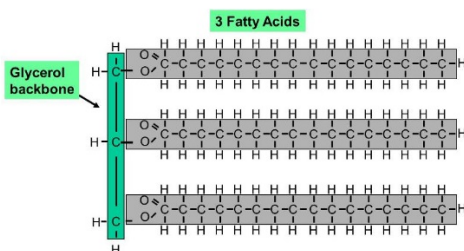


Identify the molecule:

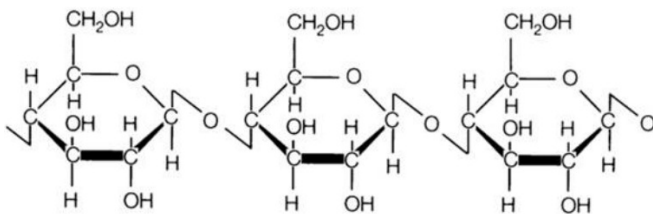


Fat, Carb, Protein or water

What process breaks down polymers into monomers?



Identify the molecule:







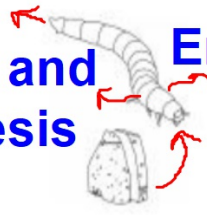






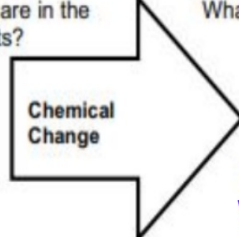
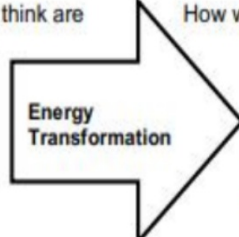


Fat, Carb, Protein or water

Which source of food would have more calories?

20% lipids
10% protein or 10% carb
70% water 90% water

Predictions Tool: What do you predict you will observe when mealworms eat? (Hypothesis)

Macroscopic scale: <i>Make predictions about what you will observe.</i>	Atomic-molecular scale: <i>Explain your predictions using the Three Questions.</i>						
<p>Predictions about mass How will the movement of matter change the mass of:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">the food?</td> <td style="width: 33%; text-align: center;">the mealworms?</td> <td style="width: 33%; text-align: center;">everything in the container?</td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </table>	the food?	the mealworms?	everything in the container?				<p>Where will the matter in the food move to after one day? Draw labeled arrows to show how food molecules might be moving into and out of the mealworm as it eats, breathes, grows, and moves.</p> <div style="text-align: center;">  </div> <p style="font-size: 2em; color: blue; text-align: center;">Digestion and Biosynthesis Energy: Movement and heat</p>
the food?	the mealworms?	everything in the container?					
							
<p>Predictions about changes in BTB How will matter changes in this system affect CO₂ in the air and the color of the BTB?</p> <p style="font-size: 1.5em; color: blue; text-align: center;">O₂  CO₂ </p> <p style="font-size: 1.5em; color: blue; text-align: center;">Blue  Yellow</p>	<p>What molecules do you think are in the mealworm's food before it eats?</p> <p style="font-size: 1.5em; color: blue;">Carbs and protein</p> <div style="text-align: center;">  </div> <p>What will happen to the food molecules that the mealworm eats?</p> <p style="font-size: 1.5em; color: blue;">Digestion + Biosynthesis</p> <p style="font-size: 1.5em; color: blue;">Water and O₂</p> <p style="font-size: 0.8em;">What other molecules will be involved?</p>						
<p>Predictions about energy What evidence of energy change will you be able to observe?</p> <p style="font-size: 1.5em; color: blue; text-align: center;">Movement</p>	<p>What forms of energy do you think are in the mealworm's food?</p> <p style="font-size: 1.5em; color: blue;">Carbs (chemical)</p> <div style="text-align: center;">  </div> <p>How will the energy stored in the food change after the mealworm eats?</p> <p style="font-size: 1.5em; color: blue;">Digestion and Biosynthesis, Kinetic energy and Heat</p>						

Tools of the Investigation - BTB:

One of the materials used in the investigation is bromothymol blue, or BTB. When BTB is dissolved in water, it can be used to detect the presence of the small inorganic molecule, carbon dioxide (CO₂). When CO₂ is added to BTB, the color will change, from blue to green to yellow.

