

# Teacher's Guide for ODYSSEY

Candy: Sweet Science  
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## **Teacher's Note:**

This guide contains project ideas, short answer, extended response, fill-in, and true/false with correction. The variation is designed to have the students think critically, as well as to test their comprehension. An answer key to the short answer sections can be found at the end of the guide.

## **Extended Response: Comprehension & Critical Thinking**

The questions below can be used as written, simply answered in complete sentences or easily transformed into longer essay (ELA) style questions, or even research topics. In any case, have the students support their answers with details from the text or use critical thinking skills to create a thorough and interesting answer. The questions, essays and projects have been aligned with the **Common Core Standards**. Consider the level of your students when deciding how to use the questions.

### **"Sense of Sweet" p. 6-9**

1. Explain the physical appearance of a taste bud.
2. What role do the 'receptors' of the taste buds play?
3. Outline the process of 'tasting'.
4. Name the 5 different taste receptors and explain how a food can spark reactions in more than one kind of receptor.
5. Why do some chemicals or taste modifiers change the taste of certain foods/drinks?
6. Besides the tongue, where else in our body do we have mechanisms to detect sweet molecules? Explain how they work in those areas.
7. How could the mice without functioning T1 receptors still taste sweetness?
8. Why are sweet foods so appealing?
9. Why do teens usually prefer lower levels of sweetness than children in what they eat?
10. How does a 'miracle berry' trick the taste buds? How is this helpful?

### **"Kids Love Sweets" p. 10-12**

1. Explain the experiment that Psychologist Susan Coldwell conducted to find out if children crave sweet foods because they were growing. What was the outcome?
2. According to Julie Mennella and her team, how are sweets linked to emotional power?
3. What connection did food scientist, Kaisu Keskitalo, discover between genetic makeup and preference for sweets?
4. How does environment and nurturing factors play a role in our eating of sweets?

**Essay:** *There are 4 different factors (growth/energy, feel good power, genetics, and nurture) which contribute to child's preference for sweets as discussed in this article. Choose one of the*

*topics and write a short essay using your own real life experiences to support the finding. Make sure to include an introduction, body and conclusion...as well as interesting details!*

### **"Artificial Sweeteners" p. 13-15**

1. Explain how sugar is a type of carbohydrate.
2. What is a calorie? How does it affect the gaining/losing of weight?
3. How did the idea of artificial sweeteners originate with Constantin Fahlberg?
4. What were the lab mistakes that resulted in Cyclamate, Aspartame, Equal and Splenda?
5. Explain how artificial sweeteners work to trick the taste buds and the body.
6. How is it that artificial sweeteners do not cause tooth decay?
7. What are were some of the past concerns regarding artificial sweeteners?
8. What are the present concerns regarding artificial sweeteners?

### **"Chocolate: Sweet Satisfaction" p. 18-21**

*Read the article in its entirety and then fill in the blanks. Refer back to the text if necessary.*

1. The average American eats \_\_\_\_\_ pounds of chocolate every year.
2. The Olmecs first crushed the beans, mixed them with water, spices, \_\_\_\_\_, and herbs and drank the concoction.
3. Cacao beans were so valuable that the Aztecs even used them for \_\_\_\_\_.
4. The craze for the sweet chocolate we love was born when \_\_\_\_\_ brought his own supply of cacao beans from the Aztecs, back to Spain.
5. The cacao tree needs a very specific environment and grows almost exclusively within 10 degrees of \_\_\_\_\_.
6. Most of the world's supply of cacao beans comes from the \_\_\_\_\_ and Ghana regions of West Africa.
7. Roasted beans are separated from their shells and chopped into tiny pieces called \_\_\_\_\_, before being ground or milled.
8. Using heat and pressure, the ground nibs are compressed and become two liquids: \_\_\_\_\_ and \_\_\_\_\_.
9. \_\_\_\_\_ is a neurotransmitter that helps make people feel calm and relaxed and typically less anxious. Chocolate stimulates its release.
10. Hormones that reduce sensitivity to pain and provide a sense of well-being are called \_\_\_\_\_.
11. Two stimulants found in chocolate are \_\_\_\_\_ and the compound theobromine.
12. Experiments with chocolate-fed mice have suggested that flavanol-rich cocoa stimulates neurovascular activity, enhancing \_\_\_\_\_ and alertness.

