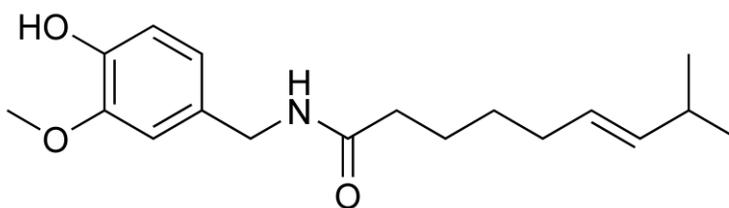
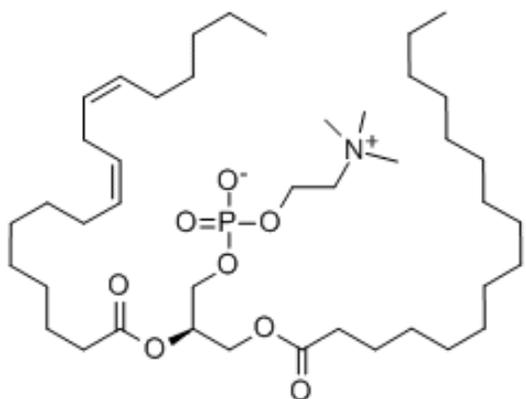
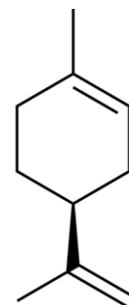
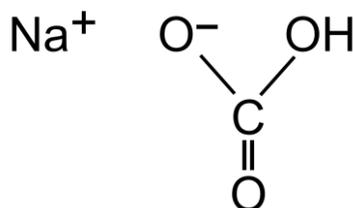
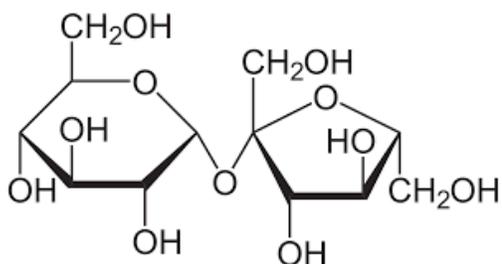


# There are molecules in my food!

Recipes from Millersville University  
Culinary Chemistry Fall 2022



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# APPETIZERS, SOUPS, AND SIDES

## Vegan Cheese, Beer, Potato, and Cabbage Soup

Submitted by: Josh Dorsheimer

- 1 tablespoon of oil or vegan butter
- 1 Small Onion (chopped)
- 2 Cloves of Garlic (minced)
- 6 Potatoes (cubed)
- 1 Small Cabbage (shredded)
- 2 Cups Water +2 Not Chick'N Bouillon Cubes (vegan bouillon)
- 1 Bottle Guinness Stout  
(or a Non-Alcoholic Alternative, like O'Douls)
- 1 lb Vegan Cheddar (shredded)
- 1-½ Cups of Soy Milk
- 2 tablespoons Worcestershire Sauce
- 1 teaspoon ground mustard
- 2 teaspoons of Rosemary
- A bit of Salt
- A bit of Pepper



1.) Heat the oil at the bottom of a large pot. Add garlic and onions and cook until they start to brown.

2.) Add the water and beer, once the liquids are blended, bring to a boil.

3.) Once at nice rolling boil, add the potatoes, the cabbage, and the rosemary. Bring down the heat and let simmer for about 15-20 minutes (long enough for the potatoes to cook).

4.) When the broth has simmered for a good while, add the soy milk, vegan cheddar, the ground mustard, and the Worcestershire sauce. Mix it thoroughly until everything is blended. Let simmer for 5 minutes or so.

Extra Step: I always like to add one more splash of beer (if you are indulging) when all is said and done just because it's fun.

### Reflection:

This recipe is a vegan variation of an Irish stew recipe and is part of a family tradition. My great grandparents were from Ireland, and I make this for my family when we celebrate our heritage on Saint Patrick's Day. I cobbled this recipe together from various places and it includes a broth made from beer, chicken stock and Irish cheddar, as well as cabbage and many root vegetables, such as

potatoes, onion, and garlic. I sometimes add country sausage, but not for this variation of the recipe.

In addition to picking this dish because of my heritage, it also worked for this assignment as there are several ingredients that I could change to make the dish a little different. For this variation, I opted to remove all dairy and animal products because that would not only provide a vegan option, but also change the types of molecular properties in the stew.

My hypothesis was that with the removal of the milk and cheese, the soup would be less thick/creamy and less rich due to less carbohydrates. I also said the flavor might not be as rich due to the lack of protein from the sausage, butter, and cheese. Despite this, I believed that the soup would be flavorful with the soy options, vegetables and spices.

The initial recipe called for butter to caramelize the onions and garlic. I removed butter and replaced it with oil, which was a fine substitute, having a higher smoking point and being better for sautéing the veggies evenly. I used conduction at the bottom of my steel pot to caramelize my onions and garlic. I added a little

After the veggies brown, the original recipe calls for chicken broth. Instead, I used two cups of water and two Not Chick'N Bouillon Cubes. These cubes are plant based, containing carbohydrates and lipids, and not protein like typical Bouillon Cubes. This, I believe, contributed to the broth being sweeter (but I will touch on that later). I also added beer to the broth, just like in the original recipe, and I waited for the mixture to boil.

I then added my potatoes and cabbage in the boiling mixture and heated them using convection. After letting them simmer for fifteen minutes or so, I noticed the first difference from my hypothesis: the soup was starting to thicken much more than I had thought it would have. The potatoes in the stew have carbohydrates (starches) and they absorb the H<sub>2</sub>O in the broth and break down. This is a process called starch gelatinization and it thickens the broth. Potatoes often are used as a soup base for this reason. Another thing worth noting is that the potato flavor created from convection is different than from radiation or conduction because they do not go through Maillard reactions.

Something else to note is that I also had not accounted for the beer when initially talking about this recipe in an experimental way. Beer, in this case the Irish Stout I used, contain malted barley. This has a lot of carbohydrates!

I also would like to note that I added my rosemary at the same time that I began boiling my vegetables. This is something I usually do because it heats the rosemary longer and I like it when the flavor breaks down into the broth. I learned earlier this semester that rosemary is a member of the mint family, and it also has two penetrating compounds which might explain why it blends in a broth very well.

Once all the veggies were broken down during the boiling (convection) and had released nutrients into the broth, it was time for my final step. I added ground mustard and the Worcestershire sauce,

as usual, and two of my changed ingredients- Soy milk and vegan cheddar. I was totally surprised to see that despite not being made of dairy, the soy milk and cheddar began to thicken the soup even more. After looking up the make-up of soy milk, I learned that it has a high amount of protein, and when heated, the protein coagulates and forms a thick, creamy mixture. It also contains carrageenan, a thickening agent. Similarly, I learned that vegan cheddar is made from vegetable products which mean carbohydrates. This, I would venture, also helped thicken the soup.

By the end of making my new soup, the new version looked very similar to my original. In fact, I could hardly tell the difference. As I mentioned, it was the same thickness, even without the milk products. Flavor wise, it was wonderful! The soup was still rich like a creamy dish, so again I was wrong in my hypothesis. I did not account for the protein in the soy milk, which there was plenty of it. The vegan cheddar also only had one gram less of protein per slice than regular cheddar.

Additionally, the taste of the soup was much sweeter than the original recipe. I believe from what I learned in class that this may have had something to do with the vegan Boullion and the vegan cheddar. I learned after looking at the ingredients that the vegan Boullion has cane sugar in it (carbs). I also learned that one of the ingredients in vegan cheddar is potato products, which is also a carb. This, combined with the potatoes in the original recipe, the beer that contains the malted barley, and caramelized onions makes for sweet flavors throughout the stew.

I love my original recipe. It is a nice blend of flavor and tastes, and it encompasses many of my favorite things found in Irish stews. That said, the result of the modified recipe ended up being very close to my original. When I shared it with my partner last night, he loved the new, sweeter flavor and actually told me that he prefers this version because it is sweet and totally dairy-free. It was with that feedback that I decided to share this new updated recipe with the class. I am very happy to share a dairy free version of my recipe, so that more folks can enjoy a dish that is so important to me and my family. Finally, I appreciated learning why it is chemically possible to produce a similar soup, but with different ingredients. This was a tasty experiment to end the semester with, and I had a great time!

# Deviled Eggs

Submitted by: Beck Copson

Recipe: <https://www.myfoodandfamily.com/recipe/050260/creamy-deviled-egg-recipe>

1. Boil soft eggs in a pot for 12 minutes
2. Cut the eggs long ways in half
3. Removes yolks and mash in a bowl
4. Add mayo, mustard and pepper
5. Spoon the yolk mixture back into the egg white divot
6. Sprinkle with paprika



## Reflection

I choose to make deviled eggs because it is a common dish my family has around the holidays. I never have these any other time of the year. The recipe I choose to use is pretty standard, is from: <https://www.myfoodandfamily.com/recipe/050260/creamy-deviled-egg-recipe>. I think that the recipe turned out good. This is a simple recipe that anyone can make. This is a common dish that is served on holiday. To make this better instead of spooning the yolks on, I could use a piping bag to create a more textured presentation of the food. Some people like to add relish too to their deviled eggs, if you like it you can add that into the yolk mixture as well.

The hypothesis I had for the recipe is that raw eggs turn into hard boiled eggs because of iron sulfide. The results were true: the iron sulfide is a reaction between the yolk and the egg white. For this recipe, I boiled the eggs in a pot of water on the stove for 12 minutes. Instead of doing that method, sometimes I like to heat the raw eggs in the air fryer and they become hard boiled. This way you don't have to wait for the water to start boiling. The three key ingredients are the egg, mayonnaise and mustard. The egg is made of oleic acid, palmitic acid, and linoleic acid. The egg white is also a protein. The egg yolk has protein, fat and vitamin minerals. The mustard and egg yolk are used to make the filling of the egg. Mustard is an antimicrobial agent that increases food safety. Mustard is also a good protein enhancer and for flavor. Mayonnaise is an emulsion of oil, egg yolk, and acid. For example vinegar or lemon juice. The high heat causes the protein to become more rubbery. The chemical reaction occurs between the yolk and the white and leaves a film around the egg. The film consists of iron sulfide, which I mentioned before. The iron is a reaction of the yolk and the hydrogen sulfide in the egg whites. In order to boil an egg you are using conduction as the source of the heat transfer. The heat is transferred from the boiling pot of water to the egg shell and then to the liquid of the egg. The heat is transferred from one particle to another. The physical change of the egg is the water inside of the egg starts to boil and heat up. The chemical change of a boiled egg is the water inside of the egg turns into steam and the egg shell dissolves in the water. This causes a chemical change when the atoms and molecules are rearranged to form a new substance, in this case the raw egg turns tough and rubbery. Eggs are made up of proteins which unfold and denature when they are heated.

# Bread

Submitted by: Sam Fieweger

Recipe: <https://www.kingarthurbaking.com/recipes/the-easiest-loaf-of-bread-youll-ever-bake-recipe>

I chose to bake bread for this project. The reason why I chose to bake bread is because honestly I've never baked bread before. I decided to use this simple recipe from King Arthur. I decided the best experiment that I could do to test what would happen if I allowed one bread to rise and another not to rise. I took the above recipe and split it in half into 2 separate loaves.



I preset my oven at 450 degrees and began mixing the ingredients in the morning. Once the oven was preheated I almost instantly put in the 1st loaf. I was extremely interested to see what would happen with this bread. There are 2 fundamental chemical reactions that happen when you bake bread the 1st one is what we're about to see. When you

are allowing bread to rise the yeast is fermenting the sugar which is an irreversible chemical reaction happening. Trapped carbon dioxide makes the dough rise. Allowing bread to rise contributes to a fluffier bread and also better more complex flavors.

The next chemical reaction is called dextrinization. Dry heat is applied in the baking process which causes the starch to break down into sugars called dextrins.

The first loaf without letting rise as you can see has a light color on the outside, and a dense inside, rather firm sponginess to the touch. This one is rather bland to taste and rather chewy. Not great...



And here is the final product of the second loaf after one day in the refrigerator rising.. as you can see it's visibly prettier, I added some dried rosemary tarragon and salt. Externally it is crisp. Internally it is light and spongy with a bit more complex taste.

Conclusion; I obviously like the second one better and am very happy with my creation! I will definitely be baking bread more often now that I have the confidence in knowing what I'm doing!



# Scones

Submitted by: Carly Blouch

Recipe: <https://www.kingarthurbaking.com/recipes/scones-recipe>

All-Purpose Flour



Almond Flour



## Reflection

I chose this recipe because I enjoy eating scones and thought it would be fun to make them for my project and observe the change when I changed flours. I use King Arthur flour so I tried to find a scone recipe on their website, and I did. The link to my recipe is <https://www.kingarthurbaking.com/recipes/scones-recipe>. I changed the type of flour I used, the base recipe called for all-purpose flour and that is what I used for the first recipe, then I changed it to almond flour. I expected the scones to not rise as much, and be darker in color. The scones made with all-purpose flour got more golden on the top but lighter on the bottom whereas the scones made with almond flour did not get as golden on the top but got more well done on the bottom. I was surprised that this happened because they were both cooked on non-stick pans with parchment paper, on the same rack, and at the same temperature. Personally, I preferred the all-purpose flour, only because I am not a huge almond flour person. My mom enjoyed the almond flour ones better, but she is on a low-carb diet so she is used to the almond flour. Three key ingredients of the recipe were all-purpose flour, granulated sugar, and butter. All-purpose flour is composed of starch which is a polymer and is written as  $(C_6H_5O_{10})_n$ . The basis of the recipe is the all-purpose flour. Almond flour is much lower in starch, but contains about 50% lipids, 25% proteins and about 20% carbohydrates. Granulated sugar is also known as sucrose, it is composed of 12

atoms of carbon, 22 atoms of hydrogen, and 11 atoms of oxygen, and it is written as 12 atoms of carbon, 22 atoms of hydrogen, and 11 atoms of oxygen. Finally, butter it is considered a fat, a mixture of triglycerides, particularly those derived from fatty acids, such as palmitic, oleic, myristic, and stearic acids. A chemical change is Maillard reactions, it is the reaction between amino acids and reducing sugars, so along with the caramelizing sugar, and that makes the scones get the brownish color. A physical change is the scones rising, they went in about  $\frac{3}{4}$  inches thick and came out about 2 inches thick. Baking is a dry heat cooking method, it is cooked in a dry heat enclosed oven. The air can move around the food freely in the oven which allows the baked good to cook. I used non-stick metal pants, parchment paper, a silicone spatula, and metal forks because that is what I had available.

# MAIN COURSES

## Shrimp Tacos

Submitted by: Harrison Groff

Recipe from: <https://natashaskitchen.com/shrimp-tacos/>

1 lb Shrimp (cooked on stove top in pan original version, cooked in air fryer changed recipe)

Shrimp Seasoning: (added while cooking in original, added after in changed)

1 garlic clove  
½ tsp salt  
¼ tsp pepper  
¼ tsp cumin  
¼ tsp cayenne pepper  
1 tbsp olive oil

Toppings:

8 corn tortillas  
½ small Purple cabbage  
1 avocado  
½ red onion, diced  
4 oz cheese  
1 lime

Sauce:

¼ cup sour cream  
1/3 cup mayo  
1 ½ lime juice  
¾ tsp garlic powder  
¾ tsp sriracha sauce



Thaw and pat dry shrimp with paper towels and place in a medium bowl. Add seasonings and garlic and stir to combine.

Place a large non-stick pan over medium-high heat. Add 1 Tbsp olive oil and add shrimp in a single layer. Sauté 1-2 minutes per side or just until cooked through. As soon as they are cooked through (white inside with some pink and red accents outside), transfer to a serving platter and set aside to cool.

Toast 8 tortillas over an open gas stovetop flame on medium/low heat (about 10 seconds per side) until lightly charred on the edges (or on a medium-hot skillet or griddle) until golden brown in some spots (30 seconds per side).

Thinly slice cabbage, dice the avocado, finely dice the red onion, and coarsely chop the cilantro.

Add these to your serving platter along with lime wedges. Build tacos by arranging toppings and shrimp over each toasted tortilla.

In a small bowl whisk together all sauce ingredients and serve with assembled shrimp tacos.

### **Reflection:**

I decided to go with this recipe for a few reasons. First, shrimp tacos is one of my favorite dishes to get at a restaurant. Second, I have never made shrimp tacos myself, so I wanted to see how they would turn out. Third, I have rarely attempted to make a complete dish like this, so I wanted to challenge myself and this project gave me a good excuse to try it out. After googling some recipes for shrimp tacos, I decided to go with this one because it looks like it replicated some shrimp taco recipes I have had at restaurants.