BTB Color Key		
Low CO ₂	Some CO ₂	High CO ₂
Blue	Green	Yellow

Pg 2

Hypothesis:

Follow your Teacher's instructions to complete the mealworm investigation Predictions Tool. This will serve as your hypothesis with explanation for what you expect the outcome of this investigation to be.

Write these here:

The mass of the potato will ...
(increase/decrease/stay the same)

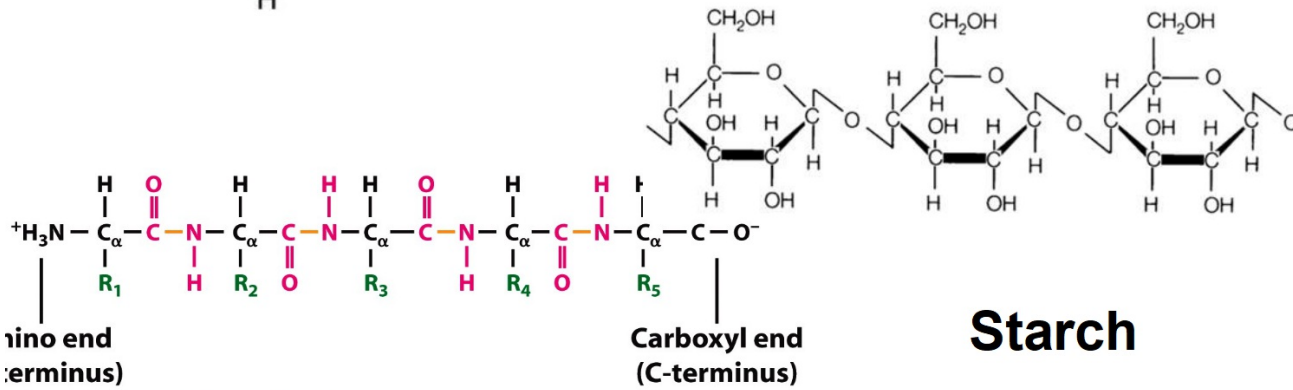
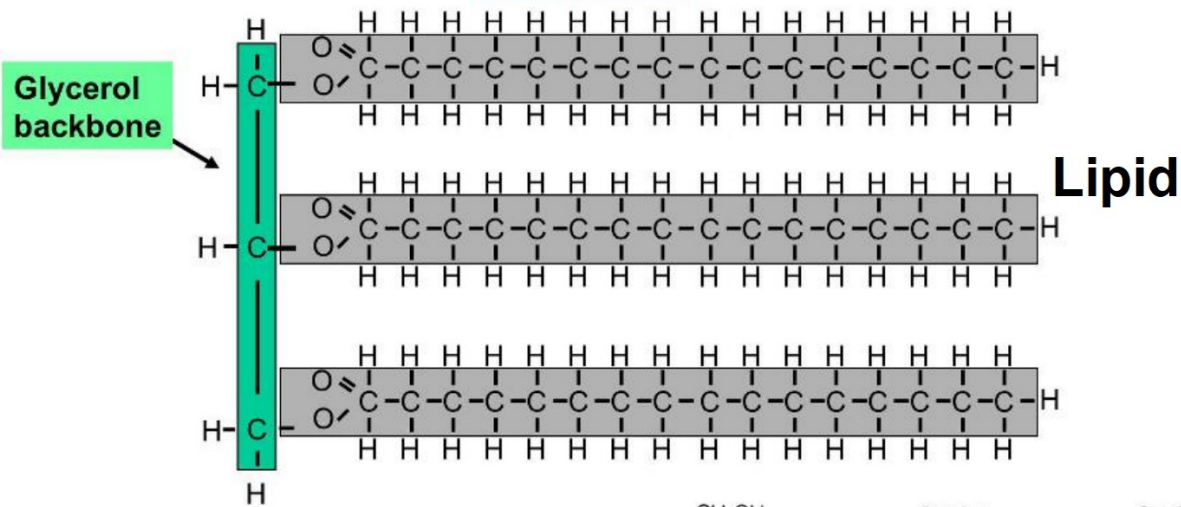
The mass of the mealworms will...
(increase/decrease/stay the same)

