Short Performance Assessment: **MS-PS1-1**

Grade Level: **Middle School**

Adapted from SNAP[1]

Title	**Where Does the Mass Come From?**		
Designed by	**Belle, Cindy, Paul**	Course(s)	**NGSS Grade 8**

Performance Expectation	**MS-PS1-1**: Develop models to describe the atomic composition of simple molecules and extended structures. **Clarification Statement**: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms. **Assessment Boundary**: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.

Science and Engineering Practice	**Developing and Using Models** • Develop a model to predict and/or describe phenomena.
Disciplinary Core Ideas	**PS1.A: Structure and Properties of Matter** • Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
Crosscutting Concept	**Scale, Proportion, and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Student Performance	1. Components of the model 2. Relationships 3. Connections

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

Name_________________________________

Where Does the Mass Come From?

Introduction:

While investigating steel wool in the lab David notices an interesting phenomenon. Unlike most burning objects the mass of the steel wool increases over time. David followed steps 1-7 below to gather empirical evidence in the science lab.

1. For safety reasons goggles are worn throughout the demonstration.
2. Fine steel wool is pulled apart to create air pockets and added to a used lasagna pan.
3. The pan and steel wool are placed on an electronic balance.
4. The initial mass of the pan and steel wool together is **38.27g**.
5. The mass of the pan and steel wool are then zeroed to **0.00g** (as shown in Image 1)
6. The steel wool is ignited with a Bunsen burner and the entire demonstration is recorded by another student.
7. After 29 seconds the electronic balance reads **1.75 g** (as shown in Image 1)

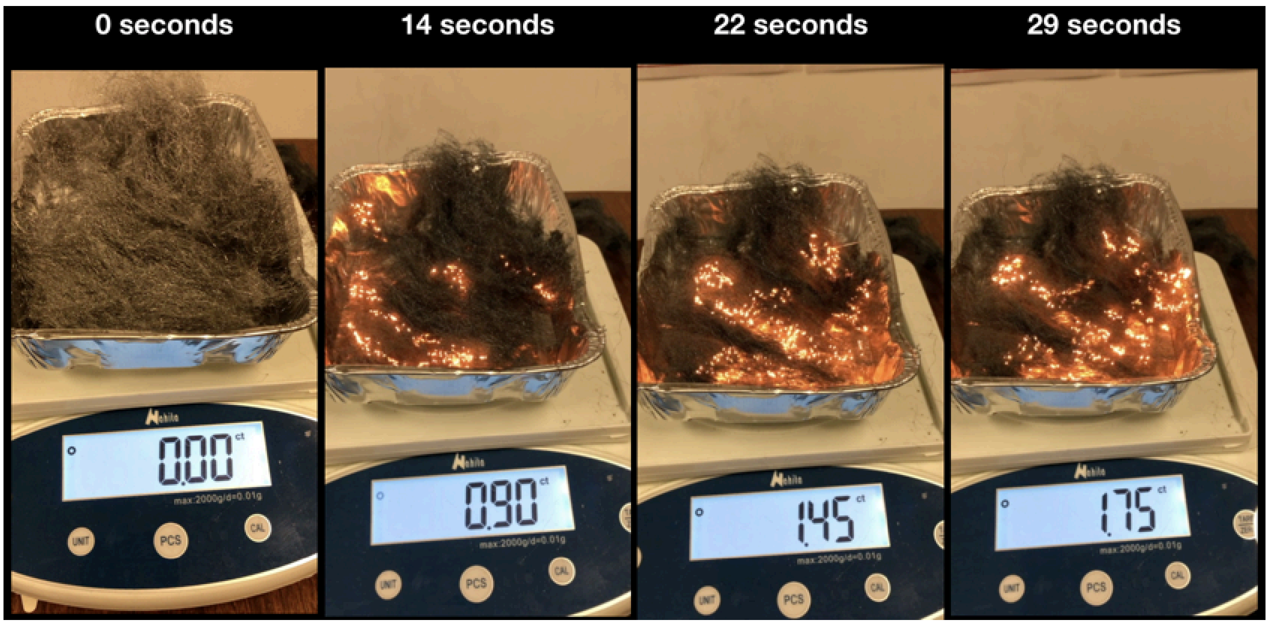


Image 1: Steel wool burned over 30 seconds

1. Aside from measuring the changes in mass, what other observations can be made from watching the video or looking at the images above?

David's Explanation:

David creates the following model (Figure 2) to explain where the mass is coming from.

