 1 cup (250 mL) of cold water and pour it into a glass.</td>
</tr>
<tr>
<td>• Salt</td>
<td>2. Add salt by the teaspoon (5 mL) to the cup (250 mL) of cold water. Stir after each addition to dissolve the salt. Continue adding salt until it will no longer dissolve.</td>
</tr>
<tr>
<td>• Drinking Glasses</td>
<td>3. Record the amount of salt added to the water and the type of solution produced in the table below.</td>
</tr>
<tr>
<td></td>
<td>4. Measure 1 cup (250 mL) of hot water and pour it into a glass.</td>
</tr>
<tr>
<td></td>
<td>5. Repeat steps 2 and 3.</td>
</tr>
<tr>
<td></td>
<td>6. Allow the glass of hot water to cool. Once cool, add a few grains of salt and record what happens.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cold Water</th>
<th>Hot Water</th>
<th>Cooled Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Salt Added</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Solution</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Types of Solutions include: Unsaturated, Saturated, Supersaturated

What happened when salt was added to the cooled hot water solution? ____________________________

______________________________
Do it!

Rock Candy

Ingredients and Materials
- Long Stick or Pencil
- Cotton String
- Lifesaver Candy
- Glass Jar
- 1 cup (250 mL) water
- 3 cups (750 mL) white or brown sugar
- Colouring (optional)
- Flavouring (optional)

Directions
1. Twist and tie a piece of cotton string around the center of the stick. The string should be long enough so that when the stick is placed across the top of the glass jar the string will hang just short of the bottom. Tie a Lifesaver candy at the bottom end.
2. Wet the string and roll it in sugar.
3. Lay the stick over the top of the glass jar so the string hangs down inside the jar but doesn’t touch the bottom.
4. In a pot, boil the water. When boiling, remove from heat and let settle.
5. Add sugar by the half cup (125 mL) and stir. Continue adding sugar until it starts collecting at the bottom of the pot and will not dissolve.
6. If you want to add flavouring or colour, stir it in now.
7. Pour the sugar syrup solution into the glass until it is about 2.5 cm from the top.
8. Place the pencil over the jar and allow the string to dangle into the solution. Be sure the string does not touch the bottom or sides.
9. Place the glass in a place where it can sit undisturbed. After a day you should start to see crystal growth forming on the string.
10. Leave the string in the solution until the crystals have completely stopped growing.
11. Remove the string from the glass and allow to dry before eating.

Yield: 1 rock candy treat

Andy Says...
The rock candy crystals will grow molecule by molecule. The final product will be made of about a quadrillion molecules attached to the string.

Andy Says...
Whatever your choice of snack, remember to floss and brush your teeth after eating!

Dig it!

What is a saturated solution?

Why does crystallization occur?

Why does rock candy grow?
Skill Builder 13: Caramelization

Andy Says....
Candy making, including the process of caramelization, is highly temperature specific. Pay close attention to the thermometer during these activities.

Dream it!
Caramelization is a process of converting sugar to a new, flavourful compound. Sugar is heated to 338°F (170°C). If too high a temperature is applied the sugar will burn.

SKILLS CHECKLIST
• Understand what affects the colour of caramel
• Explain how baking soda makes caramel become light and foamy

Important Words
Watch for these important words in this Skill Builder: Caramel, Foam, Hard Crack Stage

Find the following words in the puzzle:
Aroma
Baking Soda
Boil
Brown
Caramelization
Colour
Corn Syrup
Flavour
Foam
Hard Crack
Melt
Nutty
Sugar
Sweet
Temperature
Texture
Volume

Andy Says....
As sugar is heated, water evaporates from the pot as steam. If sugar is heated to a very high temperature, above that of hard-crack and caramel, the sugar will burn. It will taste bitter because the sugars are destroyed.
Do it!