The mass of the container will...
(increase/decrease/stay the same)

**The BTB will turn/stay (yellow/green)...showing
CO₂ has (increased/decreased/stayed the same)**

**The energy in the potato will be stored / used in/by
the mealworms to move / grow**

3 Fatty Acids



Protein

Starch

Dried Mealworms

Nutrition Facts	
1 servings per container	
Serving size	(100g)
Amount Per Serving	
Calories	440
<small>% Daily Value*</small>	
Total Fat 19g	24%
Saturated Fat 4g	20%
Trans Fat 0g	
Cholesterol 150mg	50%
Sodium 180mg	8%
Total Carbohydrate 15g	6%
Dietary Fiber 9g	31%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 55g	110%
Vitamin D 0mcg	0%
Calcium 81mg	6%
Iron 4mg	20%
Potassium 1100mg	25%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Potato

Nutrition Facts	
1 servings per container	
Serving size	1 (148g)
Amount Per Serving	
Calories	110
<small>% Daily Value*</small>	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 26g	9%
Dietary Fiber 2g	7%
Total Sugars 1g	
Includes 0g Added Sugars	0%
Protein 3g	6%
Vitamin D 0mcg	0%
Calcium 26mg	2%
Iron 1.08mg	6%
Potassium 846mg	20%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Get your cup of mealworms and record measurements

- 1) WITHOUT REMOVING LID - weigh whole container
- 2) Remove lid, remove potato -> weigh potato
- 3) Remove cup -> record color
- 4) Weigh container with mealworms, subtract 14.86 g to get mass of meal worms

Data:

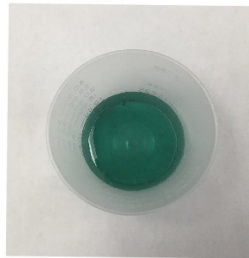
Table 1: Measurements During The Investigation

	Measurement BEFORE (g)	Measurement AFTER (g)	Change in Mass (g)
Mass of mealworms		cup w/ lid + mealworms - 14.86= mealworms	
Mass of potato			
Mass of whole container		get this first (keep lid on)	
Color of BTB			Change in color:

(mass of empty cup and lid=14.86 g)



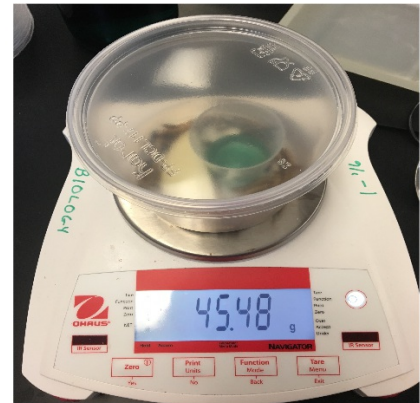
Record the mass of the potato



Record the color of the BTB (take a picture)



Place the potato and BTB cup into the cup.



