McMush Lab

Everything you eat is composed of three major components: carbohydrates, proteins and fats. In order to convert food into energy, the body must be able to break the food into these basic compounds and then further reduce them to the molecular level. The body can only absorb food when it is at the molecular level because it needs to be small enough to pass through cell membranes. Food is broken down by two processes: mechanica breakdown and then chemical hydrolysis (which involves enzymes). This process of food breakdown is called digestion. You will work in a lab group to analyze a McMush mixture (AKA **Happy Meal Smoothie**) for the presence of monosaccharides (glucose), protein, fats and polysaccharides (starch).

***Form a hypothesis prior to performing each test, and put predicted outcome in data chart!!**

Test #1: Analysis of Fat in McMush Mixture
The amount of fat permitted in ground beef is regulated by law: 30% maximum for regular ground beef; 15% maximum for lean ground beef. The amount of fat in french fries is not regulated. You can estimate the amount of fats in McMush by looking at the **Group Graduated Cylinder** that was filled with McMush and then allowed to stand so that oil and water-soluble layers could separate.

Procedure:
1. Read the **total** amount of McMush in the graduated cylinder and mark this on the data chart.
2. Calculate the amount of **fat** collecting at the top of the cylinder by subtracting the amount of nonfat material (water-soluble lower layer) from the total volume.
3. Calculate the fat percentage of the McMush (**fat amount ÷ total**) and record in your data chart.

Test #2: Analysis of Simple Sugars (Monosaccharides = Glucose):
You will be testing McMush for glucose (similar to a diabetic person testing their blood glucose) by using a color-changing indicator called Benedict's solution. This solution will turn from blue to orange when heated if **glucose** molecules are present. Amylase, a digestive enzyme in saliva, will first be added to break down any larger carbohydrate polymers into monosaccharides.

Procedure:
1. Take 4 clean test tubes and label them #1 - #4.
2. In test tube #1: put 1 ml of distilled water
   In test tube #2: put 1 ml glucose sugar solution
   In test tube #3: put 1ml of McMush
   In test tube #4: put 1 ml of unknown
3. Add 1 ml of **amylase** solution (saliva enzyme) to all 4 test tubes (# 1,2 , 3 and 4).
4. Add 1 ml of **Benedict's solution** to all four test tubes. Swirl gently to mix.
5. *Note test tube color BEFORE heating and mark on data chart.
6. Place the test tubes in warm 60 C water bath for 10 minutes.
7. *Examine the tube color AFTER heating and mark this in your data chart.
8. Clean your test tubes and go to the next test.

Test #3: Analysis of Protein (Amino Acids):
The building blocks of protein are amino acids. In order for your body to manufacture the specific proteins it needs, the protein eaten in the diet must be broken down into amino acids and be ready for reassembly. We will first treat the McMush mixture with both **HCl** (stomach acid) and **pepsin** (a protein-digesting stomach enzyme) and then test for the presence of protein amino acids using Biurets reagent (a color-changing indicator). The reagent will turn purple when protein is present.

Procedure:
1. Take 4 clean test tubes and label them #1 - #4.
2. In test tube #1: put 1 ml of distilled water
   In test tube #2: put 1 ml of albumin (egg white protein)
   In test tube #3: put 1ml of filtered McMush
   In test tube #4: put 1 ml of unknown.
3. Add 1 ml of **pepsin** (stomach enzyme) solution to all 4 test tubes (# 1,2, 3 and 4).
4. Add 1 ml of **HCl** (stomach acid) solution to all 4 test tubes (# 1,2 ,3 and 4).
5. *Note test tube color BEFORE adding Biuret reagent.
6. Add 1 ml of Biuret solution to all four test tubes. Swirl gently to mix.
7. *Examine the tube color and mark this in your data chart.
8. Clean your test tubes and go to the next test.

Test #4: Analysis of Polysaccharide (starch) in McMush Mixture
A single starch molecule consists of hundreds of connected glucose molecules. The french fries and the bun both contain starch. Iodines is used to test for the presence of **starch** because it changes from brown to blue-black when strach is present.

Procedures:
1. Take 4 clean test tubes and label them #1 - #4.
2. In test tube #1: put 1 ml of distilled water
   In test tube #2: put 1 ml of starch solution
   In test tube #3: put 1ml of McMush
   In test tube #4: put 1 ml of unknown
3. *Note test tube color BEFORE adding iodine and mark on data chart.
4. Add 1 ml of **iodine** solution to all 4 test tubes (# 1,2, 3 and 4). Swirl gently to mix.
5. *Examine the tube color and mark this in your data chart.
6. Clean your test tubes and your work area.

McMush Analysis Questions: ----------

1. Identify the human body part which is being simulated by the following lab tests:

- Test #2 (monosaccharide)
- Test #3 (protein)

2. Identify the positive and negative controls used in each of the tests performed.

	Positive (+) control	Negative (-) control
Test 2 (monosaccharide)		
Test 3 (protein)		
Test 4 (polysaccharide)		

3. What is the purpose for a **positive** control in this lab?

4. What is a purpose for a **negative** control in this lab?

5. Using the data from this lab, decide whether the McMush meal is healthy? Why or why not? Discuss which dietary biomolecules were present and which were absent from the meal.

McMush Lab Data Chart

Test #1: A) Fat Hypothesis _____(%) B) **Total** Amount of McMush in Graduated Cylinder: _____(mL)

C) Water-soluble lower portion _____ (mL) D) Amout of Fat (hint = subtract) _____(mL) E) **% of Fats in McMush** (divide) _____

Test:	#1: **Negative** control (water)	#2: **Positive** control	#3: **McMush**	#4: **Unknown**	Hypothesis proved or not & why
Test #2 – Hypothesis (Yes or NO) Do you think the tube will have GLUCOSE?					
Test #2 Monosaccharide Color of tube with Benedict's **BEFORE** heating					
Color of tube with Benedict's **AFTER** heating					
Result of Test: (+ or – for glucose?)					
Test #3 – Hypothesis (Yes or NO) Do you think the tube will have PROTEIN?					
Test #3 Protein: Color of tube **BEFORE** Biuret					
Color of tube **AFTER** Biuret					
Result of Test: (+ or – for protein?)					
Test # 4 - Hypothesis (Yes or NO) Do you think the tube will have STARCH?					
Test #4 Starch: Color of tube **BEFORE** iodine					
Color of tube **AFTER** iodone					
Result of Test: (+ or – for protein?)					

McMush Lab: Recap

1)

Biomolecule Tested	Chemical Indicator used in the lab	Positive (+) **result** color change	Positive (+) control used in the lab	Negative (-) Control used in the lab	McMush Results (Yes or No)
starch					

2) Identify **2** possible reasons why a negative control might show a positive color change?

3) Identify **2** possible reasons why a positive control might NOT show a color change when it should?

---------- Negative & Positive Control Test Tube Review ----------

#2 Glucose

(-) (+)

#3 Protein

(-) (+)

#4 Starch

(-) (+)