Short Performance Assessment: **HS-PS1-7**

Grade Level: **High School**

Adapted from SNAP[1]

Title	**Conservation of Matter**		
Designed by Modified by	CREATE for STEM at Michigan State University New York Teachers	Course(s)	**High School**

HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques

Assessment Boundary: Assessment does not include complex chemical reactions.

Science and Engineering Practice	**Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena to support claims.
Disciplinary Core Ideas	**PS1.B: Chemical Reactions** • The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.
Crosscutting Concept	**Energy and Matter** • The total amount of energy and matter in closed systems is conserved.

Student Performance	1. Representations 2. Mathematical modeling 3. Analysis

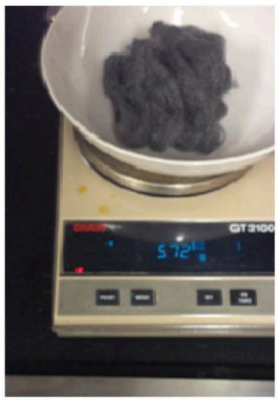
[1] The Short Performance Assessment (SPA) and the Assessment Rubric adapted from the Stanford NGSS Assessment Project http://snapgse.stanford.edu/

Conservation of Matter

Name_____

Sandy took a piece of iron wool ($Fe_{(s)}$) and decided to investigate it. She measured its mass (5.72g), burned it in the presence of oxygen ($O_{2(g)}$), and then measured the mass of the product. Follow the prompts below. You may use your reference table.