For my change, I decided to modify two things. I changed to cooking method from conduction to convection for the shrimp. Additionally, I added the spices after I cooked it, instead of adding it while I was cooking. I expected the shrimp with my method to have a different texture and overall flavor. This hypothesis was correct. The shrimp made with the conduction method and pre added spices had a much better blend of flavors. This complemented the rest of the ingredients in the taco and the flavors all blended together nicely. The air fried and post spiced shrimp did not lack in flavor, the spices were more apparent and it had a stronger presence in this taste. This was not a bad thing, but it was slightly overpowering in the recipe. The texture of the shrimp was a little bit softer, as it did not have any browning on it from the olive oil like the stove top shrimp did. However the “fishy” taste was more present. Both were good, but I preferred the original recipe to my change.

Some key ingredients of this recipe were shrimp, garlic, lime , and the cayenne pepper. All of these ingredients contributed to the overall flavor of the recipe. Shrimp was used as the main protein source of the recipe. The garlic was used in both the sauce and in the shrimp seasoning. In both the sauce and the seasoning it was functioning as a spice. Garlic contains allicin which is used in the plant as a defense mechanism against herbivores and omnivores. This is the main molecule that contributes to the flavor in garlic and it is what makes it so distinct. Another ingredient was the lime. The lime juice was used in the sauce, and was also used as a garnish to be squeezed onto the taco itself. Lime is an acidic fruit and has a PH level of approximately 2.5-2.8. Cayenne pepper was used as a spice in the seasoning to add flavor to the shrimp. It added a little spice to the recipe and this is due to the presence of capsaicin. Capsaicin is a molecule that triggers the pain receptors in the mouth, and is used by the plant as a deterrent against animals.

A chemical change that was occurring was the cooking of the shrimp. Raw shrimp is a gray color, that does not appear very appetizing. But once cooked, it turns a more appealing pinkish color. This color change is due to protein chains on the surface of the shrimp loosening up and this causes the pink pigment of astaxanthin to show through. There was many physical changes happening in this recipe. For example the purple cabbage. It started out as a half head of cabbage, and then was cut down into smaller slivers to be added as a topping on the tacos. This also happened with the limes, avocados, onions, and the cheese.

There was two types of heat transfer happening, as it was one of my changes to the recipe. The first heat transfer method was conduction through a stove top burner and a pan. Olive oil was also added to the pan to speed up the cooking process. The other heat transfer type used was convection, through an air fryer. The air fryer heated up the air inside the cooking chamber which

transferred its heat onto the shrimp to cook it. Both were good, but for shrimp I think the conduction method was better.

Overall, this experiment was a good challenge and learning experience. This recipe was delicious, and I am glad I decided to choose it. This is something that I will definitely be making in the future.

# Pepper Chicken Breasts

Submitted by: Daysmarie Rivera

2 Chicken breasts  
¼ cup of green peppers  
A pinch of salt  
Black pepper (to taste)  
1 tbsp butter  
½ tsp all purpose seasoning  
1 tsp minced garlic  
½ tsp parsley flakes  
¼ tsp paprika  
¼ tsp garlic powder  
Cilantro (to taste)



First, cut the chicken breasts in half.

In a small container mix salt, black pepper, all purpose seasoning, paprika and garlic powder.

Add the seasoning mix to the chicken breasts and mix.

In a frying pan, put butter at Medium temp and mix until is completely melted.

Then, cut the green peppers in strips, add them to the pan and stir for 1 minute.

Add cilantro to taste and stir for 1 minute.

Put the chicken breasts in the pan at Medium temperature for 25 minutes.

Flip the meat occasionally until its fully cooked on both sides.

After cooking place it in a plate with rice or pasta and enjoy!

## Reflection:

I chose this recipe because it is a very simple and flavorful recipe that does not require a lot of ingredients. I obtained this recipe from my mother. Some interesting facts from this recipe is that if you don't have the ingredients that are listed here, you can substitute some of them and still be able to make the recipe. For example, if you don't have green peppers you can substitute them for onions or red peppers. The change I made to these recipe was to cook it in the oven instead of cooking it in a frying pan. My hypothesis was that there will be changes in the color, texture, and flavor of the chicken. In fact, I was right, the chicken cooked in the oven was more tender than the one cooked in the frying pan, it had a light color, and the flavor was a little bit stronger than the chicken cooked in the frying pan. However, I personally prefer the version that is cooked in the frying pan because I like the crispness of the chicken. Three ingredients that are very important in this recipe include minced garlic which is volatile, miscible and enhances the flavor of the recipe, which is an herb, volatile and it adds a savory flavor to the dish without the need to add more spices and salt which is a spice, non- volatile, polar, miscible and it also enhances the flavor of the dish. Some physical and chemical reactions that occurred during the cooking process were browning, flavor and texture due to Maillard reactions and denaturation. Also, the type of heat transfer that was used was conduction as the heat transferred to the frying pan and cooked the meat. Lastly, the materials that I used for this dish were a teflon frying pan, glass tray and stainless steel tongs.

# Homemade Baked Macaroni and Cheese

Submitted by: Shyanne Binder

Recipe from: <https://www.allrecipes.com/recipe/11679/homemade-mac-and-cheese/>

- 8 ounces uncooked elbow macaroni
- ¼ cup salted butter
- 3 tablespoons all-purpose flour
- 2 ½ cups milk, or more as needed
- 2 cups shredded sharp Cheddar cheese
- ½ cup finely grated Parmesan cheese
- Salt and ground pepper to taste (optional)

Bread Crumb Topping:

- 2 tablespoons salted butter
- ½ cup dry bread crumbs
- 1 pinch ground paprika



- 1 pinch ground paprika

1. Preheat the oven to 350 degrees F. Grease an 8-inch square baking dish.
2. Make the macaroni and cheese: Bring a large pot of lightly salted water to a boil. Add macaroni and simmer, stirring occasionally, until tender yet firm to the bite, about 8 minutes; it will finish cooking in the oven. Drain and transfer to the prepared baking dish.
3. While the macaroni is cooking, melt 1/4 cup butter in a medium skillet over low heat. Whisk in flour and stir until the mixture becomes paste-like and light golden brown, 3 to 5 minutes.
4. Gradually whisk 2 1/2 cups milk into the flour mixture and bring to a simmer. Stir in shredded Cheddar and finely grated Parmesan cheese; season with salt and pepper. Cook and stir over low heat until cheese is melted and the sauce has thickened, 3 to 5 minutes, adding up to 1/2 cup more milk if needed. Pour cheese sauce over macaroni and stir until well combined.
5. Make the bread crumb topping: Melt 2 tablespoons butter in a skillet over medium heat. Add bread crumbs; cook and stir until well coated and browned. Spread bread crumbs over macaroni and cheese, then sprinkle with paprika.
6. Bake in the preheated oven until the topping is golden brown and the macaroni and cheese is bubbling, about 30 minutes

## Reflection

I chose this recipe because pasta has always been a favorite dish of mine. My grandpa has a great recipe that he always makes but I wanted to experiment with a new recipe. I love mac and cheese a lot and have never tried to make baked mac and cheese by myself, it's always just been Kraft. Therefore, this was kind of a personal challenge for me. My reasoning behind this recipe was that it simply was one of the first to pop up when I googled recipes, as well as having easy and simple ingredients in it. When making this recipe, it calls for the use of milk for the creaminess of the macaroni and cheese. However, I decided that it would be interesting to try to use the water from the boiled pasta instead of milk. I used the same amount of water that I would have used for milk. My hypothesis for this change was that the mac and cheese will turn out the same when using the

pasta water instead of milk. The result was exactly so. The mac and cheese were not significantly different when I used pasta water instead of milk. Scientifically, the pasta water is starchy from the noodles boiling in it and therefore slightly thicker than regular water. When added to the mac and cheese it, has a very small subtle difference in the taste. To me, it tasted lighter and not as thick as homemade mac and cheese can taste sometimes. Otherwise, I would not have noticed a difference, nor cared if I had made it without milk. In this recipe, three big ingredients can be analyzed at a level for this chemistry class. First off, pasta is a carbohydrate. It is the main ingredient in this dish. Pasta contains wheat, as well as gluten. Carbohydrates are polar molecules, meaning that they are soluble in water. Another ingredient that is important in this dish is milk. Milk contains the sugars galactose and glucose. It is a carbohydrate that is made of these sugars. It can be polar and nonpolar and contains lots of vitamins, minerals, fats, proteins, and sugars. Milk is what provided the base of the sauce for the mac and cheese. The last important ingredient is breadcrumbs. They are the topping of mac and cheese and are a protein and starch. They contain glutenin and yeast. Some of the physical changes that occurred in this recipe are the cheese melting from a solid to a liquid, the ingredients of the recipe mixing, and the boiling and cooking of the noodles. A chemical change was the browning of the cheese on the top which was a Maillard reaction. The type of heat transfer that was used was convection in the form of a convection oven that circulated the heat around to cook the dish. To properly cook this dish, I needed a few ingredients. I needed an 8x8 glass pan, a pot, a bowl, a strainer, and a skillet or pan. I also needed utensils such as a whisk, a spoon to stir, and measuring cups and spoons. Overall, these helped to best cook this dish.

# Lean Turkey Meatloaf

Submitted by: Jakob Logan

## Recipe for the “All-Beef Version” of the Meatloaf:

2 pounds of beef: 1/3rd is ground beef, 1/3rd is ground pork, and 1/3rd is ground veal. All of the meats here will or should be around 85% lean 15% fat, or something close to these numbers.

2 Eggs, 3/4 cup of breadcrumbs, 3/4 cup of shredded carrots, few cloves of minced garlic, salt + pepper, oregano, 1/4 cup of BBQ sauce (which for me is homemade, apple BBQ sauce, but you may use whichever kind you would like).

The other meatloaf version I will be using removes the beef altogether, and adds in 2 pounds of 93% lean 7% fat ground turkey. I will also be using around a teaspoon and a half of Paprika for flavor and color. The other ingredients outside the beef will be used for this version as well.

To start, you mix the eggs, breadcrumbs, and BBQ sauce together. Then, you take the meat and mix it together with the first three ingredients listed. After that, you take the other ingredients, which are mostly spices and herbs + carrots, and mix it WELL with the other ball mixture. You use your hands to mix these ingredients all together.

For the Turkey recipe, this will be the same, minus the beef and adding in the Paprika along with the salt and pepper, garlic powder, etc. When preparing the Turkey version of the meatloaf, the ground Turkey will look pink but needs to be mixed in well with all of the other ingredients!

The complete mixture is then put in the fridge for an hour, and then removed and put into a 5x5 loaf pan. Afterwards, the meatloaf is baked in the oven at 375o between 50-60 minutes.

The loaf should be browned (the meat) and there should be a crust on top of the loaf itself. The main difference between the Beef version of the Meatloaf and the Turkey is the browning/ crust. Raw Turkey is pinkish, and takes a lot longer to brown. DO NOT be scared if your meatloaf looks a little “discolored” when using Turkey, it is a completely different meat than beef!!



## Reflection

Personally, I used to not like looking at Meatloaf, because for one, I thought it was disgusting looking and two, it had carrots (hated them growing up). Now, I really enjoy meatloaf and like to eat it with a side of mashed potatoes. This recipe is mainly because I love meatloaf, it is now one of my favorite dishes to eat. I have been recently looking to eat healthier and so my mom and I came up with the idea of using turkey instead of all red meats. The recipe was created by my mom and is listed above, using various different spices, meats, and includes healthier items like carrots! The biggest change I had made to the meatloaf dish was instead of using the typical all red meats, ground beef, pork, and veal; I used 93% lean ground Turkey, which was very new for me considering I for one do not eat Turkey meat unless it's in a lunch meat or on Thanksgiving. I also included a portion of paprika as well, which is absent in the original recipe. This paprika adds a new, reddish color to the dish. In terms of changes, the main physical change is going to be the change of color and mass of the dish. This is because Turkey as a component is more dense, compact. This results in a more firm change of state for the dish. Before, it was less dense, and now the density has changed. In terms of chemical changes, the biggest one is that the Maillard reaction taking place was less in the Turkey meatloaf as opposed to the beef one. The Maillard reaction and browning reaction/ flavor is less in our Turkey. This is due to Turkey not being a good browning agent unless directly heated on a stove top for longer periods of time! Beef has a better time browning due to the higher fat content than Turkey, which also contributes to the less thickness and flavor of the Turkey meatloaf (because of low fat content). The beef meatloaf is high in saturated fats, and contains more flavor, as well as high proteins and carbohydrates. The egg yolk acts as an emulsifier when taking the Ingredients together in my glass mixing bowl. The other dishes I used included: glass mixing bowl, metal kitchen grater (which is stainless steel) , plastic measuring spoons and cups, and two mini loafs (which are ceramic). I chose the ceramic because ceramic takes a little longer to heat, but ends up retaining heat longer in its container. They also are much easier to clean, and are chip resistant and mostly scratch proof. The glass dish is used because it is non-porous, hard, and pretty easy to see what's in and missing (only downside is that it can shatter.) the stainless steel grater, although a poor conductor, in this case is durable, and has a chromium oxidation which forms a protective coating. While preparing the dish, I knew it had to go into the oven to bake. One rule of thumb my mom had always taught me is to just eyeball it, make sure that everything is browned and if needed, cut into the middle of it! When thinking about the heating of the dish, it was clear the oven was going to be providing the heat, literally. Because hot air bounces off the walls of the ovens and moves around during the cooking process, I knew this was a mixture of both radiation and convection based heating. Overall, the ground Turkey element versus the beef and red meats was a success and clearly I could see the changes. The browning flavor and reaction takes place more on the beef due to high fat content versus the Turkey being low in fats, and having a pinkish color when uncooked. Turkey takes a lot longer to brown, and so I added paprika to provide a color on top, and a color as well. The crusts were seen on both dishes, and both were still high in protein. The main difference is one is less in fats, sodium, and carbohydrates while the other is leaner, more firm, and is healthier. I really enjoyed making something new, yet familiar I would say. I for one like trying new things, and it was cool to do something so simple but also provided for a very nice meal at the end of the day. I will say however, that the pinkness of the ground Turkey near the beginning really threw me off, but I got over it.

# Empanadas

Submitted by: Lawrys Velasquez

Recipe: <https://www.allrecipes.com/recipe/71805/fried-empanadas/>

## Ingredients

Empanada dough discs  
Vegetable oil  
Cheese  
Ground Beef  
Salt  
2 tbsp Paprika  
Garlic cloves  
Organo  
Adobo



## Instructions

1. To make the filling, first heat the vegetable oil in a medium frying pan over medium heat. Add onions and stir around until they have fully sauteed. Add the ground beef along with the seasonings ( order of seasoning depends on one's own preference ). Cook and stir until the beef is browned and crumbly. Drain excess grease and sit aside.
2. Get the dough ready, in this case we will be using both made from scratch and store bought empanada discs. Preheat the fryers on high, about 365 degrees.
3. To begin filling the empanadas, lay the discs on a flat surface, spoon some of the beef onto the center of the discs and sprinkle some cheese on top ( the cheese could also be laid before the beef, depending on preference ).fold the discs into a half moon, press the edges with your fingers to seal. You may use a fork to press around the edges on the empanada to seal.
4. Fry the empanada for about 2 minutes until browned and let them sit to drain on a paper towel.

## Reflection

I chose Empanadas for this recipe because it is one of my favorites and I also find it very easy to make, which makes me more comfortable in doing so. I picked an online recipe and incorporated some of my knowledge of the process. The changes I decided to make were in the dough and the type of heat I used. I made the empanadas with dough that was bought from the store and also some with dough that I made from scratch. The different heat transfers I used for this recipe were air frying (Convection) and deep frying (conduction).With these changes I expect the texture and color of the empanadas to be different from one another. I deep fried both store bought and made from scratch dough as well as air fried both types to see how different they would be from one another. The results were as I expected, I did noticed that air frying the empanadas took much longer than deep frying. The empanadas that were deep fried were also much brown with more texture and flaky on the outside than the ones that were air fried and with dough made from scratch, those were light brown in color and much smoother but much more flaky. I found it surprising how flaky the air fried empanadas were compared to the ones that

were deep fried, as I expected the opposite. I didn't notice much of the difference in the dough, only that the dough that was store bought was easier and faster to work with which it was expected and the reason why I made more of this kind. In this case I prefer deep frying to be better for this kind of recipe. Three key ingredients in this recipe are oil, cheese and beef. Oil is a fatty acid, this will be used and become helpful with the heat transfer. Cheese is considered a proteins, will add flavor and is also part of the filling. Beef is also part of the filling, it contains fat and is considered a protein and carbohydrates. The physical and chemical changes in this recipe will occur while the empanadas are being fried, the cheese will melt inside and the outside of the empanada will become brown and crisp which is considered to be a Maillard reaction. For this recipe I used, Stainless steel spatula, fork, cutting board, stainless steel frying pan, and square turner. I find stainless steel to work better when deep frying food, also the square turner was used to flip the empanadas from side to side which kitchen tongs would be more preferred and easier to grab the empanadas in the oil. The fork was used to seal the empanadas and add texture to the edges around the empanadas, this is optional you may seal the empanadas with your hand and twist the edges upwards. Empanadas may be filled with anything, it all depends of preference. Overall this recipe is very easy to make and not very time consuming.

