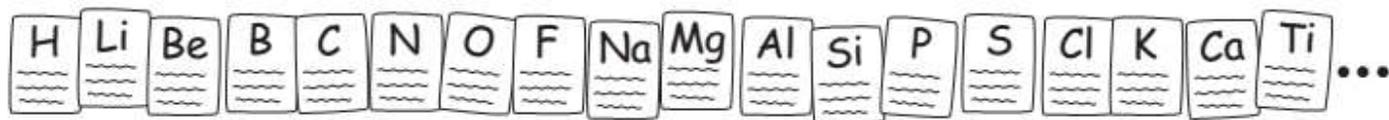


Read “The First Periodic Table” and answer the following questions:

1. What was the first way that Mendeleev organized his element cards?
2. Why did Mendeleev organize the element cards into several short rows and columns?
3. Why is the element table called the “periodic” table of elements?
4. Why did Mendeleev move Titanium (and the elements after it) to the right after organizing his table? What occurred as a result?
5. How was Mendeleev able to predict elements?
6. What part of Mendeleev’s original periodic table is still used in the way the periodic table is currently organized?

THE FIRST PERIODIC TABLE

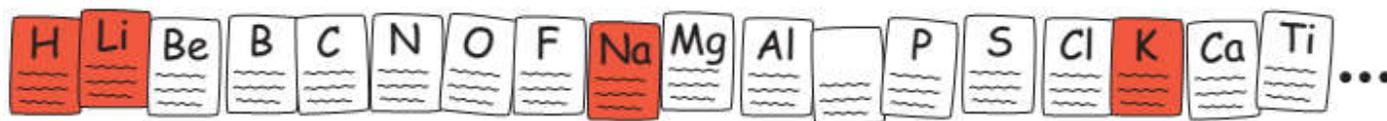
In 1869, a Russian chemist named Dmitry Ivanovich Mendeleev (1834–1907) was writing a book about the elements. He made a set of element cards. Each card had one element's name and symbol and everything that was known about it. He put the cards in one long row from lightest to heaviest, hydrogen to uranium.



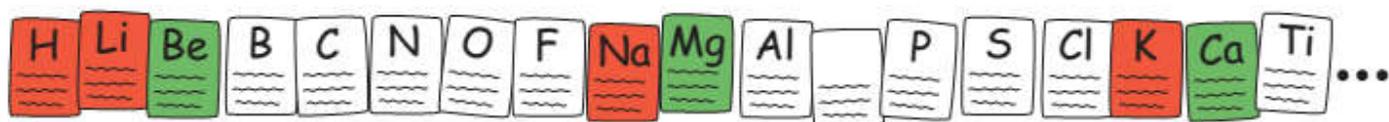
Mendeleev looked at the line of element cards and saw something interesting. The first two elements, **hydrogen** (H) and **lithium** (Li), had similar chemical properties.



And as he looked down the line, he noticed that **sodium** (Na) and **potassium** (K) also had chemical properties similar to **hydrogen** and **lithium**. The similar chemical properties showed up periodically in his lineup.

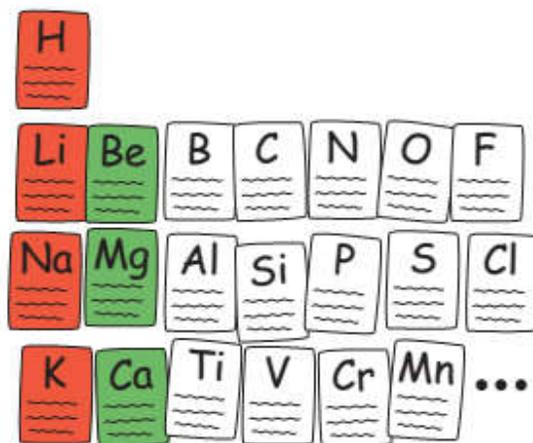


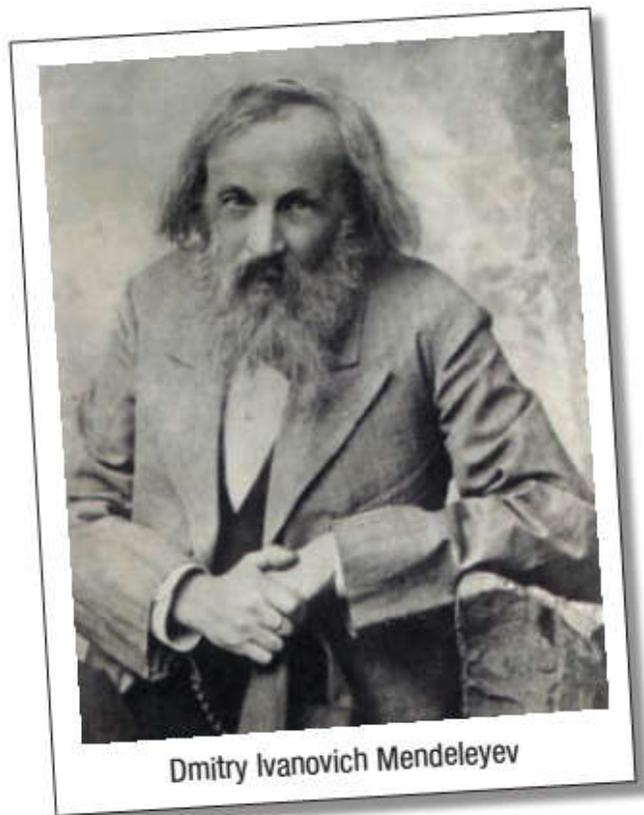
Then Mendeleev saw that **beryllium** (Be), **magnesium** (Mg), and **calcium** (Ca) all had similar, but different properties. The similar chemical properties of beryllium, magnesium, and calcium showed up periodically, too.



