

# The Macromolecule Diet

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## PRE-LAB

Refer to the Background, your notes & textbook to answer the following questions.

1. Complete the following summary chart:

Macromolecule	Monomer(s)	Polymer(s)	Primary Function	Common Dietary Sources
Carbohydrates				
Lipids				
Proteins				
Nucleic Acids				-----

2. Which two macromolecules are important for providing energy for cells?
3. Which two macromolecules are important for providing structure and function for cells?

Read through the Introduction, Background & Procedure for this lab before answering the following questions.

4. Which two macromolecules will you be testing in this lab?
5. What will you be directly measuring in the lab?
6. What does an increase in water temperature indicate?
7. Based on your knowledge of the functions of the macromolecules, make a prediction about how each food source will affect a temperature change in the water.

## DATA

Table 1. Mass of Food & Food Holder

Food Item	Initial Mass (g)	Final Mass (g)	Mass Burned (g) = Initial Mass - Final Mass
Marshmallow (Carbohydrate)			
Cheeto (Lipid)			

**Table 2. Change in Water Temperature**

Marshmallow (Carbohydrate)		Cheeto (Lipid)	
Time (minutes)	Temperature (°C)	Time (minutes)	Temperature (°C)
0		0	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
<b>Change In Temperature =</b>		<b>Change In Temperature =</b>	

**ANALYSIS OF RESULTS**

1. Calculate the mass of food burned for each macromolecule by subtracting the final mass from the initial mass. Record each value in Table 1.

$$\text{Mass of Food Burned} = \text{Initial Mass} - \text{Final Mass}$$

2. Calculate the change in temperature of the water for each food item tested by subtracting the temperature at 0 minutes from the final temperature when the food stopped burning. Record each value in Table 2.

$$\Delta T = T_{\text{final}} - T_{0 \text{ minutes}}$$

3. For each macromolecule tested, calculate the temperature change per gram using the formula below and record the values in Table 3. You will also need to enter these values when you complete the online assignment.

$$\text{Temperature Change per Gram} = \frac{\Delta T}{(\text{mass burned})}$$

**Table 3. Amount of Heat Released During Combustion**

Macromolecule	Heat Released ( $\Delta T/g$ )
Carbohydrate	
Lipid	

**DISCUSSION QUESTIONS**

1. Based on your results, which type of macromolecule stores the greatest amount of energy? Use your data to support your answer.

2. Did your results match your prediction? Specifically, how were they the same or different?
3. According to nutritional studies, **carbohydrates** contain **4 Calories per gram** and **fats** contain **9 Calories per gram**. Based on these accepted values, use the information provided on the food labels below to answer the following questions:

***Food Item A***

<b>Nutrition Facts</b>	
Serving Size 55 Pieces (30g/1.1oz)	
Servings Per Container About 28	
Amount Per Serving	
<b>Calories ??</b>	Calories from Fat ??
% Daily Value*	
<b>Total Fat</b> 5 g	8%
Saturated Fat 1 g	5%
Trans Fat 0 g	
Polyunsaturated Fat 1.5 g	
Monounsaturated Fat 2.5 g	
<b>Cholesterol</b> Less than 5 mg	1%
<b>Sodium</b> 250 mg	10%
<b>Total Carbohydrate</b> 19 g	6%
Dietary Fiber 2 g	7%
Sugars Less than 1 g	
<b>Protein</b> 4 g	
*Based on a 2,000 Calorie diet	

***Food Item B***

<b>Nutrition Facts</b>	
Serving Size 1 oz (28g/about 39 pieces)	
Servings Per Container About 16	
Amount Per Serving	
<b>Calories ??</b>	Calories from Fat ??
% Daily Value*	
<b>Total Fat</b> 14 g	22%
Saturated Fat 2 g	10%
Trans Fat 0 g	
Polyunsaturated Fat 4.5 g	
Monounsaturated Fat 7 g	
<b>Cholesterol</b> 0 mg	0%
<b>Sodium</b> 150 mg	6%
<b>Potassium</b> 200 mg	6%
<b>Total Carbohydrate</b> 5 g	2%
Dietary Fiber 2 g	10%
Sugars 2 g	
<b>Protein</b> 7 g	8%
*Based on a 2,000 Calorie diet	

- a. Calculate the total number of calories per serving for each food item based on the information you discovered in your research. Record your answers in Table 4 below.
- b. Divide each of your answers above by the number of grams per serving to determine the number of calories per gram for each food item. Record your answers in Table 4 below.

**Table 4. Calorie Calculations**

Food Item	Calories per Serving	Calories per Gram
<i>A</i>		
<i>B</i>		

- c. Imagine that you are packing for a day hike and have limited space in your pack. Which food item above would be the best one to pack as a snack? Explain your choice.