# Stove Top Macaroni and Cheese

Submitted by: Alexis Johnston

## Recipe

1 pound elbow noodles  
½ cup salted butter  
½ cup all-purpose flour  
1 ½ teaspoon onion powder  
1 ½ teaspoon ground mustard  
1 teaspoon salt  
½ teaspoon white pepper  
3 cups milk whole, 2%, or 1%  
8 ounces shredded sharp cheddar cheese



## Reflection:

I chose to make stove top macaroni and cheese because it is one of my favorite foods. I wanted to compare two methods: stovetop macaroni and cheese and baked macaroni and cheese. I utilized the same recipe but wondered how changing the method of cooking would impact my overall recipe. I hypothesized that the baked macaroni and cheese would become drier than that of the stovetop macaroni and cheese. I also added that it may become brown and crispy, unlike the stovetop recipe. After cooking my stovetop and baked macaroni and cheese, I found that what I hypothesized was fairly accurate. The baked macaroni and cheese became dry and less creamy when compared to the stovetop recipe. I personally prefer the stovetop recipe because it creates a creamier version of macaroni and cheese and you avoid the crispiness that occurs with baking. Three major ingredients in this recipe include: elbow noodles, sharp cheddar cheese, and milk 2%. The elbow macaroni noodles are necessary to create the dish and serve as one of the two main ingredients. In general noodles include a mixture of plant-based nitrogen, carbon and hydrogen compounds, starch, and sugars. The molecular structure of cheese is made of caseins, fat globules, water, minerals, bacteria, and dissolved solutes such as lactose and lactic acid. In this recipe, cheese serves as the second most important ingredient and is used to contribute the correct balance of flavor and meltability. Milk is used in this particular to make the pasta creamier and also acts to maintain some starches. Molecularly, milk is composed of water, carbohydrates, fats, and proteins. One major physical change that occurs when cooking macaroni and cheese is melting of the cheese. During the cooking process a chemical change occurs when starch molecules are released and become entwined with one another. These molecules trap the milk and cause the cheese sauce to become thick. I used my stovetop to cooking this dish or conduction. I used a medium sized sauce pan made of aluminum and a wooden spoon. I had no specific reason for using these kitchen materials. These are typically what I would use when cooking any type of food.

# Cream of Mushroom Risotto

Submitted by: Cooper Younger

## Ingredients

½ cup minced sweet onion  
2 cloves garlic, minced  
2 cans Cream of Mushroom Soup  
Kosher salt  
2 tablespoons salted butter  
2 tablespoons extra-virgin olive oil  
2 cups dry white arborio rice  
1 cup dry white wine, such as Pinot Grigio or Chardonnay\*  
1 cup shredded Parmesan cheese, plus more for garnish  
Zest from ½ lemon  
2 teaspoons finely chopped fresh thyme (optional but recommended)  
Freshly ground black pepper



## Instructions

1. Prep the vegetables: Prepare the onion and garlic and noted above.
2. Heat the soup: Combine the soup with 4 cups water and 1 teaspoon kosher salt in a saucepan and bring it to a low simmer. Reduce heat to low.
3. Sauté the vegetables: In a large skillet, heat the butter and olive oil over medium heat until the butter is melted. Add the minced onion and cook for about 2 minutes until tender. Add the garlic and dry rice and cook, stirring occasionally, about 2 minutes until the rice starts to turn light brown.
4. Add the wine: Stir in the wine and cook, stirring occasionally, until the liquid is fully absorbed, about 2 minutes.
5. Add the soup: Add two ladles of the hot soup to the risotto. Cook, stirring occasionally until the liquid is fully absorbed, then add two more ladles of soup. Cook in this same manner for about 12 minutes, adding two ladles and stirring frequently. Continue to adjust the heat to make sure the risotto is at a steady simmer. After 12 minutes, taste a grain of rice. If it's creamy but still al dente in the center, you're ready for the final step! If not, continue to cook and add soup for a few minutes more. (You'll have some soup left over: save it for reheating leftovers.)
6. Finish the risotto: When the rice is al dente, reduce the heat to low. Add two more ladles of soup, the Parmesan cheese and a few grinds of black pepper. Stir vigorously for 1 to 2 minutes until you've got a thick and creamy risotto. Add the lemon zest, fresh thyme, and black pepper. Taste and add more salt as desired (we add another heaping ¼ teaspoon kosher salt). Serve with additional Parmesan cheese to top.

## Reflection

This recipe is similar to one that was used in my household when growing up, the key difference being a substitution of cream of mushroom soup for the traditional chicken broth. Risotto has always been a very interesting dish for me. I could never perfectly replicate the way my father would make it, but I've always wanted to try. The base for the changed recipe came from an online recipe: <https://www.acouplecooks.com/risotto-recipe/> Risotto is a dish that originated in Italy and is the result of rice being introduced to Italy by Arabian traders in the Middle Ages. Risotto is a dish that gave use to shorter grain rice and introduces texture that is not present in other rice dishes. It remains a staple in the culinary world and the recipe remains consistent in many different kitchens and restaurants in many different countries.

So why change this perfect recipe? The theory behind the change was that the cream of mushroom soup would make a richer and creamier risotto. If successful it would also provide another vegetarian alternative to traditional risotto as the traditional recipe uses chicken broth. Risotto has a variety of different components, and due to its versatile nature, it is used as a side dish or a main course, the key difference being the size of the portion. The different ingredients provide many of the nutritious markers of a good meal. The rice acts as a base carbohydrate and the soup is a roux combined with cream or milk providing fats and protein. The olive oil used to toast the rice is a fat and allows the rice to be cooked in a certain way. The garlic and onions are minced which is a physical change, along with the simmering of the soup. When the rice is toasted it undergoes a chemical change. The soup was heated through conduction while the rice was toasted through convection. The stove heated the pot which heated the soup, while the stove heated the pan which heated the oil which heated the rice.

The results of this culinary experiment were negative to say the least. The soup was too thick to act in the same way as the broth and overpowered most of the other flavors without condensing or actually becoming a risotto. The preferred dish in this instance would be the traditional risotto using either chicken or vegetable broth for a vegetarian variation. I used chicken broth, and the texture was more pleasant than what the soup provided. The soup was not as effective as the broth because it was too thick and proved overwhelming when being added to the rice. The vegetables and spices were not able to permeate the soup as well because it was thick. Ultimately the changed dish tasted more like a soup than a risotto and that's where I think it failed. I made both of these dishes while getting over a stomach bug, and while I couldn't finish my variation, the original recipe was very soothing despite some of the strong flavors and smells. I would highly recommend the traditional risotto to anyone who is a fan of rice dishes and Italian cuisine.

# Baked Macaroni and Cheese

Submitted by: Ashley Cleland

3 Cups dry elbow macaroni  
4 Tbsp salted butter  
2 (12oz) cans evaporated milk  
1/3 cup of milk (your choice)  
2 large eggs  
1/4 tsp garlic salt  
1 tsp paprika  
4 cups cheddar cheese (shredded)  
2 cups mozzarella cheese (shredded)  
Salt and pepper to taste



1. Bring pot of water to boil. Add macaroni, and cook until al dente. Drain and return to the pot. Add in the butter and stir until the butter is melted. Set aside.
2. In a large bowl, mix together the evaporated milk, milk, eggs, and garlic salt. Wisk until fully combine. In a separate bowl, mix together cheese.
3. Preheat oven to 375 degrees Fahrenheit. Lightly spray a 9x13 inch baking pan.
4. Layer 1/3 of the macaroni, then 1/3 of the cheese. Repeat with remaining macaroni and cheese mixture. Pour the milk mixture over the top. Sprinkle with paprika evenly on top.
5. Bake in preheated oven for 25-30 minutes.

## Reflection

The recipe with egg definitely held its shape much better. It had a more cohesive texture. The recipe without egg was not held together very well and spread out all over the spoon and plate. I think this particular recipe calls for too much liquid milk. Neither dish was solid; there was still milk in the bottom after the 30-minute cook mark. I think cooking the dish longer for the amount of liquid called for would allow for more evaporation and absorption of the milk mixture. After allowing to sit for five minutes, the non egg portion continued to have no cohesion unlike the egg mixture, which held its shape even more, both on the plate and fork. As far as taste goes, the non egg portion had less flavor. The egg portion had much more flavor and allowed the cheese flavor to come through more strongly. It was also fluffier in texture. I would absolutely use the egg in this dish from here on out, and I will be using this as my new macaroni and cheese recipe from now on. I asked someone to taste test and this person could tell a difference. He said the non egg mixture had more of a classic macaroni and cheese taste while the egg mixture was more tart, probably because he could taste the cheese, in his words. There is definitely a difference between egg and no egg macaroni and cheese, and ultimately, it comes down to preference.

# Tasty Turkey Burger

Submitted by: Stephen Moore

Recipe from: <https://www.delish.com/cooking/recipe-ideas/a19664658/best-turkey-burger-recipe/>

1 lb. Ground Turkey  
1 egg, beaten  
2 tbsp. Parsley  
Salt  
Black pepper  
Hamburger Roll(s)  
Cheese (optional)  
Tomatoes (optional)  
Lettuce (optional)  
1 tbsp Spicy Dijon Mustard (the Change)



## Instructions

1. Mix turkey meat and dry ingredients together in a bowl. Add and mix the emulsifier (Egg or Mustard).
2. Form mixture into flat patties.
3. In a medium pan or skillet on medium heat, add patties and cook until golden brown.

## Reflection

My choice of recipe for the final project was Tasty Turkey Burgers. I have always been a fan of burger recipes and because of that thought it would be a great choice for the project. I acquired the base recipe for this burger on the Delish website (<https://www.delish.com/cooking/recipe-ideas/a19664658/best-turkey-burger-recipe/>) and excluded certain ingredients to keep it easy/simple/within what I had available and to put an emphasis on my major change. The ingredient that I am focusing on in this recipe is the egg. Egg is commonly used for an emulsifier due to the Lecithin found within, and its purpose in this recipe is to bind with the protein in the turkey while at the same time keeping it and the seasonings from falling apart while cooking. It also would help keep the turkey moist and stop it from drying out when the burger begins to undergo the Maillard reaction after being on the non-stick metal pan/stove and being cooked through conduction. My change for this recipe is that the egg can be substituted with any type or flavoring of Mustard (in this case, a tbsp of Spicy Dijon). Mustard is in fact a condiment/spice that is a combination of several different ingredients. Although not its common use, it can be an emulsifier and antioxidant, but usually is used to add flavoring. My hypothesis that the mustard will achieve the same goals as the egg in this recipe, binding with the turkey and seasonings, keeping the patty moist, and more importantly adding even more flavor to the burger.

After cooking and eating my original recipe, as well as the one with the critical change the result was exactly as I predicted. Both the egg and mustard acted as emulsifiers in their respective burgers. However the burgers with mustard in them seemed to be more solid and held shape better than those with the egg in them. My personal preference would have to be the mustard burgers, as my hypothesis that it would have increased flavor was also proven correct.

# Salsa Spaghetti

Submitted by: Liz Martin

Olive Oil

Half a box of spaghetti noodles

Half a pound of ground hamburger

15 oz jar of salsa (I recommend Chi Chi's)



## Seasoning

5 teaspoons Paprika

1 ¼ teaspoons Garlic powder

1 ¼ teaspoons Ground cumin

1 teaspoon Onion powder

1 teaspoon Oregano leaves

1 teaspoon Cilantro

Salt & Pepper to taste

## Reflection

Regular spaghetti is one of my favorite classic dishes to make. It's also a favorite of mine in my family's opinion too. However, I also love Mexican cuisine so I wanted to see if I could do a twist on the two dishes. The major change I made to my spaghetti dish was instead of seasoning the ground hamburger with Italian seasonings and tomato sauce, I used taco seasoning and salsa. My hypothesis was it would taste like a taco but instead of the tortilla shell, it would be pasta noodles. Overall thinking that the change would work. With the first few bites, it did work, however it felt a bit awkward due to the aromas of the dish smelling like tacos but the textures being spaghetti noodles. The more that I ate it however, it ended up being really good.

The first main ingredient in the new dish is the ground hamburger which serves as the protein, a polar molecule. The second main ingredient is the pasta noodles (spaghetti noodles) which are carbs, the starch component, and another polar molecule. The third main component was the salsa. Salsa being a tomato-based condiment which is nonpolar and adds the acidity and flavor to the dish.

A main chemical change in the dish is the pasta boiling in water, being that the water interacts with the starches and protein to make the noodles soft. Another chemical change is the ground hamburger cooking. A physical change is adding the salsa to the ground hamburger after it is cooked.

The methods of heat transfer used for this dish is convection (to heat the noodles) and conduction (to heat the meat). I used silicone utensils to prevent food from sticking to them and I feel they help with stirring the best.

# Fried Rice

Submitted by: Addison Brewbaker

Recipe: <https://www.iheartnaptime.net/fried-rice/>

Butter

Veggies (carrots and peas)

Diced onion

Garlic

2 eggs

2 cups Rice (or Thai kitchen stir fry rice roodles)

Soy sauce

1 tsp sesame oil

Onion powder



1. Chill the rice. Store in the fridge until ready to use (I use 1 cup of rice.)
2. Cook the veggies (I used carrot and peas) (10oz). Add butter (2 tbs) to a large skillet or wok over medium high heat. Add onion (1 cup) for 2 minutes. Then stir in garlic (1 tbs).
3. Scramble Eggs (2 eggs) on a different pan, then add it to the veggies or push veggies to one side and pour the eggs to the skillet. Scramble and then stir together. Then you'll add in the rice.
4. Stir together. Gently stir and then add soy sauce and toss to coat. S&P to taste. If desired, add a dash or two of sesame oil. You can top with green onions if you'd like.

## Reflection

For this project I wanted to make fried rice and then switch from rice to noodles, to see what's the difference between them. Why did I choose to make fried rice, because first of all, they taste so good, second of all, it is my culture's food, and third of all, it is a good leftover. A fun fact about fried rice is the reason why it became popular in China is that it is a good dish for leftovers, and that's all! Before I dive in to make the food, I made a hypothesis. I think the noodles will not absorb the sauce/seasoning as much as the rice. The reason why is that I know that rice soaks up my liquid more than noodles. So, I think with the noodles in it, the flavor will taste less in the noodles. Spoilers alert I was right.

While I was making the food without the change, I did not have any problem with it. It went smoothly, and it tasted delicious. While I was making the food with the change, I was struggling a little bit with making the food. Cooking the vegetables, and the eggs were fine, but when it came to noodles, it was not fine. The reason why I struggled is that, with rice, it was easy to stir and mix, but with noodles, it was harder to move the vegetables evenly throughout the noodles. While we are talking about cooking, let me quickly explain the energy/heat transfer during this cooking process. Convection for softening rice and noodles, and conduction for frying vegetables, rice, noodles, and more. Now back to the topic, it also made a lot of mess, but the taste was also delicious. Luckily, I used a stainless-steel pan, so I don't have to worry about food sticking to the pan. Although it tasted delicious, I had to add more soy sauce to try to match the food without the change. I hate to say this, but I love the change in the food because mostly of the texture of the noodles. I also feel like it is the main dish, and it made me feel fuller.

If you want to know more about the ingredients in fried rice, I am happy to explain some of the ingredients. Let me explain the ingredients' molecular properties and functions in the recipe.

Eggs are included in this recipe. It has water, globular proteins, fats, vitamins, and its function in the recipe is to add more proteins to the dish. Also, it tastes good with rice. Butter is also included in this recipe. It has water triglycerides, and fatty acids and its function in the recipe is to help brown the rice. Also, it adds more flavor to the rice, and I love flavors in my food! Soy sauce is my favorite ingredient in this recipe. It has amino acids, nucleotides, peptides, polyols, and soluble saccharides, and its function in the recipe is to get rid of the sticky texture of the rice. Also, it tastes good with it. Now, let's talk about their physical and chemical change. Scrambling eggs count as a physical change because breaking cooked eggs into smaller pieces does not involve chemicals. You are just physically making smaller pieces. Also, cooking rice counts as a chemical change because while the rice is softening, the chemical properties in the hard rice will change to make the rice soft. The process is called Gelatinization.

