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Spring 2020

### Periodic Table Club

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NEBRASKA HONORS PROGRAM  
CLC EXPANDED LEARNING OPPORTUNITY CLUBS  
INFORMATION SHEET

**Name of Club:** Periodic Table Club

**Age/Grade Level:** Middle School (6<sup>th</sup> – 8<sup>th</sup> Grade)

**Number of Attendees:** (ideal number) 4-8 students

**Goal of the Club:** (learning objectives/outcomes)

1. To make chemistry more accessible, applicable, and fun
2. To educate students on the elements that make up their world

**Resources:** (Information for club provided by)

PubChem Periodic Table of Elements - <https://pubchem.ncbi.nlm.nih.gov/periodic-table/>

ChemSpider – <https://chemspider.com>

Makayla Gill and Kailynn Jensen’s education provided by UNL Chemistry Department

**Content Areas:** (check all that apply)

- Arts (Visual, Music, Theater & Performance)
- Literacy
- STEM (Science, Technology, Engineering & Math)
- Social Studies
- Wellness (Physical Education, Health, Nutrition & Character Education)

**Outputs or final products:** (Does the club have a final product/project to showcase to community?)

Each student will invent their own element using the knowledge they learned of the periodic table.

**Introducing your Club/Activities:**

This club is dedicated to teaching the generation of future scientists the periodic table. This is designed to be a unique take on a STEM club that uses the periodic table as a backbone for a solid foundation in chemistry.

**General Directions:**

Session structure

- 1) Introductions – go over names; provide outline of activities for the day
- 2) Periodic Table Knowledge – introduce concepts related to the periodic table (atoms, trends, groups/families, etc.); follow up with activity related to the concept
- 3) Element of the Week – focus on one element; introduce characteristics and real-world applications
- 4) Experiment – experiment related to element of the week and/or periodic table concept
- 5) Activity – games and/or handouts to reinforce the concepts covered during the presentations

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**Tips/Tricks:**

Be prepared to have a talk about lab safety. Kids often need reminders of how important it is to listen when doing experiments. Encourage questions from students. Our students would often only ask questions or clarification when prompted. Be sure to choose activities that gets students moving and/or encourage creativity.

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# WEEK 1 LESSON PLAN

Topic: Element Basics & Oxygen

**Lesson Activity Name:** O<sub>2</sub> for Me & You

**Length of Activity:** Presentation: 20 minutes. Experiment: 20 minutes. Activity: 10 minutes.

**Supplies:** 2L Diet Coke, Mentos (alternate option: buy smaller bottles of soda for each student to do their own experiment)

Experiment Directions:

<https://www.stevespanglerscience.com/lab/experiments/original-mentos-diet-coke-geyser/>

## Directions:

Start with introducing yourself and the goal of your club. Give each student and yourselves “element nicknames.” For example, one club leader’s initials were M.G. so she was Magnesium and the other club leader’s name started with a ‘K’ so she was Potassium. Spend the next 20 minutes giving a presentation on the basics of the periodic table. Introduce what the periodic table is and how it was created. Play the Periodic Table Song. Demonstrate how to interpret the values and symbols written on the periodic table. Give a basic introduction to the structure of the atom (electrons, neutrons, protons). Follow the presentation with an interactive atom activity. Use the number of students and instructors to determine an element you can recreate. For example, 9 participants would give you enough to demonstrate a Lithium atom. Have 6 participants stand in the middle to represent the 3 protons and 3 neutrons. Have the other 3 circle around the other 6 to represent electrons. Transition into the element segment of the club by introducing Oxygen. Discuss its properties, real world applications, and use it as a model to review interpreting the periodic table. Perform the Mentos/Diet Coke Geysers Experiment. Leave time for clean-up. Then, explain the role oxygen has in the Diet Coke and Mentos experiment.

## Conclusion of the activity:

Students were able to interpret the periodic table (atomic mass, atomic number, symbol, etc.). Students were also had a better understanding of atomic structure and knew more about oxygen. From the experiment, students learned about carbon dioxide.

## Parts of activity that worked:

Students seemed to comprehend the method of reading the periodic table. They were also very excited to each play an individual role in the experiment. The atom reenactment activity was a good way to get some of our more hyper students a way to release energy as electrons.

## Parts of activity that did not work:

Our experiment was not as exciting as anticipated. Be sure to discuss experiment boundaries and lab safety prior to all experiments.