Caramel Corn

Ingredients
- 1 cup (250 mL) margarine
- 2 cups (500 mL) brown sugar
- 1/2 cup (125 mL) corn syrup
- 1 tsp (5 mL) salt
- 1/2 tsp (2.5 mL) baking soda
- 1 tsp (5 mL) vanilla
- 6 quarts (6 L) of popcorn

Yield: Two 4 L pails

Directions
1. Pop popcorn.
2. Combine margarine, brown sugar, corn syrup, and salt in a heavy pot.
3. Bring to a boil, stirring constantly.
4. Turn heat down. Boil 5 minutes without stirring.
5. Add baking soda and vanilla. Stir to mix.
6. Pour over popcorn. Stir to spread evenly.
7. Bake in two 9x13 cake pans at 250 F (120 C) for 1 hour stirring every 15 minutes.
8. Remove from oven, pour into large bowls, and stir as it cools to break apart.

I like this... I don’t like this... Next time I will change...

Sponge Toffee

Ingredients
- 2 1/2 cups (625mL) granulated sugar
- 2/3 cup (150 mL) white corn syrup
- 1/3 cup (75 mL) water
- 2 tsp (10 mL) vanilla
- 4 tsp (18 mL) baking soda

Directions
1. In 3 L saucepan, stir together sugar, corn syrup, water, and vanilla over medium heat just until sugar dissolves.
2. Bring to a boil; cook, without stirring but brushing down side of pan occasionally with pastry brush dipped in cold water, until candy thermometer reaches hard-crack stage of 300°F (149°C), or when 1 tsp (5mL) hot syrup dropped into cold water forms hard brittle threads, about 10 minutes.
3. Remove from heat. Whisk in baking soda. CAUTION: Stand back, holding face a distance away from the pot.
4. Pour into greased foil-lined 9x13 metal cake pan. Let cool in pan on rack without disturbing, about 2 hours.
5. Break in 1 1/2” (4cm) pieces.
6. Make ahead and store layered between wax paper in airtight container for up to 1 month.

I like this... I don’t like this... Next time I will change...

Andy Says...
CAUTION: When whisking the baking soda into the caramel in step 3 Stand back, holding face a distance away from the pot.
Andy Says...
Whatever your choice of snack, remember to floss and brush your teeth after eating!

More Eats!
For more caramel recipes go to www.allrecipes.com

Dig it!
What changes do you observe as sugar becomes caramel?

What happens if the sugar is heated to a higher temperature than stated in the recipe?

What effect does the addition of baking soda have on a mixture?
Skill Builder 14: Polymers & Gelatin

Andy Says....
Polymers are very long chains of monomers. Poly- means many. Mono- refers to one single unit or molecule.

SKILLS CHECKLIST
- Understand where gelatin comes from
- Explain how polymers are formed

Important Words
Watch out for these important words in this Skill Builder: Polymer, Gelatin, Colloid Suspension, Dissolution

Dream it!
Polymers are formed as long strands of molecules link together in winding chains. In the slime experiment the Borax links the polyvinyl acetate in the glue to form a long stretchy polymer.

Slime

Ingredients
- 1/2 cup (125 mL) white glue
- 1 1/2 cup (375 mL) water (divided)
- 1 tsp (5mL) borax
- Food colouring (optional)

Directions
1. Mix glue and 1/2 cup (125 mL) water. Add food colouring if desired.
2. In another bowl, mix borax and 1 cup (250 mL) water.
3. Add the glue mixture to the borax mixture, stirring slowly.
4. Stir as much as possible. Then, knead with your hands until it becomes less sticky.

Do not eat your slime. These are chemicals, not food.

Try squeezing, bouncing, and stretching your slime. Write two sentences to report your observations.

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Andy Says...
Gelatin is a polymer that comes from boiled animal bones and connective tissues. Gelatin is used in jams, jellies, and marshmallows. The collagen protein in the bones joins together to form a gel.
**Fruit Gummies**

**Ingredients**
- 2 cups (500 mL) fruit juice (divided)
- 1 oz (30 mL) gelatin

**Directions**
1. Spray a 9” square pan with cooking spray. Wipe away most of the spray with a paper towel.
2. Pour 1 1/2 cups (375 mL) juice in small sauce pan. Heat over medium heat until it reaches a gentle boil.
3. In another bowl, pour 1/2 cup (125 mL) juice and gelatin. Let bloom for 5 minutes.
4. Add gelatin to heated juice and stir until fully dissolved.
5. Take a small taste of the juice mixture to test its sweetness. You may choose to add honey.
6. Pour into 9x9 metal baking pan.
7. Chill for 1-2
8. Slice into squares of desired size.
9. Store in refrigerator for up to 3 to 4 days.