# Spaghetti Aglio E Olio

Submitted by: Dillon Copeland

## Ingredients

- Water
- Salt
- ½ Box of Pasta
- ¼ Cup of Olive Oil
- 3 Cloves of Garlic
- Parsley
- Red Pepper Flakes
- \*Parmesan for the altered recipe\*



## Steps

- Boil Water in a Pot
- Add Salt to Water
- Add Pasta to Boiling Water
- Add Oil to pan and Turn to Medium Heat
- Once Heated add Garlic into Pan
- After a Short Time add Red Pepper Flakes to Pan \*Add 3 Handfuls of Parmesan to the pan\*
- Before Garlic begins to turn brown add 1 Ladle of Pasta Water to Pan
- Once the Pasta is 70% Cooked Remove from Pot and Add to the Pan
- Add more Pasta Water as needed
- Add Parsley
- Serve

## Reflection

For my dish I decided to make Spaghetti Aglio E Olio; or in other words: Spaghetti with garlic and oil. This is one of my favorite dishes to make for a number of reasons, however there are three reasons that really stand out. The first of those reasons is speed. Once the water is boiling it only takes about 15 minutes to fully cook this dish. The second reason I love this dish is simplicity. There's only seven ingredients needed to make this dish and you don't have to do anything fancy with them. The third reason is taste. I love to eat pasta, but many of the sauces out there are very cheesy or tomato based (which I like, Vodka sauce is actually my favorite sauce) but eating super thick pasta sauce can get old and I do a lot of physical activity in a week so it's nice when you can have a lighter meal that still has good flavor. The garlic and red pepper flakes in this meal combine to make a very strong, yet very good sauce. To circle back to the point I made about simplicity, this was the first dish I ever learned how to cook and I got it from "Not Another Cooking Show" on youtube. This dish also has some family ties for me. A large part of my extended family and my fiancé are Italian so I grew up eating all kinds of Italian dishes, so learning how to cook another one (especially one that keeps the fiancé happy) is awesome.

Some people think that the red pepper flakes in the pasta can be too spicy (I think they make the dish taste better) so I looked for a way to combat that heat. What I found was that

dairy is one of the best ways to combat the heat of red pepper flakes. So for my alteration to the recipe (shown below) I decided to add parmesan to the sauce at the same point that I added the red pepper flakes. I believed that by doing this the parmesan would help to cool some of the heat from the red pepper flakes.. I decided that the cheese should be added at the same time as the red pepper flakes so that the cheese had the same opportunity to mix into the sauce with the red pepper flakes, rather than just trying to retroactively cover up the heat at the end. What I found was that the cheese did in fact cool the dish down a little but, but not necessary to a significant level of cooling. The pasta was still spicy, just moderately less spicy than it was before. Adding the cheese so early on into the sauce also made it difficult to cook. The parmesan began to bunch up, melt, and get sticky when it was added to the sauce. At the end of the day I prefer the original way to make this dish rather than my altered way.

Consistent with the name of the dish; spaghetti, garlic, and olive oil are the three main ingredients of this dish. The spaghetti is a carbohydrate (gluten) and serves as the texture, flavor, and filling for this dish. The pasta helps to break up the pure garlic and red pepper flakes and without the pasta there wouldn't be much to keep you full with this dish. The oil is a fatty acid (mostly composed of triacylglycerols) and serves as the base of the sauce, flavor, and aiding reactions. Garlic is a vegetable and it contains many bioactive compounds (allicin, alliin, diallyl sulfide, diallyl disulfide, diallyl trisulfide, ajoene, and S-allyl-cysteine). Garlic serves as one of the main flavors for this dish. There are two methods of heating that are used to cook these ingredients. Convection is used to boil the water for the pasta noodles. Convection is used to cook everything else as well as the finishing of the pasta noodles in the sauce. There are also a number of physical and chemical changes that occur within this dish. One example of a physical change is when the pasta is added to the pan it will begin to absorb the sauce. Chemically, the starch from the pasta helps to create a water in oil emulsion which means that the water is spread throughout the oil. You can tell this is the emulsion that occurs because the sauce feels a little greasy. If there are any questions the material below may help to answer them, but if you still have a question that none of the material answered feel free to reach out to me.

# SWEET TREATS

## Chocolate Mayonnaise Cake

Submitted by: Whitney Walmer

1 1/2 cups hot strong brewed coffee  
1 cup unsweetened cocoa  
3 cups all-purpose flour  
2 teaspoons baking soda  
1/2 teaspoon baking powder  
1/2 teaspoon plus 1/4 tsp. salt, divided  
2 1/2 cups granulated sugar  
4 large eggs  
1 cup mayonnaise (such as Duke's)  
2 teaspoons vanilla extract, divided  
1 1/4 cups bittersweet chocolate chips  
2 tablespoons light corn syrup  
3 - 4 tablespoons heavy cream, divided  
3/4 cup unsalted butter, softened  
4 cups powdered sugar, divided



- Whisk together hot coffee and cocoa in a bowl. Let stand until room temperature, about 20 minutes. Preheat oven to 350°F. Grease and flour 3 (9-inch) round cake pans.
- Whisk together flour, baking soda, baking powder, and 1/2 teaspoon of the salt in a bowl. Combine granulated sugar and eggs in a large bowl. Beat with an electric mixer on medium-low speed until light and fluffy, about 4 minutes. Beat in mayonnaise and 1 1/2 teaspoons of the vanilla on low speed. Alternately add flour mixture and coffee mixture to egg mixture in 5 additions, beginning and ending with flour mixture. Divide batter evenly among prepared pans. Bake in preheated oven until a wooden pick inserted in center comes out with moist crumbs, 22 to 25 minutes.
- Cool cake layers in pans on a wire rack 20 minutes. Remove cake layers from pans; cool completely on rack, about 30 minutes.
- Place chocolate chips, light corn syrup, and 3 tablespoons of the heavy cream in a microwavable bowl. Microwave on HIGH until smooth, about 1 minute, stirring every 15 seconds. Let stand until room temperature, 10 minutes.
- Combine butter, remaining 1/4 teaspoon salt, 2 cups of the powdered sugar, and remaining 1/2 teaspoon vanilla in bowl of a heavy-duty stand mixer; beat on low speed until smooth. Beat in chocolate mixture on low speed until smooth. Beat in the remaining 2 cups powdered sugar and, if needed, remaining 1 tablespoon cream, 1 teaspoon at a time until spreadable consistency is reached.

- Place 1 cake layer on a serving plate. Spread 1/2 cup frosting over top. Top with second layer; spread 1/2 cup frosting over top. Top with third layer. Spread remaining frosting over sides and top of cake.

### **Reflection:**

For me choosing a recipe was not very easy because I always like to try new recipes and challenge myself. While reflecting on what was covered over the course of the semester my mind went back to what I found to be strange and fascinating in terms of practical baking practices like the use of mayonnaise in baking. When I was younger, I recall hearing about how my grandmother used to use it in her baking. I never got the opportunity to try in practice or taste it for myself. So, I decided to experiment with a chocolate cake recipe and prepare it with and without mayonnaise. While all ingredients play their own part in the recipe, I had chosen to analyze how coffee, flour, and mayonnaise function in the recipe along with their properties.

The first ingredient coffee used in this recipe is produced through the Maillard reaction and emulsion as I had to brew fresh hot coffee to combine with the chocolate. The method that I used to brew coffee through pressure brewing in using a moka pot as the water in bottom of the pot coming to a boil and brings out the flavor through the coffee grounds. In using the coffee, the flavor of the cake becomes richer and darker in color as a result in the Maillard reaction after the cake is baked releases a sweeter and savorier aroma. In allowing the chocolate to steep in the coffee the flavor intensified and allowing the flavor in the cocoa [powder to intensify as well. While adding coffee is option when baking a chocolate cake optional, flavor is not. In baking, flour is a major component in making a variety of different desserts and it plays an important role in not only the structure. In the flour gluten develops when the protein in the flour combined with heat and moisture. The flour was also mixed with leaving agents like baking powder and baking soda that in turn helps the cake rise. While in the same molecular category in as involving proteins the next ingredient is mayonnaise.

As mayonnaise is already an intriguing food comprising protein and oil it has found its way in baking. In the recipe the mayonnaise was added to an emulsion of egg and sugar that had been oxidized in beating until the mixture. While mayonnaise is commonly thought of an emulsifier in the way that it enhances the texture of the batter and maintaining moisture it is a form of leavening agent. It gives the batter thickness and lightness in color and no noticeable mayonnaise flavor. The way that the flour mixture and coffee mixture are slowly added into the egg the mayonnaise is able to react with the other ingredients and change the texture of batter. In the heat transfer used known as convection where the hot air circulates in the oven allowing the heat to also go from the rack in the oven to the bundt pan that allows the batter to solidify. In terms of how I prefer the the chocolate cake to be prepared, I surprisingly I found the one with my mayonnaise to be better than the cake without because of texture and moisture. For my own person touched I made a chocolate mint butter cream icing following the recipe for icing that it in the recipe above but adding 1 tsp of mint extract and crushed candy cane for a fun decorative touch.

# French Crepes with Very Cherry Berry Compote

Submitted by: Kaatia Fedrow

1. Mix together dry and wet ingredients in separate bowls.

1a) Dry ingredients:

1 cup flour (Bread Flour or All-purpose Flour)

1 tsp salt

¼ cup sugar

1b) Wet ingredients:

2 tbsp melted butter

1 tsp vanilla extract

1 large egg



Mix wet ingredients then add milk\* and mix again.

1 ¼ cup of “sour milk” as substitute for Buttermilk (mix 1 tbsp apple cider vinegar with 1.25 cups of whole milk and let sit for 15 minutes).

2) Combine wet and dry ingredients and mix until there are no lumps.

3) Oil and butter the heated pan (low/medium heat).

4) Pour in 1/3 cup of batter in a swirl motion from center to edges to spread the batter wide and thin.

5) When the edges start to crisp golden brown and the crepe starts to wobble/lift off the pan, flip the crepe. Repeat process for each crepe, buttering the pan in between.

6) What you are looking for is light array of brown spots/not too dark and not too bare/dough-y.

7) Plate the crepe, fill with berry compote, and roll into a scroll

8) Serve and Enjoy!

\*For the Berry Compote

1. mix 3 Tbsps of liquid of choice (ex: water, orange juice, ginger-ale) with 1 cup of frozen berries such as small bing cherries and strawberries

2. Heat in a pan or microwave until the berries soften. Note: you may have to slice up the strawberries as they do not break down as easily as the cherries

3. Add 2-4 tablespoons of sugar as desired and mix

4. When berries are cooked down, remove from heat and set aside

## Reflection

One morning I was craving a sweet breakfast and decided to make pancakes until I realized I did not have pancake mix and the only flour I had was bread flour. I looked up some bread flour pancake recipes online and found this article by Baker Bettie: "5 Ingredient Easy Pancake Recipe." I appreciated the way the article discusses how different kinds of flour can be used to alter the texture of pancake and tips on altering recipes for each type of flour. For example, if using cake flour, increase the amount of flour, if using wheat flour decrease the amount, and if using self rising flour, omit the baking powder. The article mentioned bread flour as a substitute but did not go into detail. The general consensus from my brief research on using bread flour for pancakes was to be careful because bread flour contains more gluten protein so the pancakes could come out too dense and chewy which is the opposite of the light and fluffy texture pancakes are known for. I decided to go ahead and try to make pancakes from scratch with few and simple ingredients and the pancakes turned out absolutely delicious. They weren't light and fluffy as I'd been warned but they were thin and flavorful, almost like a sweet French crepe!

French crepes are known to be made with only a few simple ingredients: flour, egg, milk, butter, sugar, and vanilla extract. Every time I have tried to make crepes I couldn't get them thin enough or they fell apart when flipping. After my accidental success with bread flour I decided that maybe that could be my secret to a successful crepe as an amateur crepe maker. My hypothesis is that because bread flour has a higher gluten percentage and therefore a higher gluten network, the batter is stronger and therefore less likely to break or tear as I try to form and flip a thin crepe. However, all the crepe recipes I looked into emphasized the use of all-purpose flour for the perfect crepe. I decided to put the flours to a test to see which made for more of a well-formed, and overall tastier crepe.

Before I share my results, I'd like to give an honorary shout out to an ingredient that I believe was an unexpected star of the recipe. Another aspect about Baker Bettie's recipe that originally excited me that one morning to try out with bread flour was an introduction to the "Sour milk" hack. Apparently if a recipe calls for buttermilk which is a tangier, flavorful milk, mixing vinegar and milk and letting it rest will create a successful dupe. The tang is a chemical result of acidification of the milk proteins which respond physically by slightly coagulating. I think it would be more of a chemical change if I soured the milk for longer with the use of bacteria to develop fermentation rather than just adding vinegar to acidify the milk. I found that the tang that the vinegar added to the milk became an essential part of what made both crepes regardless of flour content, taste like a dessert crepe should. When attempting to make crepes for breakfast in the past I would usually end up trying to thin out pancake batter with more milk and the result would not only fall apart and lack proper form but it would also just kind taste like a thin pancake. I think crepes are more than thin pancakes, they have an elevated flavor and doughy texture to them that makes them stand out from pancakes. Another key difference between pancakes and crepes is that crepes are not supposed to be fluffy; they are not supposed to "rise" so the recipe does not call for a leavening agent such as baking powder. Bread flour is known to be used with a leavening agent because bread intends to rise, so it was interesting to see if bread flour could be valuable as an ingredient in a un-leavened batter.

Even without leavening, flour is still going through a chemical change when mixed with water as flour is made up of gluten proteins: gliadin and glutenin that bind together to form gluten (amino acid/protein) chains with hydrogen bonds thanks to the addition of water and they form an overall protein network that provides structure to the crepe. Another important chemical change

that I failed to conduct in my first trial making my crepes is the use of lecithin in egg as an emulsifier of polar and non polar ingredients of vanilla and butter. My recipe called for the wet ingredients to be mixed together and for the first trial I added the cold milk to the wet ingredients of vanilla, egg, and melted butter without whisking the egg with the vanilla and butter first. What happened was an unsatisfactory physical change of the melted butter being cooled by the milk and forming clumps. To avoid a batter that is clumpy with cold bits of butter, it is necessary to emulsify the butter and vanilla with the egg before mixing in the cold milk. Emulsification is an important chemical change for ensuring ingredients are well mixed so that the final product tastes like a transformation of ingredients into a single product instead of something in which you can taste all the individual ingredients heterogeneously which does not work well for cakes or crepes.

Finally, I'll disclose my bread flour vs all-purpose flour crepe results. To be honest, they both turned out delicious but there were pros and cons to each. The batter made with bread flour was stronger as my hypothesis suggested, but that led to a weakness in spreadability. My bread flour batter would not spread thin enough to become a crepe so when my recipe originally called for only 1 cup of milk I decided to add an additional 1/4 cup to thin out the batter. The all-purpose flour batter was thin enough and spread well enough but I needed to control my variables so I added the 1/4 cup to it as well. To my surprise, I had no trouble flipping the crepe made with all-purpose flour so in that respect the bread flour did not seem to make much of a difference in success of crepe formation. I think what made my crepes easier to flip in general regardless of strength of gluten network, was my use of a non-stick stainless steel pan (non-stick coating made from ceramic coating that is PFOA free) instead of a regular stainless steel pan. When cooking with the heat transfer method of conduction, it is easy for food to stick and/or burn because it is in direct contact to the heat source. I had to make sure I kept the heat at a medium/medium low temperature in order to avoid burning the thin edges as I tried to achieve some crispiness. The real difference between the two flour types showed in the taste/texture test. The all-purpose flour crepes were slightly thinner and crispier on the edges while the crepe made with bread flour was slightly more dense and has a silkier slightly slimy (somehow slimy in a good way!) and doughy texture that really gave a dessert-like mouthfeel and overall an indulgent experience. Ultimately, I think it would come down to personal preference. I also found that each could be cooked for longer or shorter times to emulate qualities of the other. If I wanted to crisp up the one with bread flour I cooked for longer, if I wanted the all-purpose flour crepe to retain some of that doughy deliciousness I would add a bit more batter and/or cook it for slightly less time.

# Banana Bread

Submitted by: Katelyn Molina

- 2 Cups of Sugar
- 2 Cups of All Purpose Flour
- 1 Tsp of Baking Soda
- ½ Tsp of Salt
- 3-4 Mashed (Ripe) Bananas
- 1 Cup of Vegetable Oil
- 3 Eggs (lightly beaten)
- 1 Cup of Chopped Walnuts (Optional)

Note: this makes two banana breads !



Instructions:

- Preheat oven to 350 °F and grease the two loaf pans.
- In one large bowl, sieve the flour together with the salt and baking soda. Set it aside.
- In another large bowl, mash bananas together. Then add oil, then eggs, sugar, and mix well. Lastly, add flour bowl a little bit at a time. Stir it constantly to combine it well. It will become slowly thicker, so it will become harder to mix the flour into the mixture.
- *Optional: If you want to add the walnuts to the banana bread, get your desired number of walnuts and crush them in a plastic bag. After they are smaller pieces, cover the top of the loaf pans with the walnut pieces.*
- Place it in the oven for 40–45 minutes (1 hour for my oven because it is slightly off). Remember to check the consistency of the bread with toothpicks and to spray the pans with cooking spray.