## Additional materials:

Presentation: (click ‘Open with Google Slides’)

<https://drive.google.com/open?id=1pUqwCJMUXZxwL6L4lhiAg72XAdQb0Xag>

## WEEK 2 LESSON PLAN

Topic: Atoms & Helium

**Lesson Activity Name:** Up, Up, and Away!

**Length of Activity:** Presentation: 20 minutes. Experiment: 5 minutes. Activity: 30 minutes.

**Supplies:** Helium balloons, scissors, scavenger hunt printouts, tape, prizes (candy)

### Directions:

Spend the first 15 minutes discussing the structure of an atom and the way that structure influences an element. Give a brief explanation of how elements bond together. Review what was learned during the first week. While giving presenting on the uses and properties of helium, cut a slit in a helium balloon and inhale. Be sure to explain why helium makes your voice so high-pitched, and then show a video of a sulfur hexafluoride inhalation. Explain why it has the opposite effect of helium. The last half of the club will consist of a scavenger hunt. The attached document is what we used, but it should be adapted to your location and the students' understanding of the periodic table. It was designed with Week 1 and Week 2 concepts in mind.

### Conclusion of the activity:

Students will understand the real-world usage and properties of helium. Students will also gain an understanding of how to identify elements by their physical properties. Club participants will also get the opportunity to review the basics of the periodic table through a scavenger hunt.

### Parts of activity that worked:

Students thought it was hilarious to hear us give presentations on helium with such high-pitched voices. The scavenger hunt gave us a good estimate of how much information the students had retained and what concepts still needed work.

### Parts of activity that did not work:

Students were adamant about inhaling the helium themselves, so we had to establish that it's dangerous for younger people to try the experiment because of lung capacity and the fact that you aren't inhaling oxygen when inhaling helium. While the students enjoyed the scavenger hunt, some steps were slightly too difficult for what we had taught them in the first two weeks.

### Additional materials:

Presentation: (click 'Open with Google Slides')

[https://drive.google.com/file/d/1ndrpiJw0LGRVcP\\_WtEqLsdOFqOwSIfBX/view?usp=sharing](https://drive.google.com/file/d/1ndrpiJw0LGRVcP_WtEqLsdOFqOwSIfBX/view?usp=sharing)

Scavenger Hunt: <https://drive.google.com/open?id=1DdeAnK9vKDHbsiZqDflS9aLAZRe2vvXn>

Printable Periodic Table:

[https://drive.google.com/open?id=1HuDNPIYaodyShT\\_sQ93COnb4ufmVFDKT](https://drive.google.com/open?id=1HuDNPIYaodyShT_sQ93COnb4ufmVFDKT)

Word Search: <https://drive.google.com/open?id=1KpdsVZyE4pw0MsZeyChH2Z9cy8hXAPob>

# WEEK 3 LESSON PLAN

Topic: Physical Properties & Calcium

**Lesson Activity Name:** Sticks & Stones Won't Break These Bones

**Length of Activity:** Presentation: 10 minutes. Experiment: 15 minutes. Activity: 30 minutes.

**Supplies:** Prizes (Jeopardy), chicken bones, vinegar

<https://sciencebob.com/bend-a-bone-with-vinegar/>

### Directions:

Start the club with a presentation on the physical properties of elements. Explain what each property means and include some comparisons between different elements. For example, explain some physical properties when comparing metals to non-metals. Next, describe the properties and uses of calcium. Be sure to include the importance calcium has in bone strength. 3 days before your club, prepare the bendy bones experiment. When presenting to your students, pass around a clean, untreated chicken bone so they can feel what it was like before putting it in the vinegar. Then, pass around the bone that soaked in vinegar for three days so that your students can observe the difference. Even though vinegar is a mild acid, it is strong enough to dissolve the calcium in the bone, leaving only soft bone tissue. Finish the last half of class with a game of Jeopardy. Use this link (<https://jeopardylabs.com>) to create your own game of Jeopardy based on what your students have learned.

### Conclusion of the activity:

Students will understand physical properties of the elements and how they differ across the periodic table. Students will also learn about calcium, its role in the world, and how important it is for their bones. Students will also be able to compete and test their knowledge of the basics of the periodic table.

### Parts of activity that worked:

Students had a fun time competing in Jeopardy.

### Parts of activity that did not work:

Some of the questions on the Jeopardy we created were too difficult for what the students had retained. The bendy bones experiment was interesting, but it would've been better to have another calcium experiment that would've allowed for more student involvement. Our students only remembered our element themed nicknames as opposed to our actual names.