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**Gelatin Pinwheels**

**Time Required:** 1 hour  
**Ingredients**
- 1 package fruit flavoured gelatin  
- 1/2 cup (125 mL) warm water  
- 1 cup (250 mL) miniature marshmallows  

**Yield:** 16 pinwheels

**Directions**
1. Spray an 8” square pan with cooking spray. Wipe away most of the spray with a paper towel.
2. Stir gelatin and water in medium microwavable bowl.
3. Microwave on High for 1 1/2 minutes; stir until gelatin is completely dissolved.
4. Stir in marshmallows.
5. Microwave on High for 30 seconds until marshmallows are partially melted.
6. Stir with whisk until marshmallows are completely melted.
7. Pour into pan.
8. Refrigerate 45 minutes or until set.
9. Run sharp knife around edge of pan to loosen gelatin layer. Starting at one edge, roll up gelatin layer tightly.
10. Cut into 1/2 inch (2.5 cm) slices using thread or dental floss (cinnamon bun method).
11. Refrigerate and cover until served.

**Dig it!**

What is a polymer?  

How did your Gelatin Pinwheels and Fruit Gummies turn out?  

What would you do differently?  

What other dishes could you create using polymers and gelatin?
Now that you have finished this project, it is time to think about how you will share your experiences and knowledge with others. You may put your new skills to work by helping at a community event or at your club Achievement or teaching others about your topic. The goal of the Showcase Challenge is to help highlight your new skills and help you understand how you can use them. It can be an opportunity to receive feedback from others on your project. So go back through your manual and find some highlights of your learning (what you are proud of) and think about how you will “showcase” it.

**Dream It!**

Here are some Showcase Challenge Suggestions:

- Demonstrate something you made or learned about
- Act out a play
- Create a game
- Use your new skills to help with the Club Achievement plans
- Make a poster or display
- Make a video or slideshow
- Compose a song
- Or come up with your own idea. It is up to you and your leader!

**My Showcase Challenge Plan**

My showcase idea: ____________________________________________
__________________________________________________________________________
__________________________________________________________________________

What materials and resources do I need? ____________________________
__________________________________________________________________________
__________________________________________________________________________

Who do I need to help me? _________________________________________
__________________________________________________________________________
__________________________________________________________________________

When do I need to have things done by? _____________________________
__________________________________________________________________________
__________________________________________________________________________
**Do It!**

Insert or attach your finished product or a photo of you sharing your skills in your Showcase Challenge.

---

**Dig It!**

Now that you have showcased your project skills;

- How did your Showcase Challenge go?

- What would you do differently next time?

- How will you use your new skills in the future? *(in different situations?)*
**Discovering Science in the Kitchen Project Skills Chart**

To be completed by the leader and the member based on observations and conversations throughout the project.

<table>
<thead>
<tr>
<th>Skill Builder</th>
<th>Members will be able to...</th>
<th>We know this because...</th>
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<td>Each Skill Builder had a Skills Checklist which identified the skill you will learn.</td>
<td>Identify activities completed and record observations and information from discussions about activities.</td>
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</tbody>
</table>
| 1             | • Apply the PEOE Inquiry Technique  
                • Read a recipe  
                • Experiment with ingredients and methods | |
| 2             | • Identify the different phases of matter  
                • Explain why matter changes states  
                • Describe freezing and melting points | |
| 3             | • Understand where and how bacteria grow  
                • Explain why incubation is important | |
| 4             | • Explain why coagulation is important in cheese making  
                • Name different types of cheeses | |
| 5             | • Use proportions  
                • Understand the process of fermentation  
                • Describe other food products of fermentation | |
| 6             | • Explain the process of carbonation  
                • Understand why some reactions are bigger than others. | |
| 7             | • Understand emulsions  
                • Explain why salad dressing separates | |
| 8             | • Explain why density is important in this recipe  
                • Describe why people find these recipes appealing | |
Discovering Science in the Kitchen Project Skills Chart
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| 9             | • Identify human senses  
• Explain how we taste food                                                                       |                                                                                                  |
| 10            | • Describe how air is incorporated into foods  
• Explain the effects of air in baking                                                             |                                                                                                  |
| 11            | • Name acidic and basic foods  
• Explain how acidity and alkalinity are measured  
• Demonstrate how red cabbage juice is a pH indicator                                               |                                                                                                  |
| 12            | • Define crystallization  
• Explain why rock candy grows                                                                      |                                                                                                  |
| 13            | • Understand what affects the colour of caramel  
• Explain how baking soda makes caramel becomes light and foamy                                   |                                                                                                  |
| 14            | • Understand where gelatin comes from  
• Explain how polymers are formed                                                                   |                                                                                                  |