## Reflection:

I chose this banana bread recipe because it is a quick and family-favorite dish. I associate it with good memories and the smell of it filling my house. We discovered this recipe though originally online, from Pinterest, but we changed it slightly since we had it. For this assignment, I changed the normal all-purpose flour to a gluten-free one to give a slice to my gluten-free family member. Before I began, I hypothesized that the gluten-free all-purpose flour will not be as structured and airy compared to the original banana bread recipe. Ultimately, this would make the original banana bread taste better than the gluten-free loaf. Even before I baked the two different loaves, there was a significant difference between the two batters. The end results were just as predicted; the original all-purpose flour loaf had significantly rose compared to the gluten-free all-purpose flour loaf. The gluten-free banana bread not only barely rose, but it also was more dense, moist, and had a dark color to it, even though the two loaves were baked at the same time. Everyone that tasted the loaves, except for my one sister, all agreed with me; that the original bread was better than the gluten-free one. I preferred the original recipe because the loaf was not moist. It was light, airy, and not oily tasting.

To get into more of the chemical side of baking, there are at least three key ingredients: all-purpose flour, baking soda, and eggs. The flour is essential to the recipe because it provides high protein percentages and stronger gluten networks. The two proteins that are responsible for the network

together and give the bread a fluffy and light texture would be glutenin and gliadin proteins. The specific type of covalent bond they have is called disulfide bond, which forms between two sulfur atoms from two "thiol" functional groups. Baking soda, also known as  $\text{NaHCO}_3$ , is a leavening agent for bread. A leavening agent is an ingredient that helps make bread rise. For baking soda, there must be an acid mixed with it for it to become activated. Lastly, egg yolks provide a lot of nutrients like iron, vitamins, and thiamin. It also contains cholesterol which is essential to cell membranes. If the cholesterol is too much though, it can be dangerous to help. Thus, there is lecithin as an emulsifier within the egg as well. Egg whites provide water, protein, and sugar. Overall, the eggs give more structure and introduce more air to the bread.

During the baking, there are many changes the ingredients go through in order to become banana bread. First, there are physical changes like mixing the flour, salt, and baking soda together in one bowl. The mashing of bananas is another physical change in the recipe. These steps only physically change the shape of the ingredients. As for the chemical changes, they change the actual structure of the ingredients. For example, when the loaves were placed in the oven, they had to go through a Maillard reaction in order to get cooked through. The reaction is done when the dish has some color or browning to it. Another chemical reaction that happens is the Neutralization reaction. This reaction produces salt, water, and carbon dioxide, which means it will create more air bubbles in the loaves. In order to make the bread mixture into actual banana bread, it needs to be introduced to a heat transfer. The type of heat transfer will have been convection because the air is circulating hot air as it is baking. If there is interest in making this recipe, make sure you have the following materials ready: two large mixing bowls, measuring cups, a fork, two loaf pans (pyrex glass bread pans), a spoon (or anything to scrap the bread mixture into the loaf pans), mittens, an oven, and cooking spray. Good luck with baking!

# Old-Fashioned Vanilla Pie

Submitted by: Samantha Zimmerman

3 cups almond milk  
1 cup sugar  
1 ½ cup silken tofu  
2 tsp. vanilla  
Dash of nutmeg  
Unbaked pie crust of your choice

- Beat together sugar, tofu, nutmeg, and vanilla.
- Add milk and whisk until smooth.
- Pour mixture into pie shell and sprinkle more nutmeg on top of the custard.
- Bake at 350° for 1 hour and 15 minutes or until set.



## Reflection:

Old-Fashioned Vanilla Pie is one of my husband's favorite dishes from when he was a child. I found this recipe on Pinterest, and the creator's site is called Spaceships and Laser Beams. It's a very simple egg custard, flavored with vanilla and nutmeg, and baked into a pie crust. Unfortunately, the original recipe calls for eggs and evaporated milk, and we are mostly vegan. For this project, I wanted to see if I could take an old classic and make it fit our vegan lifestyle. I expected that the the vegan pie would be fairly similar to the original pie in taste and texture, as they contained similar molecular structures; however, the vegan pie would be lower in saturated fats and cholesterol due to the substitutions. After baking both of my pies, I decided that I preferred the vegan version. The custard was a bit looser, and I preferred that texture to the pie that had an egg custard filling, which can feel a bit eggy, for lack of a better word. A few of the ingredients in Old-Fashioned Vanilla Pie include vanilla, eggs or tofu, and sugar. Vanilla contains vanillin, which is a phenolic compound and adds flavor and a delicious aroma. Eggs and tofu both contain proteins, which act as a thickening agent in the custard. Sugar contains simple carbohydrates. These, of course, add sweetness to the custard; however, they also break apart and disperse the protein molecules throughout the mixture. This dispersal of molecules forces the custard to cook more slowly, which helps the custard to have a silkier mouthfeel. There are several physical and chemical changes that occur throughout this recipe. The physical changes include mixing all of the ingredients together and heating the pie in the oven. One of the chemical changes in this recipe is the breaking down of the proteins through bonding with the sugar. Another is the thickening and setting of the custard due to the denaturing and re-bonding of the protein structure. Sometimes, especially with a vegan pie, the proteins continue to bond and set the mixture even after the pie is removed from the oven. To bake this pie you need a convection oven, which uses the convection method of heat transfer, as hot air is continuously cycled around the pie. There is also some conduction heat transfer, as the pie plate will likely heat before the pie is cooked, and that heat will transfer into the molecules in the pie. This pie is very simple to whip together. I only needed a glass mixing bowl, a stainless-steel whisk, and a silicone spatula. These tools are all easy to clean and make things much simpler. I used a glass pie plate, and, just for fun, I made my pie crust out of Christmas sugar cookies. Once the custard was mixed together, I poured it into the pie shell and let the oven work its magic.

# Banana Bread

Submitted by: Mikayla Adams

Recipe from: [https://www.simplyrecipes.com/recipes/banana\\_bread/](https://www.simplyrecipes.com/recipes/banana_bread/)

2 to 3 medium (7" to 7-7/8" long) very ripe bananas, peeled (about 1 1/4 to 1 1/2 cups mashed)

1/3 cup (76g) butter, unsalted or salted, melted

1/2 teaspoon baking soda (not baking powder)

1 pinch salt

3/4 cup (150g) sugar (1/2 cup if you would like it less sweet, 1 cup if more sweet)

1 large egg, beaten

1 teaspoon vanilla extract

Chocolate chips

1 1/2 cups (205g) all-purpose flour

CHANGED WITH:

1 1/2 cups almond flour

- Butter an 8x4 inch loaf pan.
- Mash bananas and stir in melted butter.
- Mix in remaining ingredients.
- Pour batter into loaf pan.
- Bake 55-65 min at 350°F



## Reflection:

I chose to do banana bread for my final project because there was a recipe link in our one lab and since I didn't do it for the lab and wanted something sweet in the house I chose this one. The recipe was very easy to follow and small adaptations that can be made to the recipe to make it with more or different flavors. The recipe was through simply recipes. I decided to change all purpose flour to almond flour. I thought that the bread will rise more than normal because almond flour has a higher protein percentage than all-purpose flour. For the results, they were very close to which rose more, but I believe that the one with all purpose flour rose a tad more than the almond flour banana bread. I preferred the all-purpose flour banana bread more than the almond flour, mostly because of the texture that the almond flour gives to the bread. Although, others in my house preferred the almond flour bread to the all purpose flour bread because they thought it had more flavor and was more moist. Butter was a key ingredient to the recipe. On a molecular level, butter is 80% fat and 20% water. Fats are made up of carboxylic acid (polar) and a long hydrocarbon chain (non-polar), 3 of these together will be a triglyceride. The function in recipe is to add flavor and help products Maillard reaction. Another key ingredient was baking soda. Molecular properties of baking soda include it being ionic because it is constructed of a metal and nonmetal connected with a covalent bond. It also helps to neutralize the acid and bases within ingredients. The function in recipe is to neutralize the batter and assist with leavening. Flour is a third key

ingredient and the focus of change in my project. Molecular properties of flour include, a protein that is used to active the gluten network and let leavening to occur. Gluten is made up of gliadin and glutenin that has formed cross links. It's function in recipe is one of the main components of the batter to be able to make the bread. Physical change is liquid batter into solid bread. Another change is a chemical change for the baking soda neutralization. Another chemical change is the Maillard reaction to occurs during baking. Because I used an oven, all methods of heat transfer were relevant. Conduction is occurring because to metal racks are hot and conduct heat to the pan that the batter is in and heat up the batter. Convection is occurring through the air movement within the oven, it circulates through the oven heating up the batter. Radiation is occurring through the electromagnetic waves (Infrared Radiation) within the oven. The type of materials used during the making processes included, plastic bowl for mixing the ingredients in, metal spoon for mixing ingredients, aluminum tin for the batter to bake in, plastic measuring cups. I chose these materials because most importantly they are what I had available to me.

# Chocolate and Peanut Butter Chip Cookies

Submitted by: Angelica Palmore

Recipe from: <https://joyfoodsunshine.com/the-most-amazing-chocolate-chip-cookies>

1 cup salted butter softened  
1 cup white (granulated) sugar  
1 cup light brown sugar packed  
2 tsp pure vanilla extract  
2 large eggs  
3 cups all-purpose flour  
1 tsp baking soda  
½ tsp baking powder  
1 tsp sea salt  
12 oz semi-sweet chocolate chips  
10 oz peanut butter chips



Preheat oven to 375 degrees F. Line a baking pan with parchment paper and set aside.

In a separate bowl mix flour, baking soda, salt, baking powder. Set aside.

Cream together butter and sugars until combined.

Beat in eggs and vanilla until fluffy.

Mix in the dry ingredients until combined.

Add chocolate chips and peanut butter chips and mix well.

Roll 2-3 TBS (depending on how large you like your cookies) of dough at a time into balls and place them evenly spaced on your prepared cookie sheets. Alternately, use a small cookie scoop to make your cookies.

Bake in preheated oven for 8-10 minutes or sometimes longer depending on how large you made the dough balls.

Take them out when they are just BARELY starting to turn brown.

Let them sit on the baking pan for 2 minutes before removing to cooling rack.

## Reflection:

I choose this recipe because I honestly couldn't think of anything else to do that wouldn't be too strenuous to make during finals week or expensive. I already had the ingredients for these cookies, and I loved them the last time I made them during the gluten and baking lab modules, so I figured why not do it again. I got the basic recipe from <https://joyfoodsunshine.com/the-most-amazing-chocolate-chip-cookies/>.

The change that I made was to use melted butter instead of softened butter. I honestly expected the cookies with the melted butter to turn out crispier and thinner than the ones made with the soften butter, which would be softer and thicker. The cookies with the melted butter turned out crispier but not thinner and I have my theories for that. I was surprised that they were still pretty thick, but I think that may have to do with the spreading room they had on the baking sheets, and they probably needed a lot more butter than was in the recipe to become significantly thinner. They were crispier but that was because I let them cook for a little bit too long, they took a bit longer to cook than the ones with the soften butter as well which was surprising. The cookies with the soften butter turned out good but they actually had to cook longer

as well but I think it was because of how big I made the dough balls. When making the dough with the melted butter it was a lot easier to mix everything together since the dough was a lot softer and I didn't have to fight with the clumps of butter because they were all melted so it was overall faster to incorporate everything. I preferred the version with the soften butter while it's harder to mix the dough the extra work makes a better cookie overall.

Three key ingredients of this recipe are flour, eggs, and butter. Flour provides the cookies with their structure and is a very large portion of the dough. It is made up of about 8-10% of protein and this protein is glutenin and gliadin. Eggs are the globular protein and are made up of proteins, lipids, and cholesterol and it also adds to the structure of the cookies. Butter is a lipid, and it is nonpolar. It's a mixture of triglycerides derived from fatty acids, and it acts as the fat in this recipe and gives the cookies moisture and directly impacts the shape, spread, and texture of the cookies.

A physical change that occurred during the cooking process was the cookies dough rose and spread. A chemical change that occurred was a Maillard Reaction which occurs between the proteins in the dough and the sugars which leads to the browning and increase in flavoring. I used the oven as the method heat transfer. I used 3 metal nonstick baking sheets, 2 silicone spatulas, 1 plastic mixing spoon, 2 plastic mixing bowls and measuring cups, and scissors. I used these materials because they were the only things I had and are the easiest to clean and to mix the dough with.

# Sugar Cookies

Submitted by: Rachel Westhoff

2  $\frac{3}{4}$  c. all purpose flour  
1 tbsp. baking soda  
 $\frac{1}{2}$  tsp. baking powder  
 $\frac{1}{2}$  tsp. salt  
1 c. unsalted butter @ room temperature  
1 c. + 2 tbsp. granulated sugar  
2 tbsp. brown sugar  
1 egg  
2 tsp. vanilla extract



Preheat oven to 350°F (180°C). Line baking sheets with parchment paper and set aside. Combine the flour, baking soda, baking powder and salt in a medium sized bowl and set aside. Cream the butter and sugars together in a large mixing bowl on medium speed until light in color and fluffy, about 2-3 minutes.

Add the egg and mix until well combined.

Add the vanilla extract and mix until well combined.

Add the dry ingredients and mix until the dough is well combined. It will be thick and shouldn't be sticky. Do not over mix. Once it's well combined, use a rubber spatula to help it come together to form a more cohesive ball.

Create 1 1/2 tablespoon sized balls of cookie dough. Gently roll into a ball, then roll each ball in the additional sugar to coat. Set the balls on the baking sheet.

Bake cookies for 7-8 minutes. The cookies will spread and the centers will look soft, but should look done. Remove just before the edges begin to turn golden. Don't over bake! The cookies will be a little puffy when you take them out of the oven but will fall a bit as they cool.

Remove from the oven and allow to cool on baking sheets for 4-5 minutes before transferring to a wire rack to cool completely.

## Reflection:

During the Covid lockdown back in March 2020 I joined the baking bandwagon. This was mostly inspired by all the free-time spent binge watching The Great British Bake Off. While I wasn't ambitious enough to try my hand at bread, I did bake quite a few different types of cookies and cupcakes. I found this recipe from [lifeloveandsugar.com](http://lifeloveandsugar.com) on Pinterest and have never looked back. It is my fool proof sugar cookie recipe. They are quick, easy, and always turn out soft, chewy, and delicious. Family gathering? Sugar cookies. Holiday? Sugar cookies. Bake sale? Sugar cookies. They never fail me. For this project I decided to try and bake a gluten-free and vegan version of these cookies. I have a few friends who are both gluten-free and vegan and they have found a way to cook and bake that works with their lifestyle, but is also tasty and you would never know it was any different. I wanted to see if I could do the same. I made the recipe gluten-free and vegan by switching out the all-purpose flour for gluten-free flour, the butter for vegan butter, and the egg for a plant based egg substitute. All purpose flour contains gluten, which is a protein. Gluten is made up of glutenin and gliadin that form covalent bonds with each other, called disulfide bonds. The

glutenin and gliadin help with the stretchiness and elasticity of the baked good. Eggs are also a protein, and when whipped they can help a baked good rise. Butter is a fat that can not only add flavor, but can also be a “tenderizer” to coat and weaken the gliadin and glutenin links. Butter also plays a big part in “cookie spread.” Cookie spread is how far out the cookies spread while baking. Butter is soft at room temperature, which means it has a lower melting point. This causes it to help the cookies spread more during baking than a fat with a higher melting point would, such as Crisco. Seeing as the gluten-free/vegan cookies would neither have the gliadin and glutenin in the flour nor the butter to help with the cookie spread, I hypothesized that the gluten-free/vegan cookies would be crumbly rather than chewy and not spread as much as the cookies made from the regular recipe. The type of heat transfer used to bake the cookies was conduction, and they underwent an endothermic reaction as they baked. They also underwent a Maillard reaction as the outside of them turned a golden brown. In the end my hypothesis was pretty spot on. The gluten-free/vegan cookies (left top image) barely spread at all and were fairly dry, crumbly, and almost a cake-like texture while the regular cookies (top right image) were as soft and chewy as they always are. While the gluten-free/vegan cookies were not my favorite, they would make an alright substitution for someone who needed to/chose to eat a gluten-free and vegan diet. I, however, will be sticking to my ride or die, never fail, always chewy, hard to mess up, “sugar cookies for dummies” cookie recipe.

# Chocolate Chip Cookies

Submitted by: Isaiah Tshudy

Recipe: <https://www.bonappetit.com/recipe/bas-best-chocolate-chip-cookies>

1½ cups (200 g) all-purpose flour (spooning into measuring cups, then leveling)  
1¼ tsp. (4 g) Diamond Crystal or ¾ tsp. (4 g) Morton kosher salt  
2 ¼ tsp. baking powder  
¾ cup (1½ sticks; 169 g) unsalted butter, divided  
1 cup (200 g) (packed) dark brown sugar  
¼ cup (50 g) granulated sugar  
1 large egg  
2 large egg yolks  
2 tsp. vanilla extract  
6 oz. (170 g) bittersweet chocolate (60%–70% cacao), coarsely chopped, or semisweet chocolate chips



Preheat oven to 375°F. Whisk flour, salt, and baking powder in a small bowl.

