Holt High School Science Olympiad Invitational

Food Science

Exploring the World of Science

KEY

Team: _____

Team #: _____

Student Names: _____

Part 1: General Knowledge

Match the vocabulary term to the description (1 pt per term):

1. _____Lactose_____ Composed of glucose and galactose.
2. _____Saturated Fatty Acid_____ A fatty acid that has the maximum number of hydrogens attached to it.
3. _____Unsaturated Fatty Acid_____ A fatty acid that does not have the maximum number of hydrogens attached.
4. _____Saturated Fatty acid_____ A fat that is from animals and not usually considered healthy.
5. _____Proteins_____ A mixture of these (which are usually found in flour, eggs, or milk) forms Gluten.
6. _____Baking Soda_____ $NaHCO_3$ that is used to neutralize acids in food.
7. _____Fructose_____ A monosaccharide that can be mad by reducing sucrose.
8. _____Maltose_____ A disaccharide made from two identical monomers.
9. _____Lipids_____ Substances that are extracted from plants and animals. Contain only carbon, hydrogen, and oxygen.
10. _____Baking Powder_____ $NaHCO_3$ that can cause acidity in foods.

11. (1pt) True or False: All foods are chemicals.

12. (2 pts) What chemicals are absorbed by the body during digestion? (circle all that apply)
    a. Proteins
    b. Sugars
    c. Fats
    d. Amino Acids

13. (2pts) What is the cheapest source of calories? (circle all that apply)
    a. Lipids
    b. Carbohydrate
    c. Proteins
    d. Fiber

14. (1pt) When sugar is heated past a melting point, what happens?

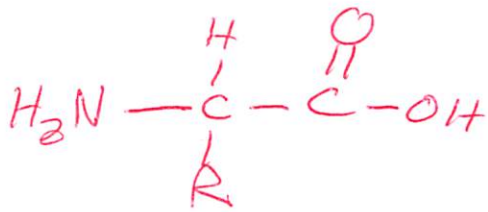
It caramelizes.

15. (2pts) Adding more fat to a cookie recipe would have what effect on the cookie (hint: adding more fat would be the equivalent of changing the melting point of the mixture from a mostly flour/sugar base to more of a butter/margarine base).

Adding fat (or butter) would effectively decrease the melting point (1pt). Therefore the cookie would melt faster in the oven, then the cookie would be thinner (and therefore crunchier) (1pt).

16. (1pt) Draw the basic structure of an amino acid (not including the R group or the variable group).

or



17. (3pts) Please list 3 differences between baking soda and baking powder and specify which property belongs to which substance.

Baking Soda	Baking Powder
Needs moisture plus and acid source	Needs acid source and a drying agent
Neutralizes acid in food	Cause acidity and/or bitter flavor
Four times stronger than baking powder	Produces CO_2 in a 2-step reaction
double acting	Reacts when moistened or heated

18. (2pts) What is an easy way to easily recognize GMO's in food? Why?

Trick question: you cannot easily recognize GMO's (1pt). As for why, they should touch on how we break down all the molecules before they are absorbed by the body, so changing their structure before they enter the body doesn't change how we absorb it (1pt).

19. (4pts) List the 8 types of FDA labeled allergens.

Peanut, tree nut, wheat, soy, fish, milk, egg, crustacean shellfish (0.5 per allergen)

20. (2pts) List 4 symptoms of an allergic attack.

Vomiting, hives, short of breath, wheezing, repetitive couch, trouble swallowing, weak pulse, pale/blue skin, dizzy or faint, anaphylaxis (immune system response), hoarse throat, stomach cramps (0.5pts for each answer)

21. (1pt) When burning food, what is the differences between burning food in the human body and a burning food in a calorimeter?

In the calorimeter, it is an uncontrolled reaction. In the body it is a controlled reaction.

22. (4pts) List the two types of fiber and what they do.
Soluble fiber: regulate blood sugar.
Insoluble fiber: helps clean out colon.

Part 2: Nutritional Label

1. (1pt) There are ____9.5____ Calories/gram of fat.
2. (1pt) There are ____4.1____ Calories/gram of carbohydrate.
3. (1pt) There are ____5.7____ Calories/gram of protein.
4. (1pt) There are ____0____ Calories/gram of water.
5. (2pts) Calculate the calories in one sandwich.

Fat: $9.5 \frac{cal}{g} \times 8g = 76$ Calories

Carb: $4.1 \frac{cal}{g} \times 37g = 151.7$ Calor.

Protein: $5.7 \frac{cal}{g} \times 3g = 17.1$ Cal.

Total: $76 + 151.7 + 17.1 = 244.8$

6. (2pts) Calculate the Calories from fat in a serving.

$8g \times 9.5 \frac{cal}{g} =$ 76 calories

7. (2pts) Calculate the Calories from carbohydrates.

$37g \times 4.1 \frac{cal}{g} =$ 151.7 Calories

8. (2pts) What percent of Calories are from protein in one serving?

$3g \times 5.7 \frac{cal}{g} =$ 17.1 Cal. 6.985%

9. (2pts) If a person needs 1,000 mg of Calcium in a day, how many mg of Calcium are in this product?

$1{,}000\ mg \times \frac{20}{100} =$ 200 mg

Nutrition Facts
Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

Calories	Calories from Fat
	% Daily Value*
Total Fat 8g	**12%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 4g	**16%**
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Part 3: Lab Tests

Density Measure

1. Using the materials provided for you, please calculate the density of the provided cake. Show all work and measurements below (3pts).

(1pt units
1pt answer
1pt equation)

$\frac{\text{mass}}{\text{Volume}} = \text{density}$

$1.5 \times 1.6 \times 1$

2.11

$\frac{2.11}{1.5 \times 1.6} = .879 \pm .1$

Lipid Measure

2. Using the provided materials, rank chips 1 through 5 on lipid content (where 5 is the most lipid content and 1 is the least). Explain your choices (3pts).

Lipid	Rank
1	4
2	1
3	5
4	3
5	2

2, 5, 4, 1, 3

* Note Variables may change, but equations are worth points

Calorimeter Experiment

3. Calculate the energy given off in one gram of Fritos. Include all of your work for full points. (10 pts)

~~+1 for final answer in Calories (5.71)~~
~~+0.5 for final in calories (5,710)~~

5.71 Calories/Frito

$$q = (m)(c)(\Delta T)$$

- q: heat energy in calories
- m: mass of H_2O
- c: Specific heat of H_2O $\left(1 \frac{cal}{g°C}\right)$
- ΔT: change in temp

+1pt for E.Q.
+1pt for Answer
+1pt for Units

$$q = \frac{(m)(c)(\Delta T)}{n} = X \text{ calories}$$

+1pt for → n: efficency of calorimeter (diff. for everyone)

+1p for Equation
+1 for Answer
+1 for Units

$$\frac{\text{Calories}}{\text{gram}} = \frac{X \text{ calories}}{\Delta m} = Y \frac{\text{calories}}{g}$$

Δm: grams burned (initial − final)

Nutritional Calories $= Y$ calories $\cdot \left(\frac{1 \text{ Calorie}}{1{,}000 \text{ calories}}\right) =$ Final Answer

+1p for EQ
+1p for Answer (in Nutrition Cal)
+1p for unit

+0.5 for answer in calories (5,710)