Mendeleev had an idea. He reorganized the cards into several short rows. This way all the elements with similar properties lined up in columns. The columns are called groups.

The periodic recurrence of similar chemical properties is why the element table is called the periodic table of the elements.





When Mendeleev had all the elements laid out, he noticed something was wrong. For instance, the chemical properties of **titanium** (Ti) were not like those of **aluminum** (Al) and **boron** (B) above it.

H						
Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl
K	Ca	Ti	V	Cr	Mn	...

When Mendeleev moved titanium and its neighbors to the right, two things happened. The chemical properties of the elements lined up better. And there was a gap in the table of elements.

Mendeleev looked at the gap and **predicted** that an undiscovered element must fit in that spot. Furthermore, he predicted the properties that the new element would have. By moving the known elements around so that their properties lined up, Mendeleev predicted about 30 new elements. Over the next 30 years, most of them were discovered.

H						
Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl
K	Ca	?	Ti	V	Cr	Mn ...

→

THE MODERN PERIODIC TABLE OF THE ELEMENTS

The modern **periodic table of the elements** organizes and displays all the elements from simplest to most complex. Hydrogen, the simplest element, is number 1. Mendeleev's idea of putting the elements in rows under each other, so that the chemical properties are similar in the columns, is still used. But Mendeleev didn't know what we know today. There are 2 elements in row 1, 8 elements in rows 2 and 3, 18 elements in rows 4 and 5, and 32 elements in rows 6 and 7. This is the modern periodic table.

Getting to know the Periodic Table:

1. Find your “staircase” on the right side of the periodic table. Feel free to make the lines thicker.
2. Using **THREE DIFFERENT COLORS**, draw a **BORDER** around the elements (don’t color them in) that are categorized below. **Be sure to include a color key.** There should not be any empty squares when you are done
 - a. **Semi-Metals (Metalloids):** these are elements that have characteristics of both metals and nonmetals. Metalloids are located along the “staircase” on the periodic table and are: B, Si, Ge, As, Sb, Te, Po, At
 - b. **Metals:** these are elements that are to the left of or below the “staircase” and the metalloids on the periodic table. **DON’T FORGET** to include the two bottom-most rows on the table!
Note: Hydrogen is NOT A METAL
 - c. **Nonmetals:** these are the elements that are to the right of or above the “staircase”.
Note: Hydrogen IS A NONMETAL

Groups: Color the following elements by **shading in their box** with a different color for each group.

1. **Alkali metals:** all group 1 (1st column) elements **EXCEPT for hydrogen.**
 - a. These elements are very reactive.
 - b. They all have **1 valence electron ($_s^1$)**
2. **Alkaline earth metals:** these are the group 2 elements.
 - a. They are also pretty reactive, but not as much as the alkali metals.
 - b. These elements all have **2 valence electrons ($_s^2$)**
3. **Transition metals:** These metals are found in the middle block of the periodic table in groups 3-12.
 - a. They don’t have a defined number of valence electrons.
 - b. They tend to lose electrons to form cations
4. **Halogens:** these are the group 17 elements.
 - a. These are very reactive nonmetals.
 - b. They all have **7 valence electrons ($_s^2_p^5$)**
5. **Noble gases:** these are the group 18 elements.
 - a. They are special because they have a **full valence shell.**
 - b. They are extremely stable and unreactive elements that don’t form bonds with other compounds in nature. This is why they are sometimes referred to as “inert gases”
6. **Boron Family: group 13**
 - a. They all have **3 valence electrons ($_s^2_p^1$)**
7. **Carbon family: group 14**
 - a. They all have **4 valence electrons ($_s^2_p^2$)**
8. **Nitrogen family: group 15**
 - a. They all have **5 valence electrons ($_s^2_p^3$)**
9. **Oxygen family: group 16**
 - a. They all have **6 valence electrons ($_s^2_p^4$)**
10. **Lanthanide series:** these are the elements found in the top row of the bottommost two rows (detached) on the table: elements 58-71
11. **Actinide series:** these are the elements found in the bottom row of the bottommost two rows (detached) on the table: elements 90-103.

Intro to Periodic Table Questions

- Beryllium is classified as
 - an alkaline earth metal
 - an alkali metal
 - a transition metal
 - a noble gas
- More than two-thirds of the elements of the periodic table are
 - metalloids
 - metals
 - nonmetals
 - noble gases
- Which element is a member of the halogen family?
 - K
 - B
 - I
 - S
- Which compound contains an alkali metal and a halogen?
 - CaCl_2
 - CaS
 - RbCl
 - Rb_2S
- The metalloids that are included in Group 15 are antimony (Sb) and
 - N
 - P
 - As
 - Bi
- In which group does each element have a total of four electrons in the outermost energy level?
 - 1
 - 18
 - 16
 - 14
- The elements known as the alkaline earth metals are found in group
 - 1
 - 2
 - 16
 - 17
- Which element is an alkali metal?
 - Na
 - Mg
 - Al
 - Cl
- Which element is classified as a noble gas?
 - Hydrogen
 - Oxygen
 - Neon
 - Nitrogen
- Which group 15 element exists as diatomic molecules at STP?
 - Phosphorous
 - Nitrogen
 - Bismuth
 - Arsenic
- Which list of elements consists of a metal, a metalloid, and a nonmetal?
 - Li, Na, Rb
 - Cr, Mo, W
 - Sn, Si, C
 - O, S, Te
- Given the following Lewis electron-dot diagrams, identify the group each element belongs to:
 $\begin{array}{cccc} \cdot\cdot & & \cdot\cdot & \cdot\cdot \\ \cdot\text{X} & & \text{X} & \cdot\text{X} \\ \cdot\cdot & & & \cdot\cdot \end{array}$

