Lab Guidelines

Procedure

Part 1. Leavening agents.

This activity investigates the impact of adding heat and acid to baking soda and baking powder.

1. Label 8 graduated cylinders, 4 each with “BP” for baking powder, and 4 each with “BS” for baking soda. For each of the “BP” and “BS”, label 2 with “CW” for cold water and 2 with “HW” for hot water. Finally, add the word “Acid” to one of the cylinders in each group.

2. Add 1 tsp of baking powder to each of the cylinders marked “BP”, and 1 tsp of baking soda to each of the cylinders marked “BS”

3. Using a graduated cylinder that has no leavening agent in it, measure 20 mL of cold water and add 20 mL to each of the graduated cylinders marked with “CW” only and record the maximum volume in the graduated cylinder and any other observations in Table 1.

4. Using a graduated cylinder that has no leavening agent in it, measure 20 mL of hot water from the hot water dispenser and add to each of the graduated cylinders marked with a “HW” only and record the maximum volume in the graduated cylinder and any other observations in Table 1.

5. Using a graduated cylinder that has no leavening agent in it, measure 18 mL of cold water and add 2 mL of vinegar. Add the water vinegar mixture to the graduated cylinders marked with “CW” + “Acid” and record the maximum volume in the graduated cylinder and any other observations in Table 1.

6. Using a graduated cylinder that has no leavening agent in it, measure 18 mL of hot water and add 2 mL of vinegar. Add the water vinegar mixture to the graduated cylinders to each of the graduated cylinders marked with “HW” + “Acid” and record the maximum volume in the graduated cylinder and any other observations in Table 1.

Part 2. Cake.

This activity investigates the aerating properties of a variety of chemical leavening agents in the preparation of cakes.

Recipe

	Station					
	A	B	C	D	E	F
All-purpose flour	150 g					None
Gluten-free flour mix	None					150 g
Sugar	200 g					
Cocoa powder	63 g					
Leavening agent	4 g baking powder	16 g baking powder	6 g baking soda	24 g baking soda	2.5 g cornstarch + 6.8 g baking soda + 6.8 g cream of tartar	6 g baking soda
Salt	2.8 g (½ tsp)					
Vegetable oil	60 mL					
Water	295 mL					
Vanilla	5 mL (1 tsp)					

Directions

1. Preheat the oven to 350 ˚F using the convection bake setting.
2. **[Group E]** In a small bowl, combine the cornstarch, baking soda, and cream of tartar.
3. Combine the flour, sugar, cocoa powder, salt, and leavening agent in a bowl.
4. Add the oil, water, and vanilla extract all at once. Stir until just combined.
5. Grease an 8x8 baking dish with non-stick cooking spray.
6. Pour the batter into your greased baking dish.
7. Bake for 32-35 minutes, or until the cake has set.
8. After removing the cake from the oven, allow it to cool.

9. Cut each cake into 16 pieces (4 pieces x 4 pieces in the pan).
10. Place one of the corner pieces on a plate for observations of visual appearance.
11. Cut each of the remaining pieces into 4 pieces each and place at the front of the room for tasting.
12. Evaluate each cake variation using Table 2.

Part 3. Scones.

This activity investigates the aerating properties of a variety of chemical leavening agents in the preparation of scones.

Recipe

	Station					
	F	E	D	C	B	A
All-purpose flour	284 g					None
Gluten-free flour mix	None					284 g
Leavening agent	None	14.2 g baking powder	14.2 g baking soda	14.2 g cream of tartar	4.4 g baking soda + 9.8 g cream of tartar	14.2 g baking powder
Butter (cold)	112 g (1 stick)					
Sugar	100 g					
Milk	120 mL					
Sour cream	120 g					

Directions

1. Preheat the oven to 400 ˚F using the convection bake setting.
2. Sift and combine the flour, sugar, and leavening agent into a bowl.

3. Cut the *cold* butter into 10-12 small pieces. Use your fingers (not your palms!) to rub the dry ingredients into the butter until it resembles breadcrumbs.
4. Add the milk and sour cream to the mixture.
5. Swiftly blend the ingredients with a spatula until the ingredients are just incorporated. Don't overmix!
6. Shape the dough into 8 rounds that are about 4.5" in diameter and 0.75" high.
7. Bake for 15-20 min.
8. After removing the scones from the oven, allow them to cool.
9. Cut one scone in half and place on a plate for visual observations of physical appearance.
10. Cut the remaining scones into 6 pieces each, and put them at the front of the room for tasting.
11. Evaluate each scone variation using Table 3.

Raw Data Sheets

Table 1. Impact of leavening agents on water volume under different conditions.

	20 mL Cold H_2O	20 mL Hot H_2O	18 mL Cold H_2O + 2 mL CH_3COOH	18 mL Hot H_2O + 2 mL CH_3COOH
Baking soda				
Baking powder				

Record any other observations here:

Table 2. Sensory evaluation of cake variations.

Leavening Agent	Appearance	Texture	Flavor
4 g baking powder			
16 g baking powder			
6 g baking soda (all-purpose flour)			
24 g baking soda			
2.5 g cornstarch + 6 g baking soda + 6.8 g cream of tartar			
6 g baking soda (gluten-free flour)			

Table 3. Sensory evaluation of scone variations.

Leavening Agent	Appearance	Texture	Flavor
None			
Baking powder (all-purpose flour)			
Baking soda			
Cream of tartar			
Baking soda + cream of tartar			
Baking powder (gluten-free flour)			