**Showcase Challenge**
- Explain success in using the skills listed above

**Additional Comments/Activities:**

**Leader Point of Praise!**

I am most impressed by...

I acknowledge that the member has completed the 4-H project requirements.

Leader’s Signature: _______________________________
Above and Beyond!
In addition to project skills, 4-H also increases skills in meeting management, communications, leadership, community involvement through participation in club, area, or provincial 4-H events or activities. List below any activities you participated in this year in 4-H.
(Some examples include Executive Positions Held, Workshops, Communication, Community Service, Rally, Bonspiels, Conferences, Judging, Camps, Trips, Awards, Representation to Area or Provincial Councils, etc)

____________________  _______________________
____________________  _______________________
____________________  _______________________
____________________  _______________________
____________________  _______________________

**Feel Free to add additional pages that include awards, certificates, new clippings, photos or other items that describe your 4-H involvement.

Member Point of Pride!

What I learned...

What I need to improve on...

What I want others to notice...

Member’s Signature: _______________________________

Point of Praise! Another’s perspective on your achievements in 4-H.

(community professionals, 4-H club head leaders, friends of 4-H)

I am most impressed by...

I believe that you have learned...

In the future I encourage you to...

Signature: _______________________________
4-H Achievement

4-H Achievement is... a 4-H club celebration when members have completed their projects. Achievements are planned by the club to give recognition to members and leaders for their accomplishments in their 4-H projects and club activities.

A 4-H Achievement can take many different formats: from choosing a theme, to member project displays, to members using their new skills for the event (entertainment, food, decorating, photographer, etc.), to members presenting their project to the whole group, the options are endless and open to the creativity of the members and leaders in each club!

Clubs may also plan their Achievement to promote 4-H to the community or to recognize sponsors and others who have helped the club.

Members and leaders - be sure to check your project books for the project completion requirements, so you will be ready for your club’s Achievement celebration!

If you have any questions, comments or suggestions for this or other 4-H projects contact:

Manitoba 4-H Projects
Manitoba Agriculture
1129 Queens Avenue
Brandon, MB R7A 1L9

Email: 4h@gov.mb.ca
Phone: 204-726-6613
Fax: 204-726-6260

This manual is for educational use only and is not intended as professional advice.

For more information about 4-H and the many 4-H opportunities available please visit

http://www.gov.mb.ca/agriculture/4-h/
What is 4-H?

4-H is an international youth organization involving more than 7 million members in 80 countries around the world.

In Canada, 4-H began in 1913 in Roland, Manitoba as a community-based organization dedicated to growth and development of rural youth. Today’s 4-H program reaches both farm and non-farm youth across Canada. The motto of “Learn To Do By Doing” is embodied in the program, as 4-H focuses on skill development as well as personal development of life skills such as communications, leadership and citizenship.

4-H Motto

“Learn To Do By Doing”

4-H Pledge

I pledge,
My HEAD to clearer thinking,
My HEART to greater loyalty,
My HANDS to larger service,
My HEALTH to better living,
For my club, my community, and my country.

This manual is available in alternate format upon request

Manitoba 4-H project material is developed by
Manitoba Agriculture