Cook ½ cup butter in large saucepan over medium heat, swirling often, until butter foams then browns, about 4 min. Scrape melted butter and brown bits into large mixing bowl and let cool 1 min. Cut remaining ¼ cup butter into small pieces and add to brown butter.

To butter add sugars and whisk until sugars are incorporated and no lumps remain. Add egg and egg yolks and whisk until sugar dissolves and mixture is smooth, about 30 sec. Whisk in vanilla. Fold reserved dry ingredients into butter mixture just until there are no dry spots. Fold in chocolate and let rest 5-10 min. Portion out 16 balls of dough and put on baking sheets. Bake 8-10 min. Let cool on baking sheets.

## Reflection:

I chose to make chocolate chip cookies for my final recipe project because I have a major sweet tooth, but also because I saw the opportunity to switch out baking soda with baking powder. I have always heard about the differences between baking soda and baking powder, but I have never seen or tasted the differences that these ingredients produce. I love chocolate chip cookies and usually have a go-to recipe that I use, but I broadened my horizons this time and used a different recipe. After some searching, I found one that looked unique from a food magazine called Bon Appetit.

The original recipe called for ¾ tsp of baking soda. I substituted this ingredient for about 2 ¼ tsp of baking powder. I did this because I read that switching these ingredients could significantly change the flavor of the cookies, typically in a bad way. Because of this, I hypothesized that the baking powder batch of cookies would have a soapy taste to it and that I would prefer the original recipe over these. I was quite surprised when I enjoyed the baking powder batch over the baking soda batch. Not only was the flavor of the baking powder batch better, but the consistency was better as well. The baking soda batch was tougher and chewier than the baking powder batch, despite having cooked them both for nine and a half minutes.

Three key ingredients in this recipe were flour, egg yolk, and salt. The flour created the foundation of the cookie by creating gluten when I mixed it into the wet ingredients. The egg yolks made the cookies chewier (too chewy in my opinion). The egg yolks constituents, water, lipids, and proteins, interact significantly with the flour to construct the height and texture of the cookie. Salt, or sodium chloride, contains an equal amount of sodium cations and chloride anions. I chose to use Morton's kosher salt in this recipe instead of Diamond Crystal salt. Morton's kosher salt is much finer than Diamond crystal salt and disperses more throughout the rest of the mixed ingredients. The most obvious physical change that occurred during the cooking process was the flattening of the dough ball when heat was applied. A significant chemical change was a Maillard reaction. Because of the Maillard reaction that took place while cooking, I was able to accurately see when the cookies were sufficiently cooked (slightly brown exterior).

The oven's method of heat transfer was convection, but the cookies were also affected by conduction from the pan being heated. Conduction is the most important method of heat transfer when baking cookies because if the pan gets too hot, the cookies can get burnt or overcooked. The materials of my kitchen equipment were not too significant in this recipe. I used a carbon steel baking pan, a stainless-steel cookie scoop, a silicone spatula, and a stainless-steel ladle. The material of the baking pan is the most significant in this recipe, but I had parchment paper over it which took away some of its effect on the cookies.

# Chocolate Chip Quick Bread

Submitted by: Kayley Yantis

Recipe: <https://julieblanner.com/chocolate-chip-bread/>

1 cup white granulated sugar  
2 cups all purpose flour  
1 tablespoon baking powder  
 $\frac{1}{2}$  teaspoon salt  
1 large egg  
1 cup milk (whole or 2%)  
 $\frac{1}{3}$  cup vegetable oil  
 $1\frac{1}{2}$  cups chocolate chips semi-sweet or any other favorite



Preheat oven to 350°F. Grease a 1 pound loaf pan (or see alternatives in notes).  
In a medium mixing bowl, combine sugar, flour, baking powder and salt. Set aside.  
In a large mixing bowl or stand mixer, beat egg, milk and oil.  
Gradually add dry mixture to wet mixture, stirring together until just moist.  
Fold in chocolate chips, reserving  $\frac{1}{4}$  cup.  
Pour batter into loaf pan. Top with remaining chocolate chips. Bake 50-60 minutes or until a toothpick inserted into the center comes out clean. Allow to cool before slicing.

## Reflection:

For this recipe I chose to do it as I had made quick bread before, so I knew how to make it on a base level. I did not get a base recipe though, but I had an idea of what I needed for the bake to work out well. Baking has ended up being a side hobby for me after having a lot of time during quarantine, so I figured a bread would be easy for this project as switching out ingredients can be really fun. For the change I made, I decided to add strawberries to a chocolate chip bread recipe. My original guess was that the strawberry bread would need more time in the oven because of the added water in the strawberries, and I was correct. Although the added time was correct, I underestimated how much more batter I could get by adding the strawberries. I needed to use another, smaller dish for the extra batter. Both of the breads ended up being delicious, but the normal chocolate chip bread was almost denser while the version with strawberries was more moist. I ended up preferring the strawberry addition better than the original. It was an addition that I knew would taste good, but the moisture really made the bread more flavorful. Although I thought I knew exactly what would happen when adding strawberries, I was still surprised by the results. Some of the key ingredients would be the flour, baking powder and the strawberries. The flour acts as the structure and protein for the bread, they are made of glutenin and gliadin proteins. Most of the molecules in the flour are non-polar, although flour is made up of multiple different things. Baking powder, also known as sodium bicarbonate, is a polar and soluble molecule, the baking powder makes the bread rise and stay fluffy. The strawberries act as the flavor and aroma for the bread, and it is more sugar. Strawberries are mostly insoluble and polar although there are a lot of different molecules, so it is not entirely one way or the other. A physical change that occurred during baking was the chocolate chips melting on and into the bread. Two chemical changes were the Maillard reaction occurring to brown the tops of the bread and carbon dioxide being produced by the baking powder. For this recipe I used the oven to bake the bread at 350F, considering I used the oven for

this it would be convection. I did not use the broiler for this so the air was circulating the bread loaf pans as it baked causing it to be convection. Some of the equipment I used for this bake was small aluminum loaf pans. I tend to use loaf pans that I can throw away once I am done with them as I struggle to get the bread out cleanly so disposable pans work best for me. For the bowls I used to mix the ingredients, they were clay bowls, nothing super special about them, I just prefer using them. The last important equipment I needed was a wooden mixing spoon, again nothing special about them, but I find it easier to get batter from wood than silicone spatulas.

# Chocolate Chip Cookies

Submitted by: Marissa Treibley

## Ingredients

- 2 1/4 cup flour
- 1 tsp baking soda
- 1 cup butter or margarine
- 1/4 cup sugar
- 3/4 cup packed light brown sugar
- 1 teaspoon vanilla
- 2 eggs
- 1 box (4oz) Jello brand instant vanilla pudding
- 1 bag (12oz) chocolate chips



## Directions

1. Mix flour with baking soda.
2. Combine butter, sugar, vanilla, and pudding and mix in large bowl until creamy.
3. Beat in eggs.
4. Gradually add flour mixture.
5. Stir in chocolate chips. Batter should be a little stiff.
6. Drop by rounded teaspoon fills about 2 inches apart on un-greased cookie sheet.
7. Bake at 375° for 8-10 minutes or until done.

## Reflection:

The chocolate chip cookie recipe I chose was given to me by my grandma and I wanted to observe what happens when eggs are not included in the recipe because I was curious what the effects would be. I split the recipe in half and in one batch I kept the egg, and the other I did not use an egg. In my proposal my hypothesis was, if I do not add eggs in the chocolate chip cookies, then they will not rise correctly or cook thoroughly. The eggs act as a leavening agent, which helps the cookies rise and adds structure. Without the eggs, the cookies will fall apart more easily, and their density will be increased.

A physical change that took place was mixing the separated ingredients with a wooden spoon. It caused gluten to form by the proteins, Glutenin and Gliadin forming covalent bonds, and in the mixture with the egg, it caused the disruption of protein structures in the eggs and added air. While mixing the ingredients, I found that the difference was evident in how the ingredients interacted with each other. The eggs aided the combination of all the ingredients and helping them spread through the mixture evenly. The mixture without the eggs did not stay together very well and the mixture was more solid than the one with the egg. After the two batches were mixed entirely, I put the cookie dough on the aluminum cookie sheet, which displayed the effects of the eggs even more. The mixture that included an egg was difficult to get off the spoon because it was sticky. The eggless mixture was hard to scoop out with a spoon because it kept falling apart and did not stay together in a ball to put on the sheet, whereas the batch with the egg was easier to collect in one spot on the sheet. Eventually, I started picking it up the mixture without egg with my hands and pressing it into a ball and it acted like play dough.

I put the cookie sheets in the oven, which used the method of conduction to bake the cookies since the cookies cooked from the direct heat transfer. Chemical changes occurred during the cooking process. The leavening agents made the cookies rise and gave them structure. The Maillard reaction took place due to the sugar and proteins being heated and browning the cookies. When they were done, I took them out to cool.

The key ingredient, egg, is made up of 90% water, the Albumin proteins Ovalbumin and Conalbumin, and some sugar. The yolk is calorie and nutrient dense, containing cholesterol and lecithin. In the recipe, egg acts as an emulsifier, and a leavening agent when it is mixed because of the air added. Another key ingredient is flour. The molecular properties of flour include starch and proteins and it is made from ground seeds. It adds structure to the recipe. Sugar is a key ingredient as well and is a carbohydrate made up of glucose and fructose. In the recipe, sugar adds flavor, binds with the water molecules to keep the cookies moist, and creates texture.

I recommend keeping the eggs in the recipe. The cookies without eggs were dense and did not spread as they were cooked. They were also sweeter and did not cook as thoroughly, with less browning. The cookies that had egg were cooked evenly and had more air in them. They also stayed together better than the other cookies, which crumbled easily when picked up.

# Pumpkin Chocolate Chip Cookies

Submitted by: Lily Nunemaker

Recipe: <https://sallysbakingaddiction.com/pumpkin-chocolate-chip-cookies/>



## Ingredients:

- 1/2 cup (1 stick or 115g) unsalted butter, melted & slightly cooled
- 1/4 cup (50g) packed light or dark brown sugar
- 1/2 cup (100g) granulated sugar
- 1 teaspoon pure vanilla extract
- 6 Tablespoons (86g) pumpkin puree
- 1 and 1/2 cups (188g) all-purpose flour (spoon & leveled)
- 1/4 teaspoon salt
- 1/4 teaspoon baking powder
- 1/4 teaspoon baking soda
- 1 and 1/2 teaspoons ground cinnamon
- 1 teaspoon store-bought or homemade pumpkin pie spice
- 1/2 cup (90g) semi-sweet chocolate chips, plus a few extra for the tops

## Recipe:

1. Whisk the melted butter, brown sugar, and granulated sugar together in a medium bowl until no brown sugar lumps remain. Whisk in the vanilla and blotted pumpkin until smooth. Set aside.
2. Whisk the flour, salt, baking powder, baking soda, cinnamon, and pumpkin pie spice together in a large bowl. Pour the wet ingredients into the dry ingredients and mix together with a large spoon or rubber spatula. The dough will be very soft. Fold in 1/2 cup semi-sweet chocolate chips.
3. Cover the dough and chill for 30 minutes or up to 3 days. Chilling the dough is imperative for this recipe.

4. Remove dough from the refrigerator. Preheat oven to 350°F (177°C). Line two large baking sheets with parchment paper or silicone baking mats.
5. Scoop the dough, about 1.5 Tablespoons of dough per cookie, and roll each into balls. Arrange cookie dough balls 3 inches apart on the prepared baking sheets. Using the back of a spoon or the bottom of a cup/measuring cup, slightly flatten the tops of the dough balls. (Without doing so, the cookies may not spread.)
6. Bake for 11-12 minutes or until the edges appear set. The cookies will look very soft in the center. Remove from the oven. Cool cookies on the baking sheets for at least 10 minutes before transferring to a wire rack to cool completely.

### Reflection:

The recipe I chose was Pumpkin Chocolate Chip Cookies. I chose this recipe because I absolutely love baking and pumpkin seemed very festive for this time of year! These cookies are different from anything I have ever made before, as you have to blot the pumpkin before you combine it with the wet ingredients, set the batter in the fridge for at least thirty minutes before baking, and let the cookies stay out for a few hours after baking to get soft and chewy. This recipe was interesting and definitely a new way of baking cookies for me, but I loved the process and the result!

The original cookies I made were using the recipe and ingredients above. I am gluten free, so I decided to change the all-purpose flour to gluten-free flour and see what happened to the cookies during the baking process. My hypothesis of this change was that the cookies would be more crumbly and less chewy than using all-purpose flour. I make this prediction because gluten-free flour tends to make my baked goods fall apart more easily. The gluten-free cookies tended to be a little more crumbly than the cookies I made with the all-purpose flour, however compared to other cookies, they held their shape well. I prefer the gluten-free recipe because the cookies were softer and more chewy compared to that of the all-purpose flour cookies.

One key ingredient in the recipe is butter. Butter is a lipid/fat and is non-polar. In this recipe, butter is used to help bind the ingredients together. Another key ingredient in this recipe is sugar. Sugar is a carbohydrate and is polar. It is used to create texture, lock in moisture, and keep the cookies soft. The next key ingredient is vanilla. Vanilla is a phenolic compound and is used to enhance other flavors throughout the recipe. In this recipe, the physical change that occurs is when the batter (liquid) changes to a cookie (solid) via the addition of dry and wet ingredients and baking it in the oven. The chemical changes that occur are leavening of the flour, heat transfer of convection, and maillard reaction (browning of the cookies around the edges). The type of heat transfer used during the cooking process was convection, when the cookies were baking in the oven.

The type of kitchen equipment that I used were measuring cups (1, ½, ¼) and measuring spoons (1, ½, and ¼ teaspoon & 1 tablespoon) to measure ingredients, silicon spatula to mix ingredients, two plastic bowls to mix wet and dry ingredients separately, plastic cookie spatula to get cookies off the baking sheet, stainless steel cookie sheet, oven, and oven mitts.

Overall, I really enjoyed making these cookies and completing this final project! The cookies ended up being dense and cake-like, which I think was due to the addition of the pumpkin. If you are looking for a seasonal treat, with lots of spices, then Pumpkin Chocolate Chip Cookies are for you!

# Moist Pumpkin Cake

Submitted by: Takeesha Diaz

Recipe: <https://www.allrecipes.com/recipe/19079/pumpkin-cake-iii>

## Ingredients

2 cups All Purpose Flour  
3 tsp Baking Powder  
2 tsp Baking Soda  
2 tsp Ground Cinnamon  
1/4 tsp Salt  
2 cups White Sugar  
1 ¼ cups Unsweetened Apple Sauce  
3 cups Canned Pumpkin  
1 tsp Vanilla Extract  
4 eggs  
1 cup Walnuts (optional)  
Whipped Cream (optional)



## Directions

- Preheat oven to 350 degrees F. Grease and flour a 12x18 inch sheet pan.
- Sift flour, baking powder, baking soda, cinnamon, and salt together in a large bowl.
- Beat sugar and oil together in large bowl until smooth. Blend in pumpkin and vanilla then beat in eggs one at a time. Gradually beat in flour mixture until just combined. Stir in walnuts; spread batter into the prepared sheet pan.
- Bake about 30 minutes or until a toothpick inserted into the center of the cake comes out clean.
- Serve with whipped cream.

