

Constructed Response Investigation

Standard: “heat transfer” and “inquiry”

Directions to Student:

Scenario: Katie, Dana, and Kim want to go on a diet. Their favorite food is jumbo marshmallows, and they want to know if marshmallows have too many Calories to eat. They decide to do an experiment to find out how many Calories a marshmallow has. Since they’ve been in Mrs. Lintker’s/Mrs. Pickering’s class, they knew how to do this! (explain experiment!!!—maybe with a picture)

Teacher developed data:

	Initial Mass of Marshmallows	Final Mass of marshmallow	Initial Temperature	Final Temperature
1 marshmallow + 100 mL H₂O	5 g	(will be given to students)	22° C	(will be given to students)
2 marshmallows + 100 mL H₂O	10 g		22° C	
3 marshmallows + 100 mL H₂O	15 g		22° C	

Student data table: Student needs to fill out this data table based on information given above.

	Δmass marshmallow	Mass of H₂O	ΔT
1 marshmallow + 100 mL H₂O			
2 marshmallows + 100 mL H₂O			
3 marshmallows + 100 mL H₂O			

Graph: Create one graph showing the relationship between the change in mass of the marshmallows and the change in temperature.

Questions Related to Data Set and Graph:

- 1) Using your graph, explain what the data means.
- 2) Calculate the calories of heat transferred to the water from the marshmallow for each trial.
- 3) Calculate the number of calories per gram of marshmallow burned for each trial.
- 4) Explain the meaning of the values you found in #3 and whether you believe these values are reasonable.
- 5) Based on what you know about calories and Calories, will Dana, Kim, and Katie need to quit eating marshmallows to follow their diet?

Rubric:

Item	Total Possible Points	Explanation
Data table	3	1 point for correct calculation in each column
Graph	5	1pt labeling axes correctly 1 pt title 1 pt “useful” type of graph (line or bar) 1 pt for reasonable scales 1 pt for correct placement of variables
Q1	3	2 pts Increasing mass, increasing temperature (1 pt for correctly identifying incorrect graph) 1 pt for using data to support
Q2	3	1 pt correct equation 1 pt correct specific heat of water 1 pt correct answer
Q3	2	1 pt setup 1 pt correct answer
Q4	2	1 pt meaning—per gram of marshmallow, not per marshmallow 1 pt recognizing they should all be the same
Q5	3	1 pt choosing yes or no 1 pt defending their answer 1 pt discussing cal/Cal