BCBT 100 – Exam 4 Practice Questions {Bodwin – Fall 2012}

Describe and identify the components of a seed. = embryo, seed coat, stored food/energy. Other descriptors include "endosperm", "bran", "dermis", "cotyledon"

Describe the difference between monocot and dicot seeds. Give examples of each. = dicots are split, monocots aren't. Monocots usually grow *through* their stored food, dicots usually push their stored food to and above the surface when they grow. Grains are (typically) monocots, legumes are (typically) dicots, true nuts are monocots. Peanuts are dicots that most people can picture all the parts: the red "skin" is a seed coat, the embryo is pretty clearly visible (and harder/crunchier) and the two cotyledons are the bulk of the peanut seed.

What are some similarities and differences between grains, legumes, and nuts? How do they grow, what food molecules do they contain, etc = All are seeds, all are significant sources of carbohydrates/starch. Grains and true nuts are monocots, legumes are dicots. Nuts typically contain more fat than grains or legumes, legumes typically contain more protein than grains

How is flour made? (from the McGee book) = milling, grinding, stone-ground, "improving", bleaching

What is "leavening"? = raising. A leavened dough has trapped gases that make it "lighter" in texture

Describe the process and chemical reaction of chemical leavening. = Chemical leavening is almost exclusively a result of a carbonate reacting with an acid to release carbon dioxide.

What is the difference between baking soda and baking powder? Why are BOTH sometimes called for? = baking soda is sodium bicarbonate; baking powder is sodium bicarbonate mixed with some source of acid. If a recipe has sufficient acid, baking soda can be used alone. If there is not enough acid in the recipe, baking powder can supply some of the acid. Baking powders can also supply acid at different temperatures to give a second burst of chemical leavening during baking ("double-acting" baking powders)

What is gluten? How is gluten formed? What type of interactions between molecules are present in gluten? = Gluten is the long proteins that form a network in bread to trap gas. It's formed from smaller glutenins reacting with each other by forming strong disulfide bonds. Weaker interactions between gluten molecules help form a strong gluten network (crosslinks, lipophilic interactions, etc)

How does kneading encourage gluten formation? = kneading stretches the glutenin and gluten molecules so they are straighter and can interact with each other more strongly. It also just serves as a way to thoroughly mix the dough so more glutenins can react with one another to form gluten

Describe the ways in which gluten can be modified when making a dough. What physical or chemical steps can be taken to increase gluten formation? What physical or chemical steps can be taken to decrease gluten formation? = Increase gluten → higher protein flour, add oxidizing substances ("improvers"), well-mixed "wet" dough, more kneading, more salt, less sugar, less fat/oil, less acid.

In aerobic metabolism of sugars, what are the products of the chemical reaction? = carbon dioxide and water

What are the products of the chemical reaction when yeast metabolizes sugars? = carbon dioxide and alcohol molecules (and other minor substances that develop flavor…)

Describe the differences between yeast-leavening and chemical-leavening. What are some advantages of each? = chemical leavening → quick, reliable, "clean". biological leavening → develops flavor, self-replicating

What is Charles' Law? = the volume of a gas is directly proportional to the absolute temperature of the gas

If the absolute temperature of 6.0L of a gas is tripled, what is the new volume of the gas? = Tripling the absolute temperature should triple the volume to 18.0L

What role does starch play in the structure of baking bread? = starch absorbs water and gels to form a secondary network when it is partially dehydrated during baking, this reinforces the gluten network to make a more stable and "lighter" structure in the bread. Starch also helps to pop and merge the bubbles that form in bread

Why is it important that the bubbles in baking bread merge and pop during the baking process? = to release steam and allow exchange/movement of gases within and in/out of the bread. If the bubbles were extremely stable (didn't pop), the loaf of bread would deflate when it cooled.

What are some of the results/effects of having a lot of steam present when baking breads? = steams transfers a lot of heat by changing phase, regulates temperature changes, keeps the surface of the bread elastic longer (allows more rising…), helps gel the surface starch to make a glossy crust

What does it mean for a bread to become "stale"? How can staleness be prevented? Reversed? = Dehydration/crystallization of the starch. Prevent by storing at room temp or freezing, reverse by gentle heating or toasting

How does the protein content of different types of flour affect the bread made from those flours? = More protein = more gluten, more gluten = better network for trapping gas

What food molecules must be present for Maillard browning to occur? = protein and reducing sugars

What property/properties do aldehydes contribute to foods? = aldehydes are usually smaller molecules that contribute flavor and aroma

Above what temperature does significant Maillard browning take place? = 250°F/120°C

What cooking conditions encourage Maillard browning? What cooking conditions inhibit Maillard browning? = High heat and little water encourages Maillard browning. Excess water prevents the temperature from getting high enough to Maillard brown.

Above what temperature does significant caramelization take place? = 330°F/165°C

What chemical reaction is catalyzed by phenol oxidase? = oxidation/polymerization of phenolic compounds, phenol oxidase is responsible for most enzymatic browning

What molecular changes take place that cause enzymatic browning? = small molecules are joined to form larger molecules with alternating single bonds and double bonds

What conditions would encourage more sugar browning/caramelization when cooking? = hot and dry. A bit hotter than Maillard browning conditions

What role does water play in most browning reactions? = regulates temperature, prevents high temperatures which often prevents browning

Where is chocolate grown? = near the equator, within ~20° of the equator, tropical climates

Describe the process of making chocolate from the tree to the finished bar. = pick the pods, remove the seeds/beans, ferment slightly, dry/dehydrate the seeds/beans (usually in the sun), pack and ship

What type(s) of browning is/are responsible for the brown color of chocolate? = Mostly enzymatic on the seeds/beans themselves, also Maillard browning during the roasting process

Which type of chocolate plant has the most delicate flavors? = Criollo. Look for "Criollo" on the label if you want a very floral chocolate

What is the purpose of "Dutch processing" of cocoa powder? = "Dutched" cocoa is treated with base (alkali) to make it mix better with water or other liquids that are mostly water

Describe the molecular changes that take place when chocolate is tempered. = The fats are crystallized and melted and crystallized and melted repeatedly to form the most stable fat crystals which make a smoother final chocolate

If a chocolate bar is not stored properly it can have a "dusty" appearance. Describe what has happened. = The chocolate has bloomed. The bar was allowed to warm up enough that some of the fats in the chocolate melted and migrated to the surface of the bar, then cooled and re-solidified. Because it's altering the fat in the chocolate, blooming can "un-temper" the chocolate and make it less smooth.

What causes chocolate to "seize"? = water. If water is introduced to melted chocolate, it can dissolve some of the sugars that are present. The sugars help keep the other components of the chocolate from clumping, so removing some sugar can make the melted chocolate clumpy.

What are the advantages of letting chocolate melt in your mouth when tasting it? = Different aroma and flavor compounds can be released as the chocolate melts, giving rise to a more complex flavor profile. Allowing the fats to slowly melt also makes it easier to assess/experience the texture of the chocolate and "feel" the quality of the conching process. On the financial and calorie side, it slows down how fast you can eat chocolate, so a $5 chocolate bar can last for a long time and be a relaxing, thoughtful, and decadent experience rather than just a way to cram "empty" calories in your mouth.