### Additional materials:

Presentation: (click 'Open with Google Slides')

[https://drive.google.com/open?id=1xcLDcKRiRQdQQT7CQZK\\_btPbkertMWu8](https://drive.google.com/open?id=1xcLDcKRiRQdQQT7CQZK_btPbkertMWu8)

# WEEK 4 LESSON PLAN

Topic: Periodic Trends & Hydrogen

<b>Lesson Activity Name:</b>	Hi! (-drogen)
<b>Length of Activity:</b>	Presentation: 20 minutes. Experiment: 20 minutes. Activity: 10 minutes.
<b>Supplies:</b>	Dry active yeast, dish soap, baking soda, 2L soda bottle, warm water, measuring cups, small cup, food coloring, funnel, hydrogen peroxide <a href="https://sciencebob.com/fantastic-foamy-fountain/">https://sciencebob.com/fantastic-foamy-fountain/</a>

## Directions:

Begin the club with a presentation on trends of the periodic table. We focused on atomic radius, electronegativity, and ionization energy. Explain the meaning of each trend and demonstrate how they change throughout the periodic table. For example, we discussed how the atomic radius changes from element to element because of the pull of the protons on the electron cloud. Throughout the presentation, demonstrate what each of these look like using yourselves and students as models. For example, my partner and I interlocked our index fingers and stood far away from each other. When the students (gently) pulled on my arm, it was easy for them to pull me away. However, when we interlocked our arms and stood very close together, it was difficult for the students to pull us apart. This helped the students to conceptualize ionization energy. After the periodic table trend activity and discussion, explain the properties and uses of helium. Complete the elephant toothpaste experiment. Allow sufficient time for clean-up and be sure to do this experiment outside if possible. Finish the club with an explanation of what happened during the experiment and show a video of more extreme versions of the reaction (found in the presentation linked below).

## Conclusion of the activity:

Students left with a knowledge of periodic table trends and changed across the periodic table. Students also gained a greater knowledge on the usages and properties of hydrogen.

## Parts of activity that worked:

Students enjoyed the experiment and the video of a larger version of the experiment.

## Parts of activity that did not work:

Our elephant toothpaste experiment was not as exciting as anticipated because we didn't add enough water to the yeast. Watch the linked YouTube video of the world's largest elephant toothpaste experiment to know where the important parts of the video are.

## Additional materials:

Presentation: (click 'Open with Google Slides')

<https://drive.google.com/open?id=1Q--OC-IW2a-eF47rSHUIqdwZl-rux3EN>

# WEEK 5 LESSON PLAN

Topic: Elements in Food & Carbon

**Lesson Activity Name:** Car-bon Appétit

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**Length of Activity:** Presentation & Activity: 30 minutes. Experiment: 15 minutes.

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**Supplies:** Chocolate, candy, bread, turkey, fruit, etc.  
Dry ice, bubbles, safety gloves, tongs, container and/or cooler.  
(<https://www.stevespanglerscience.com/lab/experiments/awesome-dry-ice-experiments/>)

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**Directions:**

Start by introducing the properties and uses of carbon. Then, explain the role of elements of the periodic table in the food that we eat. We focused on the structure of glucose and how those elements get converted into energy for humans to use. Bring food for each student to eat as you discuss its chemical composition. (Check for allergies before bringing food.) Before starting the experiment, go over lab safety and rules. Demonstrate the properties of dry ice. Try putting the dry ice in a bowl and covering it with bubbles or adding water. Explain what dry ice is and what's happening when water is added. Be sure to explain how dry ice is unique because earlier experiments focused on carbon dioxide in a gaseous state.

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**Conclusion of the activity:**

Students will have a greater understanding of the role of chemistry in nutrition. They will also be exposed to unique physical properties of carbon dioxide with dry ice.

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**Parts of activity that worked:**

N/A due to COVID-19

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**Parts of activity that did not work:**

N/A due to COVID-19

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**Additional materials:**

Presentation: (click 'Open with Google Slides')

[https://drive.google.com/open?id=1VK2XsGX-7rNhS7P\\_wqdCYGpHkGAbC6-a](https://drive.google.com/open?id=1VK2XsGX-7rNhS7P_wqdCYGpHkGAbC6-a)

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# WEEK 6 LESSON PLAN

Topic: Metals & Iron

**Lesson Activity Name:** Fe Man

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**Length of Activity:** Presentation: 15 minutes. Experiment: 35 minutes.

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**Supplies:** <https://www.stevespanglerscience.com/lab/experiments/magnetic-slime/>  
White glue, borax, small plastic bowls, small plastic cup, measuring cups, plastic spoons, sealable plastic bags, iron filings, neodymium magnets, warm water.

