The Science of Cooking:
Understanding the Biology and Chemistry Behind Food and Cooking
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Weekly Quiz Question Pool

These questions are to be done individually – not a group project. Open note, book, internet is fine. Answer using your chemistry, biochemistry and biology knowledge – in other words – use science detail and mechanism in your answers. Load your answer with your name on each sheet as a PDF file. ONLY a PDF file. **PICK TWO** of the weekly quizzes to submit.

Week	Quiz Due Date	Topic
Week 1	March 21	Browning

1. Explain why a wash in baking soda would make a food brown more quickly than an untreated food (meat, fish, vegetable doesn't matter which kind of food)
2. Follow one path of the Hodges pathway of the Maillard reaction and describe the chemistry that takes place in this path and one of the type of products from this reaction pathway
3. In your textbook, the author adeptly describes the low level of danger of caramel in food. Yet there exists people who claim that caramel in food or beverage is toxic. Find literature to support or defend the claims of both your textbook author and the folks on insta who say "more research is needed" but thinks caramel is toxic to people.

Week 2 March 28 Milk and Dairy

1. Compare and contrast the "cages" that make foams. Using your chemistry and biochemistry knowledge, describe why foams are more resilient than another. Also discuss why it is so important to keep bowls and heavy whipping cream cold when making whipped cream. Answer this in terms of melting points and fluidity.
2. Describe the pressure that maintained the mutation allowing lactose tolerance. What gene and what mutation took place? What is the mechanism that the mutation allowed for lactose tolerance to continue into adulthood?
3. Affinage is the aging of cheese. How does aging the cheese lead to a sharper cheese? And answer one of the following 1) Find one additional flavorants in an aged cheese and describe its metabolic production. Or 2) describe the metabolic products of a smeared cheese, what are those molecules and how do these molecules give the flavor of a smeared cheese.

Week 3 April 11 Breads Cakes and Pasta

1. While we didn't discuss gluten tolerance, take a moment to look up the clinical definition of gluten tolerance and describe the biochemical/physiological nature of the disorder. How common is this disorder? How is this disorder clinically diagnosed? Knowing how gluten is used in foods with dough, investigate how to make a dough without gluten and what is replacing the "muscle of flour"?
2. More carefully describe the process of starch gelatinization and retrogradation. How does changing starch sources impact the type of thickening results while cooking?
3. Dig in the literature and find some of the types of bacteria and yeast used in types of sourdough. How do these variants impact the flavor of the bread?

Week 4 April 18 Beer, Wine & Liquor

1. Pick one of the steps of brewing. Investigate the chemical or biochemical processes and describe what is happening.
2. What is the difference between yeast of lager and ale? There is some interesting research that show the fusion of three strains of yeast gave rise to the cold tolerant bottom fermenters. Investigate and describe this phenomena
3. Describe the biochemical nature of terroir. How is it that where a grape is produced will impact the wine made by the grape?
4. Flavonoid phenolics play a very important part the structure of wine. Investigate how tannins impact the wine's quality. Or if you are more nutritionally inclined, research the health benefits of red wine and the biochemical/physiological mechanism of the benefit.

Week 5 April 25 Sauces Gravies & Emulsions

1. Find the structure for 3-4 emulsion stabilizers and emulsifiers. Describe the difference between an emulsifier and stabilizer more in-depth than your notes. From the structure, examine how and describe how these compounds work…
2. Pick your favorite sauce (one of the five French mother sauces, or one of the other basic sauces) and explain in molecular terms, the role of each compound and what is happening during the making of the sauce.
3. "Broken sauce" is a sad thing. As a scientist, describe what is happening and using the chemical/physical properties of foods, how you would fix the broken sauce.

Week 6 May 2 Molecular Gastronomy

1. Pick ONE (or two if you are ambitious) of the molecular gastronomy techniques you are most interested in and further describe the molecular nature of this and find a food item you wish to create, describing the compounds used and the molecular changes performed in the food/drink/dish…

Week 7 May 9 Meats and Synthetic Meats

1. Look at the proteins and other components of eggs and the results of the sous vide – egg experiment published in Sous vide cooking: A review and explain why the eggs "hard-boiled the way they did".
2. Using the term GRAS, Impossible Food was able to argue around the GMO label for their "fake meat". Argue for or against the decision.
3. Why does adding lemon juice or some other acidic liquid to fish reduce the fishy odor of fish (ocean) while cooking>
4. Investigate the level of nitrosamines required for harmful health effects and the mechanism of the production of the nitrosamines. Is bacon or other nitrate containing foods a potential cancer causing food?

Week 8 May 16 Spices, Herbs and Hot Peppers

1. Many people feel there are health benefits using Himalayan salts in food. Similar claims are made for sea salt. Can you identify where this is stated and the chemistry or biology for such claims? Are they possible? Hint, you will need to look up how the salt is mined and produced (start with the book and research beyond). Pick ONE of the two salts, do not answer for both.
2. Several herbs/flavorants have multiple "versions" each with varying qualities. Pick one and determine if there are differences in the key molecular structure/nature of the flavorants of the herb and how it is prepared. Possible choices include cinnamon, vanilla ("real" and artificial), saffron, or wasabi.
3. Investigate the expression and regulation of the pain receptor (TRPV1) in both expression level and variants. Does this explain why one person might be more tolerant of hot peppers?
4. Capsaicin has several benefits both to the host pepper plant and for therapies and clinical uses. Research and describe one or two of these uses in the journal Capsaicin: Current Understanding of its Mechanisms and Therapy of Pain and Other Pre-Clinical and Clinical Uses. Molecules 206 Jul: 21(7):844