13. The type of saturated fat found in chocolate, stearic acid, is unique because it doesn't raise blood \_\_\_\_\_.

14. Chocolate contains \_\_\_\_\_, substances that may protect your cells from harm.

### **"Love, Sweet Love" p. 22-23**

1. What do scientists who study love believe about the emotion of love?
2. What is the difference between 'libido' and 'love'?
3. Explain the cascade of chemical reactions that romantic love is linked to. Include the terms monoamines, dopamine, norepinephrine, and serotonin.
4. How does chemistry help create 'long term love'?
5. Why do relationships change from your teens to your twenties?

**Essay:** Write a short essay explaining how in your opinion love is more than just chemistry. Or is it??

### **"Do Animals Have a Sweet Tooth?" p. 27-29**

1. What is the reason that cats do not have a 'sweet tooth'?
2. Although they love it, why is chocolate toxic to dogs?
3. What have scientists found to be true concerning animals and their like/dislike of artificial sweeteners?
4. Explain the similarities and differences between humans, and our surprising sweet twin, the fruit fly.

### **"Exposed: The Secrets of Candy Alchemy" p. 30-33**

1. What is an apothecary?
2. Explain the 'mystique' surrounding sugar that made candy a rare luxury with inexplicable properties.
3. What were the Crusades?
4. Other than candy, what were some of the other wonders that the Crusaders encountered in foreign lands?
5. Where did sugarcane first grow?
6. How is the hardness of a candy linked to its cooking temperature?
7. How is a candy's texture determined?
8. Explain how caramelization occurs.
9. Why was sugar considered the 'medieval miracle'?

### **"Morgan Goodall: Sweet Science Comes Baked In" p. 34-38**

1. Why did Morgan Goodall experiment with a grain called sorghum as a possible substitute for wheat in bread eaten by West Africans?
2. How did Morgan's childhood contribute to her interest in food science?
3. What made Morgan most apprehensive about the food science program at Purdue?
4. Why was participating in the internship provided by General Mills such a good learning experience for Morgan?
5. Explain the word 'viscoelastic' and how it applies to the bread making process.

6. Do you think that Morgan Goodall was successful in her experiments with sorghum? Why or why not?

### **"Ordinary Sugar...Extraordinary Science"**

Mark the following statements TRUE or FALSE. Provide the correct answer if FALSE.

- \_\_\_\_\_1. Medical researchers are building artificial body parts using cotton candy.
- \_\_\_\_\_2. An amorphous solid is an organized pattern of molecules.
- \_\_\_\_\_3. Under a microscope, cotton candy looks like networks of capillaries.
- \_\_\_\_\_4. A polymer is a plastic resin.
- \_\_\_\_\_5. Your natural organs work on water power.
- \_\_\_\_\_6. Artificial hearts usually run on air molecules.
- \_\_\_\_\_7. Fuel cells are devices that convert chemical energy directly into an electrical charge.
- \_\_\_\_\_8. The "D" in DNA stands for differentiated.
- \_\_\_\_\_9. Using the IRAM telescope, scientists have detected the presence of the simplest form of sugar in the Milky Way.
- \_\_\_\_\_10. A 'spectral line' is the unique way in which different materials affect the light that strikes them.

### **"Making New Candy Concoctions" p. 42-44**

1. Explain the chemistry of candy. Be sure to include the key elements of sugar, heat, acid and fats.
2. What factors play a part in the enjoyment of a taste?
3. How have some popular candies been the result of 'accidents'?
4. Why were M&Ms created?
5. How has technology affected the candy industry?

### **ANSWER KEY:**

#### **"Chocolate: Sweet Satisfaction"**

- |                |                               |
|----------------|-------------------------------|
| 1. 11          | 8. cocoa butter, cocoa liquor |
| 2. chilies     | 9. serotonin                  |
| 3. money       | 10. endorphins                |
| 4. Cortes      | 11. caffeine                  |
| 5. the equator | 12. memory                    |
| 6. Ivory Coast | 13. cholesterol               |
| 7. nibs        | 14. antioxidants              |

**"Ordinary Sugar"**

1. *True*
2. *False, jumbles of oddly packed molecules*
3. *True*
4. *True*
5. *False, sugar*
6. *False, electricity*
7. *True*
8. *False, deoxyribose*
9. *True*
10. *True*