Record the total mass of the setup

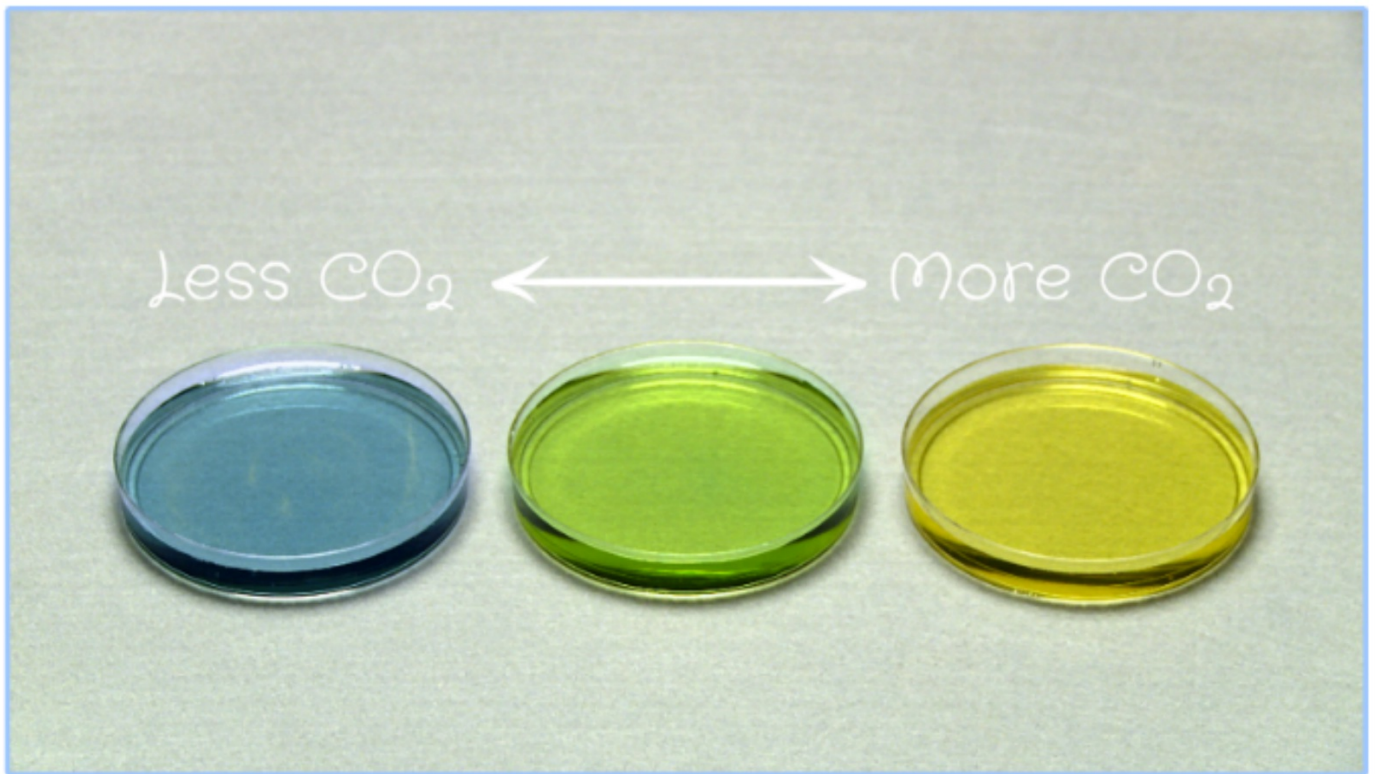
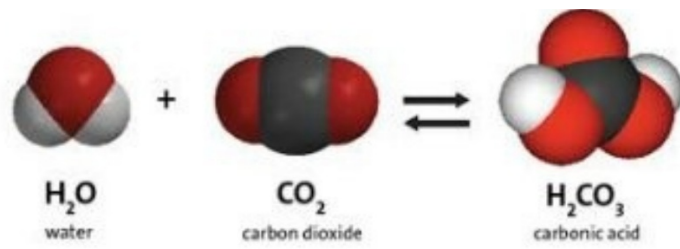
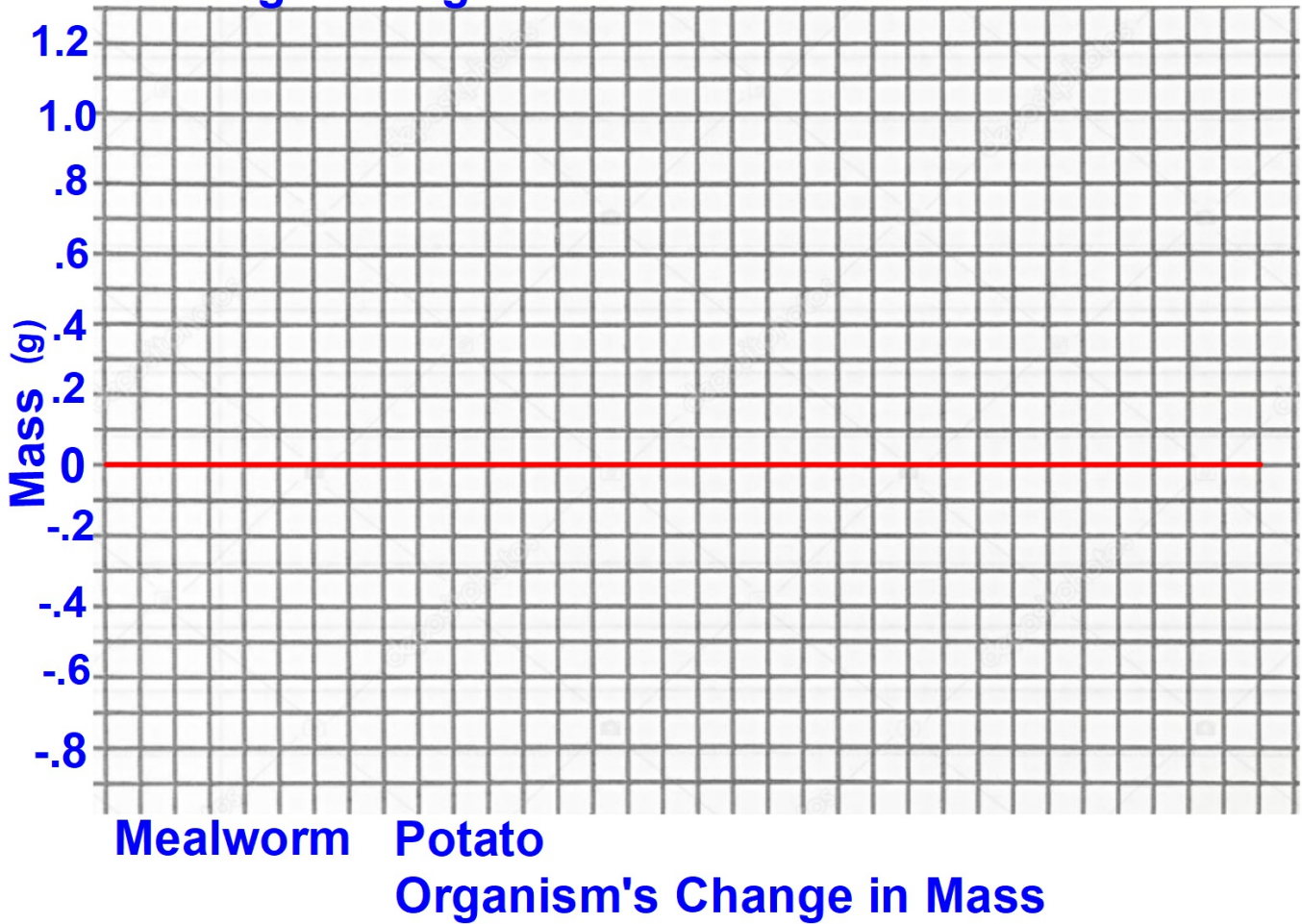