## Reflection

I love pumpkin pie. So I thought, wouldn't it be great to make a super moist cake/pie style desert... And the experiment began. I obtained the original recipe from the website: <https://www.allrecipes.com/recipe/19079/pumpkin-cake-iii/>. I chose to change 2 ingredients. The original recipe called for 2 cups of canned pumpkin and 1 ¼ cups of vegetable oil. I chose to change the ingredients to 3 cups of canned pumpkin and 1 ¼ unsweetened applesauce instead of using the oil. I have heard that to substitute the oil with applesauce you are to use the same measurements. If the recipe calls for ½ cup oil then it can be substituted with ½ apple sauce. By switching these 2 ingredients I am hoping that it will increase the moisture and density of the cake while also providing a healthier version by using the applesauce instead of the oil. All the ingredients are critical to make this cake but there's a few components I would like to mention. The eggs provide protein, lipids, and lecithin while adding flavor. The eggs also cause a physical change which is seen in the moisture, density, and structure of the cake. A chemical change is also observed when the baking soda produces gas bubbles from neutralization/leavening reaction of sodium bicarbonate with tartaric acid which also results in a physical change when the cake is seen to be fluffy and with structure. Flour also contributes to protein (gluten) for structure. The white sugar which is composed of glucose and fructose adds flavor and also caramelizes during the

Maillard Reaction when the chemical reaction between the amino acids/proteins and sugars are introduced to heat via radiation from the oven causing the browning/caramelization of the cake releasing the delicious aroma! After both cakes were baked, I noticed that the original recipe pumpkin cake was lighter and fluffier in structure and lighter in flavor and color. The altered cake was heavier, dense, had increased flavor, and a deeper color. The cinnamon in the altered cake was more flavorful. Both cakes were delicious! But my preferred recipe is the altered cake, especially when it was cooled in the fridge and served with a bit of whipped cream! I did not add the walnuts to the either cake as a personal preference. But I'm sure the walnuts would only add to the deliciousness of the cake. To make this delicious recipe you simply grab all your ingredients and supplies and get started. Preheat oven to 350 degrees F, grease & flour 13x9" baking pan. Sift flour, baking powder, baking soda, cinnamon, and salt together in a large bowl set aside. Beat sugar and applesauce in a large bowl with a whisk until smooth. Blend in pumpkin and vanilla then beat in eggs one at a time. Gradually beat in flour mixture until just combined. Stir in walnuts (optional). Spread batter into the baking pan. Bake in oven about 45-60mins until toothpick inserted in the center comes out clean. Let cool and serve with whipped cream (optional).

# Chocolate Chip Cookies

Submitted by: Natalie Szerszenski

$\frac{3}{4}$  cup sugar  
 $\frac{3}{4}$  cup brown sugar  
 $2 \frac{1}{4}$  cup flour  
1 tsp. vanilla  
1 cup butter softened or Crisco  
1 tsp. baking soda  
 $\frac{1}{2}$  tsp. salt  
2 eggs  
1 pkg. (6oz) Hershey chocolate morsels  
(or whatever you prefer)



Mix together and bake 8-10 mins at 375 F.

## Reflection

For this final project, I wanted to go back to my family's roots and make my great grandma's famous chocolate chip cookies! Ever since I was a young girl, I enjoyed spending time making cookies with her and I cherish those moments. This recipe has been passed down in my family and I've always enjoyed making these cookies that my family introduced to me. Whenever I can get the chance to indulge in some sweets, in which this gave me an opportunity to get me baking with my family and friends. I already made cookies earlier in the week for my other lab so luckily, I was able to save some time and make the altered ones. Within the recipe, I decided to make a change to the baking soda and instead make it with baking powder to see how the cookies will taste and look. Usually, when I bake my great grandma's cookies, they have a light brown color with a chewy texture especially when they come straight out of the oven. Using the baking powder, I would assume the texture won't be chewy and light, instead maybe thin and spread out with a darker color. After figuring out my hypothesis, I made the altered cookies with my boyfriend and mother. As result, they ended up coming out darker brown and flattened out but also airy cookies that didn't taste as good probably me also forgetting to set a timer, so they sat in the oven for a few more minutes than expected. I had my friends come over the other night to try the two different cookies and to give their opinion on which one they preferred of the two cookies. From their facial reactions, I could easily assume that everyone enjoyed the original recipe over the altered one. Overall, I think I would still stick with my original recipe since I know it by heart, and I enjoy the chewy taste rather than a brittle one. The three key ingredients within the recipe are flour, baking powder, and butter. Starting off with flour binds the dough as one, it's a stabilizer and thickener that helps control a chemical reaction for the cookie to rise. The physical reaction with the baking powder resulted in a more caramelized, flat, and toasted cookie. Another chemical reaction with the baking powder takes place which produces carbon dioxide gas that deflates the cookie making the texture of the cookie more brittle. The brown sugar's molecular properties easily bind with the moisture of the dough, helping it from drying out chemically giving it a slightly softer cookie. Lastly, the butter softens and adds moisture to the cookies creating a more rich, more tender, and chewy structure

which is a physical change when placed in the oven. Convection is the method of heat transfer that was used during the cooking process of the chocolate chip cookie. In the oven, the hot air circulates around using the fans which equally distributes the heat in a more effective cooking process. The kitchen equipment that was used for making the cookies are measuring spoons, measuring cups, a KitchenAid mixer, a spatula, and a baking sheet.

# Brownies

Submitted by: Kate Walker

Recipe: <https://www.allrecipes.com/recipe/25010/absolutely-best-brownies/>

## Ingredients

½ cup butter, melted  
1 cup white sugar  
2 eggs  
½ cup self-rising flour (or gluten free flour)  
⅓ cup unsweetened cocoa powder  
¼ teaspoon salt  
1 teaspoon vanilla extract

## Directions

1. Preheat the oven to 350 degrees F.
2. In a bowl, beat together the butter and sugar. Add eggs and mix. Combine the flour, cocoa, and salt; stir into the sugar mixture. Spread evenly into the pan.
3. Bake for 25-30 minutes in the preheated oven.

## Reflection

Right away after receiving the information on this project, I knew immediately what I was going to do. I have an uncle who has celiac's disease and can not eat any gluten whatsoever. As a younger version of myself I was so intrigued as to how he can still eat things that typically have wheat in them. I knew that my family was making a gluten free version for him, but I never understood how that worked and what the difference, besides wheat, was. That is why for my recipe I decided to make brownies one way with gluten free flour and another way with self rising flour. I obtained this recipe from Absolutely best brownies. Allrecipes. (n.d.). Retrieved December 8, 2022, from <https://www.allrecipes.com/recipe/25010/absolutely-best-brownies/>.

The change I made to the recipe was substitution of flour. First time I made it I used self-rising flour, the second time I used gluten free flour. My hypothesis on the change was that the self-rising flour batch would be thicker and rise more, as well as I thought it would be more gooey. After baking both batches of brownies, my hypothesis was kind of right. The batch with self-rising flour was thicker and definitely rose more than the batch without gluten. However, the brownie batch without gluten was more gooey than the other.

Within the recipe there were many ingredients but I am going to look further into three of them. The first ingredient being flour, the part of the recipe that changed. The molecular property of flour is  $(C_6H_5O_{10})_n$ . The function of this ingredient within the recipe was to keep all the ingredients together. It created a thicker dough-like consistency that soaked up smaller ingredients such as vanilla extract. Another ingredient was sugar. Sugar's molecular property is  $(C_{12}H_{22}O_{11})$ . The function of this ingredient is to keep the brownies soft and moist. The last ingredient I looked more at was salt. This molecular property is  $NaCl$ . The purpose of salt in the recipe was to enhance the sweetness of the dish.

During the baking process of brownies, both chemical and physical changes are happening. One of the chemical changes is that a Maillard reaction is happening. This reaction is making the sugar content of the recipe a strong variable of thickness and crustiness. Another chemical change

is the butter in the recipe. The butter acts as the fat and mixed together with shortens to create the dough. This allows for the consistency of the brownie to be created. One physical change of the baking of brownies is that they go from a liquid to a solid. Another physical change is that while the brownies are baking they are expanding and changing in form.

For this project I used the oven as my method of heat transfer. This form of heat transfer uses both convection and radiation. The hot air flows by convection while heat is coming up creating radiation. The final product is produced by convection. Besides the oven, I also used a metal non-stick pan, large plastic mixing bowl, and wooden spatula. As discussed in class about whether we should use plastics or not while cooking, I decided in this scenario it was okay to use. I did not cook anything in the plastic bowl, instead just used it to mix all of my ingredients together.

Brownies with self-rising flour



Brownies with gluten free flour



# Hershey's Double Chocolate Cookies

Submitted by: Anna Schwartz

## Ingredients

1 cup (2 sticks) softened butter  
1½ cups sugar  
2 eggs  
2 teaspoons vanilla extract  
2 cups all-purpose flour  
⅔ cups cocoa  
¾ teaspoon baking soda  
¼ teaspoon salt  
1¾ cup (10-ounce package) chocolate chips



## Instructions

1. Heat oven to 350 °F
2. Beat butter, sugar, eggs, and vanilla with electric mixer on medium speed in large bowl until light and fluffy. Stir together flour, cocoa, baking soda, and salt; add to butter mixture, beating until well blended. Stir in chocolates. Drop by table spoon onto ungreased cookie sheet.
3. Bake 8 to 10 minutes or until just set. Cool Slightly. Remove wire rack and cool completely. (makes about 42 cookies)

## Reflection

This summer I got really interested in baking, so I tried a few recipes from our Hershey's recipe tin, the recipe being from the Hershey Company. Out of all the recipes, the double chocolate cookies are my favorite. They were a big hit with my whole family, even my picky sister. I knew I had to make them again for the holiday season, so why not do some experimenting with the recipe? I wanted to know why my dad likes butter cookies more than the shortening cookies he grew up with. Shortening is used in my favorite pie crust, so how different could it make the cookies? I thought that because shortening has a higher melting point the cookies would spread less, and have less flavor than the cookies with butter. Only half of my hypothesis was proven right. Surprisingly, my shortening cookies spread further and rose less than the ones with butter, but they did have less flavor. The butter batter was thicker and harder to scoop while the shortening batter was smooth almost immediately into the mixing process. I think the temperatures of the butter and shortening may have been the confounding variable in this recipe. The butter was left out to soften, but it was previously in the refrigerator while the shortening had never been refrigerated, and it was left out longer than the butter. I am unsure why, but they were also lighter in color than the butter batch. I know that butter can be 'browned' so, maybe the butter improves the Maillard reaction? Overall, my family and I prefer the batch made with butter. They are less flakey/crispy and the flavors come across stronger. I now understand why my dad prefers these cookies. The shortening cookies are not bad, but the drier texture isn't as pleasant.

During the cooking process, I used a variety of materials. For more flexible tools, the spatula, mixer, and cookie sheet, I used silicone. Measuring spoons and cups were made of harder plastics. We use plastic instead of metal because we cook it's cheaper to get a lot of them. The ingredients were mixed in stainless steel bowls and cooked on a metal pan. The cookies were

cooked in the oven using conduction, but I noticed that when I put the dough on the hot tray, the dough started to warm.

Three important ingredients in this recipe were salt, baking soda, and flour. I used Iodized salt specifically in this recipe. It's salt that has potassium iodate sprayed onto it. The salt was added mostly for flavor, but I know salt is also used to lengthen shelf life. In my household, we usually don't have to worry about baked goods going bad. It blended easily into the batter because it was soluble. Baking soda is essential to the cookies' leavening process. If I make the shortening cookies again, I might want to add more baking soda, so they aren't as flat. For this recipe, I used all-purpose flour. All-purpose flour has a higher protein percentage, so it forms more gluten than alternatives like cake flour. The flour gave the cookies their structure. As for less essential ingredients, I did a mini experiment with the chocolate added. I split both the butter and shortening batches in two and put chocolate chips in one half and Ghirardelli peppermint squares in the other. For both sets of cookies, the squares melted quickly and spread more within the cookie while the chips kept most of their shape. This resulted in a more spread-out cookie when it came to the peppermint square batches. The shortening batch may not have been a hit, but the peppermint squares were very popular, and I will be making them again for Christmas.

# Almond Pound Cake

Submitted by: Jacob Krafzur

1 cup butter, softened  
2 cups white sugar  
6 eggs, room temperature (Modified to Half Eggs)  
1  $\frac{3}{4}$  cups all-purpose flour  
 $\frac{1}{2}$  teaspoon salt  
2 teaspoons almond extract  
8 ounces almond paste  
1 cup confectioners' sugar  
4 tablespoons milk  
 $\frac{1}{2}$  cup blanched almonds  
4 drops red food coloring  
4 drops green food coloring



## Reflection

The recipe that I presented to the lab is an almond pound cake. I chose this recipe because baking cakes or cookies has several more different chemical reactions going on all at once instead of just simply cooking something like spaghetti or burgers. In this recipe, normally there are supposed to be 6 eggs in the batter, which not only provides a bit of structure and softness to the dough, but it also fuels the Maillard Reactions needed to provide extra flavor and color to the cake. However, I decided to cut the number of eggs put into the batter by half, and thus put in 3 eggs instead of 6. What I expected to happen was that the cake would not be as soft, or as structurally stable, or even contain that much browning to be in the cake. What I found in the actual result was that instead of the cake being a crumbly mess, it actually turned out to be similar to a giant cookie. The flavor overall was not entirely affected by the change in recipe, but it was definitely shorter than what the cake was supposed to be. Honestly, if I had to choose between this version of the cake and the correct way to create this cake, I would actually choose this version of the cake for myself because it is not only crumbly like a giant cookie, it's actually a bit easier to carry around for a nice snack if I wanted one. However, if I wanted to provide a cake for some kind of celebration, such as Christmas, I would have to go with the original recipe instead of this version because the only kind of person who would eat this kind of cake would be Santa Claus, since the cake is very crumbly and is not very soft which is what people do not want in a cake and instead want in their cookies. A few key ingredients in the cake are the eggs, the flour and the sugar. The flour in cake provides a basic foundation in terms of the structural integrity of the cake. Sugar is used in the cake to not only provide sweetness, but also to provide the cake with the Maillard reactions. Eggs essentially serve both purposes at once, as they provide both structure and softness to the dough, while also using its proteins in order to fuel the Maillard Reactions for better browning. The physical reaction in the making of this cake is stirring and creaming the ingredients together, such as creaming the butter and the sugar, as well as mixing together the flour and the eggs into the concoction. The chemical reaction in making the cake is the process of actually baking the cake, as the raw dough, put into the oven, creates the product of a cake via the absorption of heat energy. In the oven, the cake undergoes a form of cooking process that involves convection, which is hot air circulating through the oven, and thus cooking the food.

# Gramp's Apple Cake

Submitted by: Melissa Miller

3 cups of flour  
2 cups sugar  
½ cup vegetable oil  
½ cup applesauce  
4 eggs  
3 ½ tsp baking powder  
½ 6 oz can of concentrate frozen orange juice  
1 can (16 oz) of apple pie filling or 4 peeled and sliced fresh apples dipped in lemon juice to prevent turning  
Sprinkle of cinnamon

1. Preheat oven to 350 F
2. Mix together flour, sugar, and baking powder.
3. In a separate container, combine eggs, vegetable oil, applesauce, and orange juice concentrate.
4. Combine wet and dry ingredients.
5. Pour ½ of the batter into greased pan
6. Add a layer of peeled apples sprinkled with cinnamon and sugar or apple pie apples.
7. Sprinkle with cinnamon
8. Add the rest of the batter.
9. Cook at 350 F for 50-60 minutes in an 8x8 pan.



## Reflection

This recipe came from my great great grandmother. This recipe has been passed down for many generations. We use it for most religious holidays because it is a traditional food from our culture. Over the years we have tweaked it a bit using what my great great grandmother called cheap apples because they were canned. I chose this recipe because it reminds me of my family and how they always support me. I made two versions of this recipe. The first one was made as per the recipe directions. The second one was made with half of the oil replaced by applesauce.

There are several key ingredients. The key ingredients are eggs, baking powder, flour, sugar, and vegetable oil. The eggs are amphiphilic. Eggs are protein and a leavening agent. They are used to bind the ingredients together and add stability to the good. Baking powder is polar. It's a leavening agent that helps the dough rise. By helping the dough rise, the product is not too dense. Flour is amphiphilic. It is a leavening agent used to give structure to the food. Sugar is polar. It is a carbohydrate used to add flavor to the food. Vegetable oil is nonpolar. Vegetable oil is a lipid used to add flavor. Each of these ingredients are needed to have a successful and edible product.

Several reactions occurred. The first reaction was physical as I mixed everything in a bowl with beaters. Adding the apple was also a physical change. One chemical change that happened when it was cooked in an oven is the maillard reaction occurred here. Emulsification also took place when the eggs and flour were mixed together. The method of heat transfer was convection as the hot air circulated in the oven. The heating element used radiation and the part of the cake that cooked because the pan was hot, used conduction. So one can say that three types of heat transfer occurred. Both cakes were baked in a glass dish. The glass dish was used because it was available. Due to the amount of heat it retained, the bottom browned faster than the inside baked.

I hypothesized that the full fat recipe would taste better. After making the two recipes, I observed some differences. The full fat did not make it taste better. That cake was more dense. The applesauce cake was more moist, fluffier, and tasted better. It was also healthier. I can conclude that the applesauce made the cake more moist. This is the recipe that I have decided to recommend.