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**Directions:**

Spend the first 15 minutes giving a presentation that introduces students to metals, highlighting the element of the day as iron. Show their location on the periodic table and ask students which metals they recognize and where they might find them in everyday life. Emphasize that metals can have very different properties by just adding one more electron/proton. Discuss how the periodic table shows the trend of melting point, then introduce other properties of metals including conductivity and magnetism. Transition into the experiment and pass out a small plastic cup, bowl, and spoon to each student. Pass out the rest of the materials as each step proceeds. Conduct the experiment linked above while cutting the recipe in half (or any fraction you choose) per student. Emphasize that students should wait until everyone is done with each step or their slime may not work. Explain the role that iron plays in this experiment. As students experiment with their slime, ask them to come up with a creative way this slime could be used in the everyday world and share. Save plenty of time for cleanup.

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**Conclusion of the activity:**

Students will have an understanding of properties and uses of metals, as well as iron.

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**Parts of activity that worked:**

N/A due to COVID-19

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**Parts of activity that did not work:**

N/A due to COVID-19

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**Additional materials:**

Presentation: (click 'Open with Google Slides')

<https://drive.google.com/file/d/1x5eMXyIcDaMPt0rxoQ2bZnIzIt6ulT85/view?usp=sharing>

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# WEEK 7 LESSON PLAN

Topic: Iodine & Periodic Predictions

<b>Lesson Activity Name:</b>	Time for Iodine
<b>Length of Activity:</b>	Presentation: 10 minutes. Experiment: 10 minutes. Activities: 30 minutes.
<b>Supplies:</b>	<a href="https://www.wikihow.com/Perform-the-Iodine-Clock-Reaction">https://www.wikihow.com/Perform-the-Iodine-Clock-Reaction</a> 3% hydrogen peroxide, 1000 mg vitamin C tablets, 5% iodine tincture, distilled water, cornstarch, coffee filters, clear containers, spoon, measuring cups (or large grad. cylinder), 25 mL grad. cylinder.

### Directions:

In the first 10 minutes, give a presentation that introduces iodine and its' use, as well as showing some reactions. Ask students to make predictions about iodine's physical properties based on its' position on the periodic table, then explain the answers. Perform the iodine clock experiment afterwards. Following the experiment, transition into a discussion of making periodic predictions with many different elements beyond iodine. Discuss how the periodic table was deliberately organized to show commonalities between elements. Break students up into groups of 2 and have each group find something specific they have in common (i.e. they each have 1 sister). Explain how these groups illustrate the groups of the periodic table. Next, pair up two groups and have them try to find something less specific they have in common (i.e. they all like sandwiches). Discuss how these larger groups show that groups next to each other on the periodic table have things in common as well. Stand as a group on one side of the classroom. Conduct the attached "Periodic Predictions" activity as a review of what has been covered so far.

### Conclusion of the activity:

Students will be able to use what they've learned in previous presentations to make predictions about elements in the periodic table. Students will also gain an understanding of the properties and uses of iodine.

### Parts of activity that worked:

N/A due to COVID-19.

### Parts of activity that did not work:

N/A due to COVID-19.

### Additional materials:

Presentation: (click 'Open with Google Slides')

<https://drive.google.com/file/d/1mseL1xHHeUqrJhexfjErVRPTfjGX25iz/view?usp=sharing>

Periodic Predictions Activity:

[https://docs.google.com/document/d/1vFA3tXsu8ZYHdAQQG1lZBw7vb\\_wNbea9ERjbFSJqPaxk/edit?usp=sharing](https://docs.google.com/document/d/1vFA3tXsu8ZYHdAQQG1lZBw7vb_wNbea9ERjbFSJqPaxk/edit?usp=sharing)

## WEEK 8 LESSON PLAN

Topic: Phosphorus, Sodium, and Environmental Elements

**Lesson Activity Name:** Fire & Ice

**Length of Activity:** Presentation: 20 minutes. Experiments: 10 minutes. Activity: 20 minutes.

**Supplies:** <https://melscience.com/US-en/articles/artificial-snow-experiment/>  
Sodium polyacrylate, distilled water, graduated cylinder.  
<https://melscience.com/US-en/articles/smoking-fingers-experiment/>  
Matchboxes, lighter.