Table 3: Class Data

Group #	Initial Mass Potato (g)	Initial Mass Worms (g)	Final Mass Potato (g)	Final Mass Worms (g)	Change in Potato Mass (g)	Change in Worm Mass (g)
1						
2						
3						
4						
5						
6						
7						
8						
	Average change in weight =					

Graph: Average change in Mass for Mealworms and Potato

Average change in mass for Mealworm and Potato



Analysis and Conclusions:

Revisiting your hypothesis

1. Does the data support your predictions about mass? Explain.

a. Change in food mass: _____

b. Change in mealworm mass: _____

c. Change in everything in the container:

2. Does the data support your prediction about changes in BTB? Explain.

3. Does the data support your prediction about energy? Explain.

Patterns in the Class Data

1. What patterns do you see in the mass data?

2. What is a possible, science-based explanation for the patterns you observe?

3. What patterns do you see in the BTB change data?

4. What is a possible, science-based explanation for the patterns you observe?

Conclusion

The purpose of this investigation was to collect evidence, using the mealworm as a model organism, to answer the question "How do living things use matter and energy to stay alive?" The investigation guided you to examine three supporting questions:

1. Where are molecules moving?
2. How are atoms in molecules being rearranged into different molecules?
3. What is happening to energy?

Complete the CER organizers to construct your conclusions about these questions based on the data.

Where are molecules moving?

Claim:	
Evidence	Reasoning

How are atoms in molecules being rearranged into different molecules?

Claim:	
Evidence	Reasoning

What is happening to energy?

Claim:	
Evidence	Reasoning