# Chocolate Chip Cookies

Submitted by: Nicole Dalton

1 cup butter, softened  
1 cup white sugar  
1 cup packed brown sugar  
2 eggs (or 2 tbsp chia seeds and 6 tbsp water)  
2 teaspoons vanilla extract  
1 teaspoon baking soda  
2 teaspoons hot water  
½ teaspoon salt  
3 cups all-purpose flour  
2 cups semisweet chocolate chips

## Reflection

I chose to make chocolate chip cookies, one, because I enjoy them and two because it is a recipe where you can make tons of substitutes and they have the chance to turn out completely different ways. I got very lucky with substituting the eggs for chia seeds! I got the recipe for these from my mom! She has a box filled with her moms old recipes so i used one of the ones she had but tweaked a few ingredients to what I have now. The change I made with this recipe for the second batch was to use soaked chia seeds instead of whole eggs. I actually have an allergy to egg yolks so I wanted to make something that I could still eat so I could test the two different results. After baking and trying both batches I would say I like the chia seeds more. They provide a cake-like texture to the cookie instead of it being super crunchy which I really enjoyed. My hypothesis was that if I changed from eggs to chia seeds then the texture would be lighter, which I have now proven true. Three of the key ingredients in my recipe that I chose were white sugar, vanilla extract and All-Purpose Flour. Within the recipe the function of white sugar is to stabilize its shape and not spread too much, act as a sweetener as well as caramelize the sugar which also contributes to the flavor. White sugar's molecular property is  $C_{12}H_{22}O_{11}$ . The vanilla extract also served as a flavor for the cookies. Its molecular property is  $C_8H_8O_3$  and being a phenolic aldehyde. The All-Purpose Flour is both a stabilizer and thickener in the cookies and overall provides a strong structure. During the baking process two of the physical changes that occurred were the chocolate chips melting in the oven and separating the dough into separate blobs. While the cookies were baking the chocolate chips began to melt so there was a physical change in the chocolate. Another physical change was separating the dough into different blobs that would then be even placed on the cookie sheet. Nothing was changing about the dough besides its shape. While it was baking there were also chemical changes such as the Maillard reaction and the ingredients becoming cohesive with one another. The Maillard reaction occurred while the cookies were baking and browning in the oven. Which also means the sugars were being baked contributing to the flavor. When creating and baking the dough there is a chemical reaction of the ingredients becoming cohesive with one another. This will cause them to lose most of their individual properties and now work together. I baked the cookies in an oven, so the heat transfer was by convection and radiation. The convection comes from the dough being somewhat liquidy and as it is baking it will grow and change shape. It also transfers by convection due to the oven's hot air circulating. The

cookies benefit from this since it will give the recipe an even heat distribution. During this baking process I used a few pieces of equipment. I used an aluminum cookie sheet to bake the cookies on. During the preparation I used a silicone spatula and a metal whisk to mix the recipe together, as well as a metal mixing bowl to mix said ingredients in. After I was done mixing the dough I cleaned the spatula and used it later to get the cookies separated from the pan. Also an oven mitt to get the cookie sheet out of the oven without burning myself.

# Coconut Macaroons

Submitted by: Sarah Mason

- 1 ⅓ cups of sweetened shredded coconut
- ⅓ cup of sugar
- 2 tbsp of all purpose flour
- ⅛ tsp of salt
- 2 large egg whites
- ½ tsp of vanilla extract



1. Preheat oven to 325F
2. Combine the coconut, sugar, flour and salt in a bowl with a silicone spatula
3. Whip the egg whites
4. Add the eggs and vanilla extract and mix with the silicone spatula
5. Use a spoon to put globs onto a greased baking sheet
6. Bake at 325 for 24 mins
7. Remove from baking sheet to cool

## Reflection:

The recipe I included was the original, but had I been in a different mood I could have picked the recipe I edited. The edition I made to the recipe was including the egg yolks in the recipe. Because yolks add moisture and make for a richer flavor and egg whites when whipped make things lighter and fluffier, and can even act as a bit of a leavening agent, I believed that adding egg yolks would turn the macaroons more into traditional cookies, or turn them into a runny mess. To my surprise, the taste was very similar. Both were moist and fluffy, and both were fairly raised. I had my roommates taste them, and both agreed that the taste was very similar. The ones with the yolks were a little flatter and had more of a yellow color, but in taste, the ones with the yolk were a bit richer and that was it. I didn't expect for them to turn out so similar, so if you don't feel like separating the yolks from the whites, they won't change that much. The recipe was surprisingly easy, I love macaroons but I didn't expect them to be so simple to make. Just make sure to grease the pan, I forgot that the first time. My roommates and I loved the results, a perfect post-finals snack!

# Brownies

Submitted by: Kevin Padilla Collera

1. Preheat the oven to 350°F. Lightly grease a 9" x 13" pan. If you plan to turn the whole sheet of brownies out of the pan at once, grease the pan, line it with parchment, and grease the parchment.
2. Crack the 4 eggs into a bowl, and beat them at medium speed with the cocoa, salt, baking powder, espresso powder, and vanilla for about 1 minute, or until smooth. You can do this while you're melting your butter (next step).
3. In a medium-sized microwave-safe bowl, or in a saucepan set over low heat, melt the butter, then add the sugar and stir to combine. Or simply combine the butter and sugar, and heat, stirring, until the butter is melted. Continue to heat (or microwave) briefly, just until the mixture is hot (about 110°F to 120°F), but not bubbling; it'll become shiny looking as you stir it. Heating the mixture to this point will dissolve more of the sugar, which will help produce a shiny top crust on your brownies.
4. Add the hot butter/sugar mixture to the egg/cocoa mixture, stirring until smooth.
5. Add the flour and chips, stirring until smooth. Again, adding the chips helps produce a shiny top crust.
6. Spoon the batter into a lightly greased 9" x 13" pan.
7. Bake the brownies for 28 to 32 minutes, until the edges feel set, and the center should look very moist, but not uncooked. When testing to see if brownies are done, take a toothpick or the tip of a sharp knife and carefully poke it into the center of the pan, digging around just enough to see the interior. You should see moist crumbs, but no uncooked batter. Yes, you'll be left with a small divot in the center of your brownies; just cut around it when you're cutting the brownies into squares.
8. Remove them from the oven and cool on a rack before cutting and serving.

**Brownie with Butter**



**Brownie with Coconut oil**



## Reflection:

Once the brownies were baked, the only main differences were the subtle coconut taste in the revised brownie recipe, the coconut oil brownies feel a bit denser and crumbly, the inside of the brownie was wetter than the brownie that was made with the original recipe. Most of the differences I saw came from before I baked them, the batters being completely different. When I

mixed the coconut oil into the mixture, the batter had a lighter color and became quite condensed, being quite difficult to stir into a smooth batter. The recipe with the butter actually darkened the mixture, being much smoother than the mixture with the coconut oil. If I would have to choose which recipe was better, I would choose the normal butter recipe as I am not a fan of Coconut, the subtle coconut taste being a bit off putting to me.

# Crème Brûlée Cookies

Submitted by: Annie Williamson

Recipe: <https://www.delish.com/cooking/recipe-ideas/recipes/a50280/creme-brulee-sugar-cookies-recipe/>

For the cookies (Recipe said it makes 20 but I got a little over 10 average sized cookies out of it)

¾ stick of softened butter  
¼ cup of packed brown sugar  
¼ cup of granulated sugar  
½ an egg  
1 ½ tsp of vanilla extract  
1 cup of all-purpose flour  
1 tsp of cornstarch  
½ tsp baking soda  
Pinch of salt



Butter cookies



Canola oil cookies



Top: Butter Bottom: Canola Oil

For the frosting

4 oz. softened block cream cheese  
½ cup of powdered sugar  
½ tsp of vanilla extract  
2 tbsp of granulated sugar

1. Preheat oven to 350° and line two cookie sheets with parchment. Cream butter and sugars until light and fluffy, 3 to 4 minutes. Mix in egg and vanilla.
2. In another bowl, whisk together flour, cornstarch, baking soda, and salt, then add mixture to wet ingredients and mix until smooth. Dough will be thick.
3. Using a small cookie scoop, place tablespoon balls of dough onto parchment-lined cookie sheets. Press down lightly on each cookie to flatten slightly. Bake until edges are just starting to brown, 9 to 10 minutes. (I baked them slightly longer since my cookies were a little bigger)
4. Remove from oven and let cool 2 to 3 minutes.
5. Make frosting: Beat cream cheese until smooth. Add powdered sugar and vanilla and mix until smooth.
6. Put sugar into a small bowl. Spread about a tablespoon of frosting onto tops of each cookie, then press into granulated sugar, coating frosting with sugar.
7. Just before serving, use a kitchen torch to caramelize sugar on top, then set aside to cool. Store cookies in the fridge for up to 4 days.

## Reflection

I found this recipe from the site Delish Cooking. I chose these cookies because crème Brûlée is my absolute favorite dessert. I made two versions, one with butter as the recipe called for and another with canola oil. Both versions came out really well. The canola ones did not spread as much as the butter, but the difference was very subtle. The butter ones came out a little moister and less crispy. The canola ones had a crunchier outside (they were baked at the exact same time for the same duration). The butter cookies were saltier which distracted a little from the icing for me. I

personally liked the canola ones more because of the crispiness but my boyfriend preferred the butter ones. If you like moister, less crispy cookies but don't want them to be too salty, you could opt for unsalted butter instead. Overall, I was happily surprised by the results. I hypothesized that the canola oil cookies would be moister due to the fat being liquid at room temperature, but I think that factored in to make them crispier on the outside and still soft and chewy on the inside. Three ingredients that are key in this recipe are Butter, flour, and egg. The butter is a fatty acid/Triglyceride, and its function is to make the cookies tender and moist by weakening gluten bonds. The flour is a protein that contains gluten, and its function is to provide structure. The egg contains cholesterol, protein, and lecithin which is an emulsifier. The egg's function is to provide structure, stability, moisture, and to hold all of the other ingredients together. There are several chemical reactions occurring during the making this recipe. The first reaction is the leavening which occurs when the cookies begin to rise while baking. The next one is the Maillard reaction which occurs when baking the cookies and the edges begin to brown. The last reaction is the caramelization that occurs when the sugar topping is torched.

# Chocolate Chip Cookies

Submitted by: Katherine Thorpe

Recipe: <https://practicallyhomemade.com/best-super-thick-chocolate-chip-cookies/>

I decided to make chocolate chip cookies using melted butter instead of cold butter. During the making of the first batch, I noticed that after I baked them there were tiny more flaky layers in the cookie. It was flakier and dense in the middle. The first batch also did not spread as much in the oven and did not change that much in color. In the second batch, I noticed when mixing everything together that the sugar and the flour dissolved better and were easier to mix. The mixture was a lot more sticky as well. After baking it, I noticed that the cookie changed color more than the cold butter. The end result was a golden brown soft and chewy cookie that was crispy around the edges. Between both, I would pick the melted butter recipe because it was the best of both worlds mixing crunchy and chewy. It was also easier to mix and make. I chose this recipe because I love chocolate chip cookies and always find myself baking and wanting to find the best chocolate chip ingredients. I found this recipe a while ago while cooking with my mom and have used it ever since, so a change was interesting to see. Melting the butter itself is a physical change, and when baked with different ingredients, it was also a physical change. I expected the cookie to be dense and flat when it came out because I figured the melted butter would allow it to flatten more in the oven. Baking soda known as sodium bicarbonate was used in the recipe to make the cookies rise. Baking soda is basic and activates with an acid to make the cookie light and fluffy. The eggs in the recipe are used to add structure and bind the mixture together. They are used as an emulsifier and help keep the cookie from falling apart. Flour is a polymer and a starch. The Flour is the base of the cookie and helps it rise. The flour contains proteins that when they are mixed with other ingredients for gluten help the dough to rise and bake. A physical change in the prep process was the melted butter, it was easier to mix together because it melted everything down and because it was a liquid that became one mix. The cold butter was harder to mix and I almost had to use an electric mixer. The cold butter created small layers of butter within the dough because it couldn't mix completely. A physical change in the recipe was the color of the cookie. The cold butter stayed a more pale color while the melted butter had a golden brown top. Another physical change was how big the cookies became. The one with the cold butter was dense and flaky in the center while the melted butter was chewy and crispy on the outside. My method of heat transfer was the oven. I used parchment paper, a wisk, measuring utensils, a microwave, and a baking sheet.



# Ethel's Sugar Cookies

Submitted by: Rebekah Holmes

3/4c. butter (softened)  
1c. Sugar  
2 eggs  
1 tsp. vanilla  
2 ½ c. flour  
1 tsp baking powder  
1 tsp salt



Mix well, shortening, sugar, eggs and vanilla. Blend flour and baking powder and salt; stir in. Chill at least 1 hour. Roll 1/8" thick on floured surface. Cut 3" cookies or use cookie cutter and place on ungreased sheet. Bake 6 to 8 minutes. Makes about 4doz.

## Reflection

I chose this recipe because it is a family recipe and is a popular choice for party cookies during the holidays. The change I made to this was substituting the regular flour for gluten free 1 to 1 flour. If I substitute the regular all-purpose flour with gluten free flour, then the sugar cookies may rise differently because the gluten structure that gives a bigger rise and body is not in the cookie. The result was in cookies that turned out almost identical to the regular cookies. I actually prefer these to the original, because I have many friends and some family members who can't have gluten, and this change allows them to enjoy the cookies too.

Three key ingredients were 2 eggs: protein, lipids, cholesterol with their function being to help with the structure. Then the 3/4c. butter (softened): triglycerides from fatty acids, and their function being contributions to body, flavor, structure. Lastly, and most importantly, the 2 ½ c. flour (that contains gluten): carbohydrates, protein, amino acids and functions structure. Swapping out regular flour for gluten free flour, gets rid of the primary molecular properties, the proteins (glutenin, and gliadin), from the recipe, making structure difficult. Which is where the xanthan gum in the 1 to 1 flour stepped in.

The chemical changes were the Maillard reactions with the proteins and sugar and heat, leavening: with the baking powder used as the rising agent. The physical changes were the dough being heat through, causing the texture to go from sticky and moist to dry. The method of heat transfer during the cooking process was convection.

Kitchen equipment: kitchen aide mixer with a metal paddle attachment, to speed up the butter and sugar mixing process. Plastic mixing bowl for blending the rest of the dry ingredients before adding them to the mixer, because that is all I have for a bowl. I also used a silicone spatula, because they are easier to clean later on than a wooden spoon. Rolled the dough out with a floured, wooden rolling pin, on a floured butchers block, because that is what I have. The cookies were cut with metal cookie cutters, and then baked on enameled, aluminum baking sheets, because clean is easier that way, especially if parchment paper is laid down first. (I prefer baking stone sheets, but they can be a pain to clean if things stick).

# Chocolate Chip Cookies

Submitted by: Alexandria Frantz

Recipe: <https://www.allrecipes.com/recipe/10813/best-chocolate-chip-cookies/>

- 1 cup butter, softened
- 1 cup white sugar
- 1 cup packed brown sugar
- 2 eggs
- 2 teaspoons vanilla extract
- 1 teaspoon baking soda
- 2 teaspoons hot water
- ½ teaspoon salt
- 3 cups all-purpose flour
- 2 cups semisweet chocolate chips



## Reflection

For this project I chose to make chocolate chip cookies. The first batch of cookies I made were standard cookies, then I made the cookies using all vegan ingredients. I chose to make this change to see how it would affect the cookie shape, size, and the consistency of the dough. Before baking, I thought that the vegan cookies would come out flat and that they would not be as soft and chewy as cookies that use eggs and other animal produced products. Upon completion, I found out that my hypothesis was only half correct. While the vegan cookies did not spread out like the regular cookies did and they were flatter, they were still soft and chewy. Personally, I prefer the regular chocolate chip cookies over the vegan cookies. I thought that the mixture was a little easier to work with and I would not have to go to the store to get vegan ingredients if I wanted to make cookies on a rainy day. With that being said, I am pleased that both cookies were delicious, easy to make, and that they were inclusive to other people's diets and dietary restrictions.

The three main ingredients to a cookie are flour, sugar, and salt. Flour has many molecular properties. Two important properties of flour are glutenin and gliadin. When water is added to these properties, they will combine to create gluten. Flour is a very important ingredient in the baking process. Flour will affect how a mixture looks, tastes, and how it feels. Flour adds volume to the mixture, and it helps to create a less sticky dough. The next ingredient, sugar, is made up of fructose and glucose. Sugar also contains hydrogen atoms, oxygen atoms and carbon atoms. The function of sugar in this dish is to make it sweet! Last, but certainly not least, salt is made up of itself, sodium chloride (NaCl). Salt helps the acidity of the dough as well as adding flavor.

One significant physical change that takes place when making cookies is the shape of the dough. The most common physical change is when a cookie cutter is used. This will alter the size and appearance of the dough, without having any ingredients starting to change form. A significant chemical change that takes place during the baking process is when the eggs start to expand. The eggs being to expand when the internal temperature of the dough reaches 144 degrees. This will also cause the dough to go through a structural change. Another chemical change that takes place when baking cookies is when the cookies start to brown. This is due to the Maillard reaction. The Maillard reaction happens when amino acids and sugars start to caramelize. Although these are not the only physical and chemical reactions that take place during the baking process, they are very

important to the final product! The type of heat transfer that takes place during this process is conduction. Conduction is when heat goes through a solid and causes an item to heat up. This is done when making cookies because the cookie pan heats up on the grates of the oven, which then heats up the cookies.