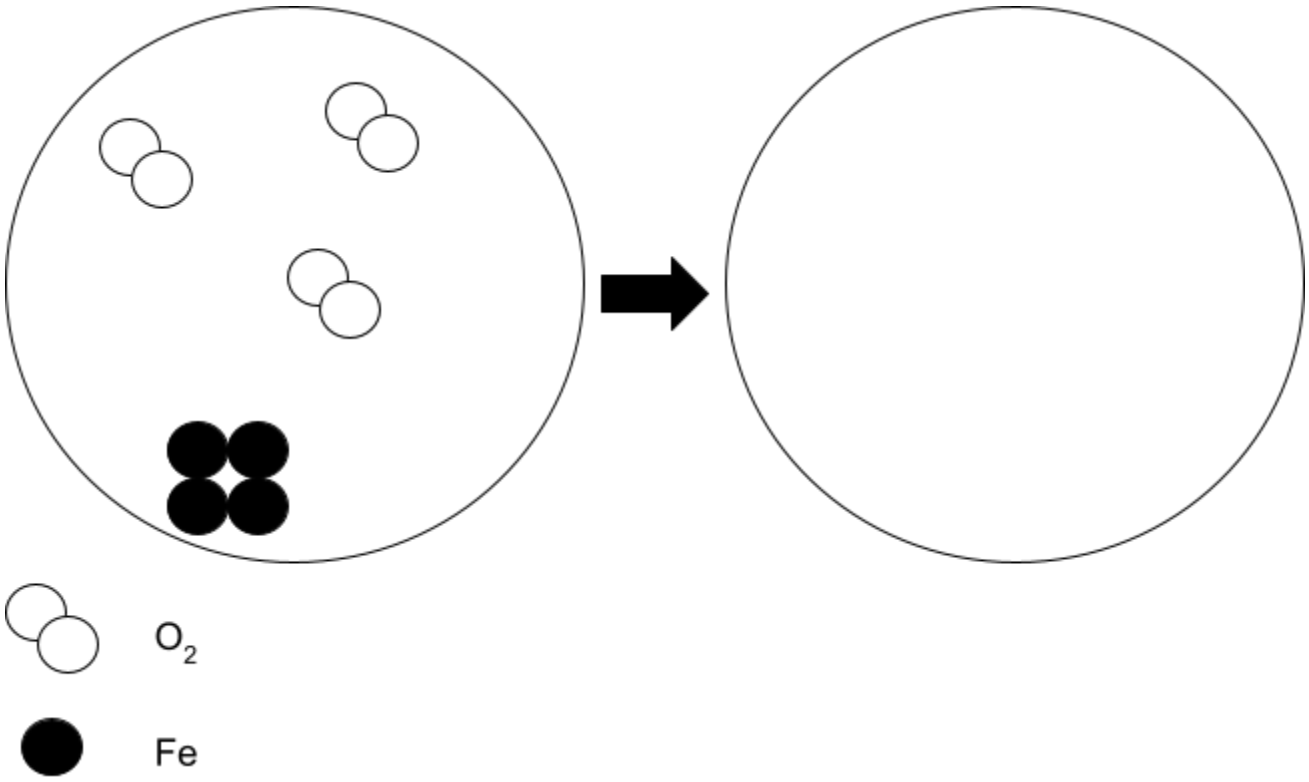
Before burning the Iron wool -



1. Sandy found out that there was only one product in the reaction. Predict the chemical formula of the product and the final mass of the product and explain your reasoning.

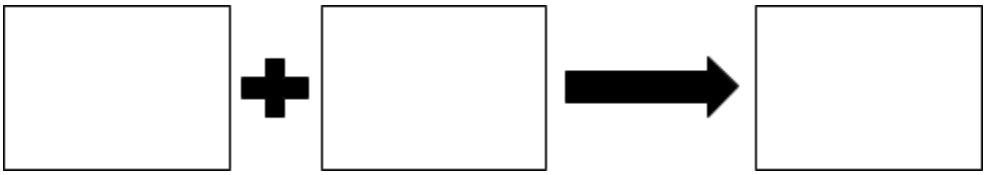
2. Is this a chemical or physical reaction and explain why.

3. Using the particle-level representation model below showing a container BEFORE the reaction occurs, draw a representation of the atoms and molecules that will be present AFTER the reaction has occurred in the container provided. Assume the reaction proceeded to the fullest extent possible.



4. Explain why you drew the particles the way you did in the AFTER container. Be sure to discuss the number and type of atoms of each element present before and after the reaction. In the graphic organizer below, write out a balanced chemical equation. Indicate the phase (i.e., solid, liquid, or gas) of each reactant and product.

5. In the graphic organizer below, write out a balanced mathematical representation. Indicate the phase(i.e., solid, liquid, or gas) of each reactant and product.



Before burning the Iron wool -

5.72g

While burning the Iron wool -

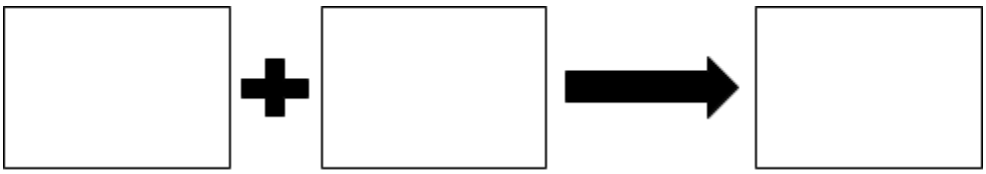
5.86g

Remaining product after burning of the Iron Wool -

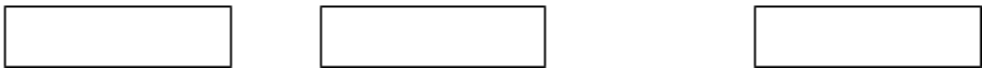
6.56g

6. Pictured above are the results Sandy obtained from her experiment. Using the formula you constructed and/or the particle-level representation diagram you constructed, explain mathematically why the product obtained from burning iron had a higher mass than the iron wool Sandy started with and how this demonstrates how atoms are conserved. In your response, be sure to include evidence from the periodic table.

Equation



Masses



	Emerging	Developing	Approaching Proficiency	Excelling
Description of performance				
Sample student responses				

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Insert additional Assessment Rubrics (if needed) here.