**Directions:**

Spend the first 20 minutes giving a presentation about the two elements of the day, emphasizing that they are just a few of multitudes of elements that surround us and make up the natural world. Show videos of cool reactions these elements participate in. Conduct the artificial snow sodium experiment, highlighting that this is often the same snow used in movies. Also conduct the phosphorus smoking fingers experiment. Next, introduce students to how to read charge of main group elements from the periodic table. Emphasize opposite charge attractions, and how molecules tend to want to be neutral. Use sodium chloride as an example. Conduct the “Charge Tag” activity (preferably outside, but a gym works too.)

**Conclusion of the activity:**

Students will have an understanding of the role elements have in the environment, as well as the properties and uses of phosphorus and sodium.

**Parts of activity that worked:**

N/A due to COVID-19.

**Parts of activity that did not work:**

N/A due to COVID-19.

**Additional Materials:**

Presentation: (click ‘Open with Google Slides’)

<https://drive.google.com/file/d/1Eb4igQ4cBXcxyy2cv-0Q4fUkHRiTX6KP/view?usp=sharing>

Charge Tag Activity:

[https://docs.google.com/document/d/19QHom6ZT7x9u\\_JfmkiF0slKcHzX7jk5GA4-Pgl6vCoI/edit?usp=sharing](https://docs.google.com/document/d/19QHom6ZT7x9u_JfmkiF0slKcHzX7jk5GA4-Pgl6vCoI/edit?usp=sharing)

# WEEK 9 LESSON PLAN

Topic: Elements in Technology & Silicon

**Lesson Activity Name:**

Silicon Valley

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**Length of Activity:**

Presentation: 15 minutes. Experiment: 20 minutes. Activity: 15 minutes.

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**Supplies:**

<https://www.instructables.com/id/Magic-Sand/>  
Baking sheet, aluminum foil, sand, can of Scotchgard Protector, water.

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**Directions:**

Begin with a presentation over silicon, and other elements that are used in technology. Discuss the uses of silicon beyond technology as well. After the presentation, introduce students to the concepts of hydrophilic and hydrophobic substances, then conduct the hydrophobic sand experiment. The experiment could be modified to allow each student to create their own miniature mixture of the sand and take it home with them. After this experiment, recap silicon's semi conductive properties and its' use in electronics. Finish by playing the game 'Pulse' to demonstrate electrical current, linked below. Connect the slowness of the group's current to the way silicon works and talk about how silicon can be mixed with other metals to change the way it conducts.

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**Conclusion of the activity:**

Students will learn about how the elements are used in modern technology and industry, specifically on the properties and uses of silicon.

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**Parts of activity that worked:**

N/A due to COVID-19.

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**Parts of activity that did not work:**

N/A due to COVID-19.

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**Additional Materials:**

Presentation: (click 'Open with Google Slides')

<https://drive.google.com/file/d/1ZcPJm5q9lZI3AYSZRZLuAuFVWA9Bv8W-w/view?usp=sharing>

Pulse Activity: <https://www.playworks.org/resource/game-of-the-week-pulse/>

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## WEEK 10 LESSON PLAN

Topic: Flame Tests & Ways to Identify Elements

**Lesson Activity Name:** Igniting the Love for Chemistry

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**Length of Activity:** Introduction: 10 minutes. Experiment: 10 minutes. Activity: 30 minutes.

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**Supplies:** <https://www.stevespanglerscience.com/lab/experiments/flame-test/>  
Various compounds, metal spatula, Bunsen burner

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### **Directions:**

Introduce students to the concept of identifying elements based on their physical properties. Ask students to brainstorm ways they might separate a mixture of elements. Talk about ways scientist use these properties (like size, solubility, melting point, flame color) in real laboratories. Conduct the flame test experiment linked above. There is a useful chart at the bottom of the website that shows different elements you could use based on their availability. The experiment tends to be brighter if you use a metal spatula, a Bunsen burner, and turn out the lights. Afterwards, explain to students that the elements of the day will be ones they create. Have students create their own elements in a format like the example one I linked below (hopefully your students make elements that look MUCH better than mine!) Have students present their elements at the end of the session.

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### **Conclusion of the activity:**

Students will have the opportunity to present the elements they created themselves and reflect on all they've learned throughout the semester. Students will also be introduced to flame tests and how they can be used to identify elements.

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### **Parts of activity that worked:**

N/A due to COVID-19.

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### **Parts of activity that did not work:**

N/A due to COVID-19.

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### **Additional Materials:**

Sample Element:

[https://drive.google.com/file/d/1rNgZC6oTEiK6MPpKxHC4bSDHsJqDZ\\_Oy/view?usp=sharing](https://drive.google.com/file/d/1rNgZC6oTEiK6MPpKxHC4bSDHsJqDZ_Oy/view?usp=sharing)

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