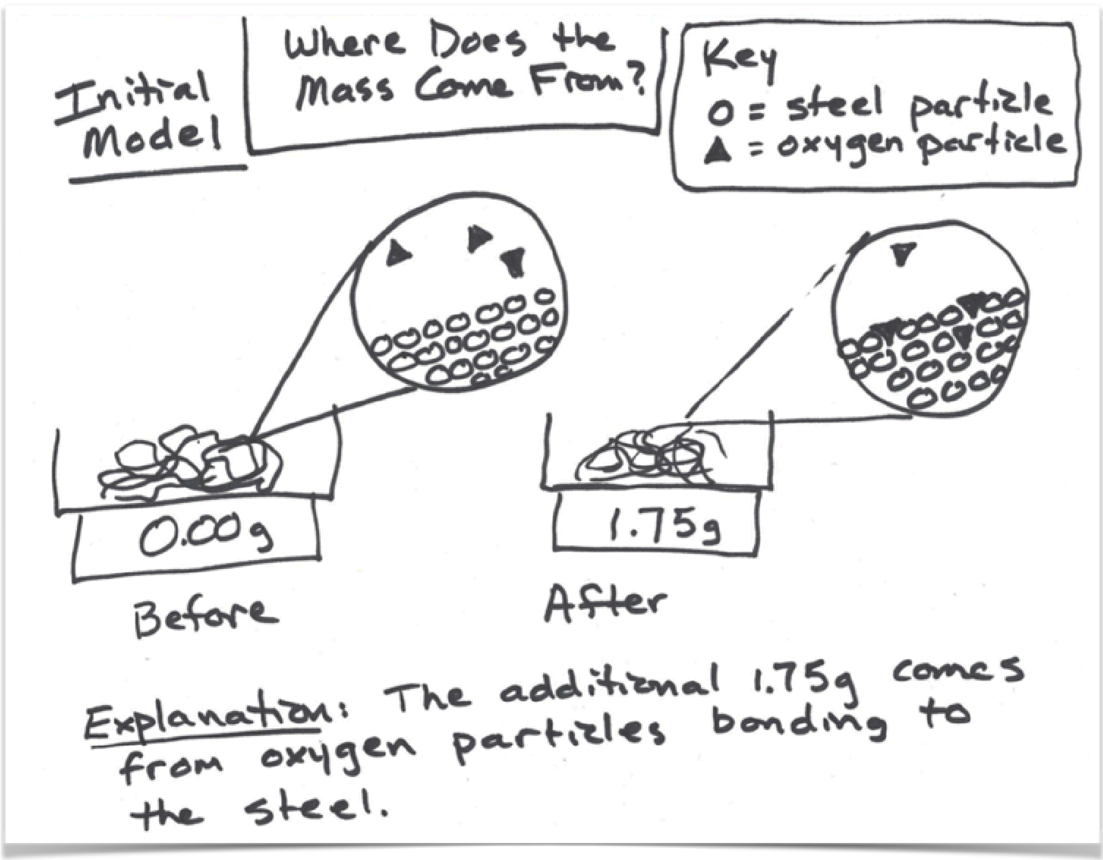


Figure 2

2. Which of the following scales are included in David's initial model? (circle all that apply)

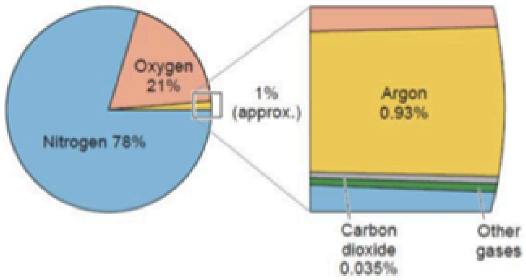
   Bulk scale   Particle scale   Atomic scale   Subatomic scale

3. According to David's initial model what is causing the increase in mass?

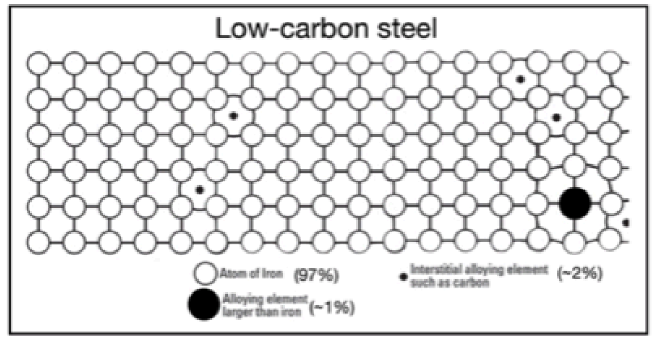
4. Do you agree with David's explanation? Why or why not?

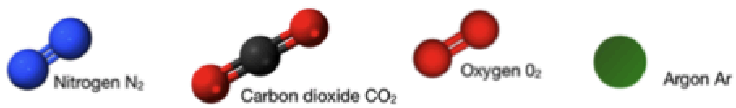
Research:

A quick internet search provides you with additional models that will help explain this phenomenon.



2.13 Component gases of the lower atmosphere





5. Draw an **atomic model** that explains the phenomenon of mass being added to burning steel wool. You may borrow ideas from David or the models above but your model must include both bulk and atomic scales. Make sure you identify and describe the components of your model.

Before	After

6. Use your **atomic model** (in question 5) to describe how the behavior of bulk substances depends on their structures at atomic and molecular levels, which are too small to see.