NSF RET Lesson

Lesson Title: Flame Demonstration (Crystals)	Grade Level/Subject: 7th to 8th Grade, Science
Maximum # of Students: Students in Classroom	Total Time Required: One class period

Prior Knowledge Needed:

- Explain that electron configuration is an important factor in what color a compound emits. Ask about other applications (spectroscopy, luminescence)
- Knowledge of crystal formations
 - o <u>https://edu.rsc.org/lesson-plans/how-are-crystals-made-11-14-years/78.article</u>

Materials:

One glass wash dish per salt (4), Petroleum jelly (pea size amount for each dish), Flame Demo Data Sheet (attached), Lighter, Safety glasses for each student

Salts:

- 1. Barium Chloride BaCl2*2H2O (light green)
- 2. Calcium Chloride CaCl2 (orange-red)
- 3. Copper Chloride CuCl2 (blue/green)
- 4. Lithium Chloride LiCl (fuchsia flame)
- 5. Potassium Chloride KCl (light lilac)
- 6. Sodium Chloride NaCl (yellow flame)
- 7. Strontium Chloride SrCl2 (red or crimson flame)

Performance Objective/Learning Target:

Chemistry/Physical Science:

• To investigate and observe the colors produced when various metal compounds are burned

Standards:						
Students wi MS-PS1- 1.	the demonstrate understanding can: 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.]					
The	performance expectation above was developed using the following elements from the NRC document A Framework for K-12 Science Education:					
Science Developing a Modeling in 6- developing, us test, and pred design system • Develop a phenomer	 and Engineering Practices bisciplinary 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). 					
Lesson Procedure						
Before:	• Set up lab beforehand:					
	 Set out one glass wash dish per salt. 					
	 Into each dish place a quarter-sized amount of jelly. 					
	 Place a pea-sized amount of salt into each dish and mix in. Use only one 					
	type of salt per dish.					
	Before the demo, discuss chemical bonds and what happens to different types of					
	salts when exposed to flames.					
	 Pass out Flame Demo Data Table (attached) 					
	 Ask inquiry-based questions to generate curiosity: 					
	 Do all the flames appear the same? 					
	 What colors do you see? 					
	 What compounds are mixed into the jelly? 					
	 What are the formulas of these compounds? 					
	 What types of bonds do they have? 					
	 Do the elements in the compounds have anything in common? 					
	• Are there any trends in the types of compounds that could explain why					
	they are that color?					
During:	• Ensure that all students have put a prediction on the whiteboard and on the demo sheet.					
	 Summarize predictions or invite individual students to share their predictions aloud. 					
	• Students are seated a safe distance away from where they can see the flames.					

	 Students should not crowd flames because loose clothing may fall into 				
	flames and flames may pop, spreading sparks. At least 2 feet from flame				
	recommended.				
	Begin Experiment				
	 Light all dishes. 				
 After giving students time to observe the flames, ask them to make observ about the demo on their paper. 					
					 Prompt students to write whether their predictions matched what they observed.
				After:	• After the experiment, students should answer all questions on the Flame Demo
	Data Table Sheet.				
	 Next, students will verbally share their findings and observations. 				
	• Then discuss the summary of results of each salts.				
	Answer any questions students may have left.				
	Summary of Results:				
	 Barium Chloride BaCl2*2H2O (light green) - color flame clearly distinguishable 				
	 Calcium Chloride CaCl2 (orange-red) – color flame clearly distinguishable 				
	 Copper Chloride CuCl2 (blue/green) – color flame clearly distinguishable 				
	 Lithium Chloride LiCl (fuchsia flame) – color flame clearly distinguishable 				
	• Potassium Chloride KCI (light lilac) – color flame distinguishable (better than any				
	other tested)				
	 Sodium Chloride NaCl (yellow flame) – color flame clearly distinguishable 				
	 Strontium Chloride SrCl2 (red or crimson flame) – color flame clearly 				
	distinguishable				
5E Mode	el: (Engage, Explore, Explain, Evaluate, Elaborate)				
Engage:	Inquiry-Based Questions				
Explore:	Explore: Lighting of the seven different salts.				
Explain: Explanation of bonds and the different types of salts.					
Evaluate: Students will use interactive data tables to help visually identify trends.					
Elaborate: Discussion of observations and findings.					

Name:_____

Flame Demo Data Table

<u>Salt</u> <u>Compounds</u>	Color Prediction	Actual Color	<u>Type of Bond?</u>
Barium Chloride BaCl2*2H2O			
Calcium Chloride CaCl2			
Copper Chloride CuCl2			
Lithium Chloride LiCl			
Potassium Chloride KCl			
Sodium Chloride NaCl			
Strontium Chloride SrCl2			

Reflection: