Chemistry

Name _____
Date _____Block _____

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?

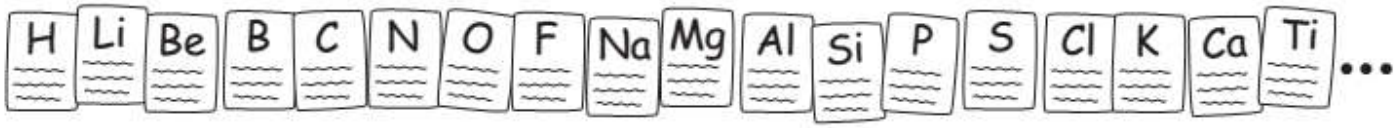
4. Why did Mendeleev move Titanium (and the elements after it) to the right after organizing his table? What occurred as a result?

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 Mendeleyev (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.



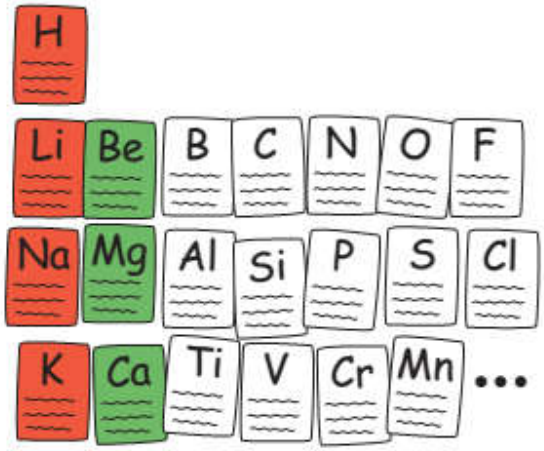
Mendeleyev looked at the line of element cards and saw something interesting. The first two elements, hydrogen (H) and lithium (Li), had similar chemical properties.

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 Mendeleyev 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.

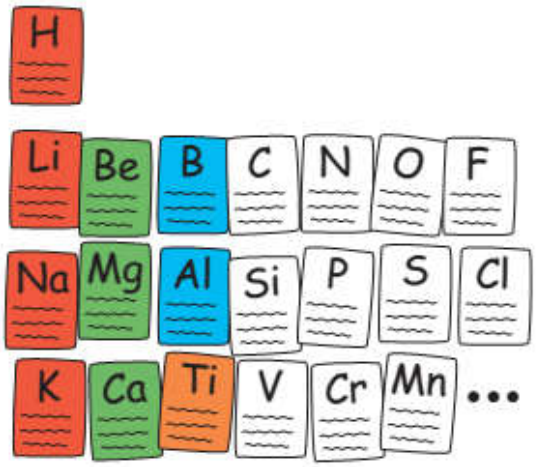
Mendeleyev had an idea. He reorganized the cards into several short rows. This way all the elements with similar properties lined up in columns. The columns are called groups.

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



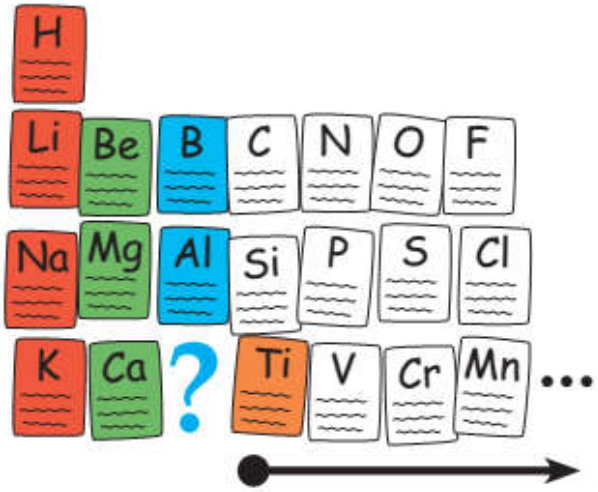
Dmitry Ivanovich Mendeleyev

When Mendeleyev 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.



When Mendeleyev 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.

Mendeleyev 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, Mendeleyev predicted about 30 new elements. Over the next 30 years, most of them were discovered.



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. Mendeleyev'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 Mendeleyev 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.

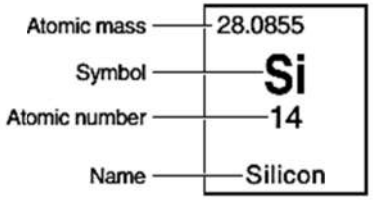
Getting to know the Periodic Table:

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.

Periodic Table of the Elements



Period	Group 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.00794 H 1 Hydrogen																	4.00260 He 2 Helium
2	6.941 Li 3 Lithium	9.01218 Be 4 Beryllium											10.81 B 5 Boron	12.0111 C 6 Carbon	14.0067 N 7 Nitrogen	15.9994 O 8 Oxygen	18.998403 F 9 Fluorine	20.179 Ne 10 Neon
3	22.98977 Na 11 Sodium	24.305 Mg 12 Magnesium											26.98154 Al 13 Aluminum	28.0855 Si 14 Silicon	30.97376 P 15 Phosphorus	32.06 S 16 Sulfur	35.453 Cl 17 Chlorine	39.948 Ar 18 Argon
4	39.0983 K 19 Potassium	40.08 Ca 20 Calcium	44.9559 Sc 21 Scandium	47.88 Ti 22 Titanium	50.9415 V 23 Vanadium	51.996 Cr 24 Chromium	54.9380 Mn 25 Manganese	55.847 Fe 26 Iron	58.9332 Co 27 Cobalt	58.69 Ni 28 Nickel	63.546 Cu 29 Copper	65.39 Zn 30 Zinc	69.72 Ga 31 Gallium	72.59 Ge 32 Germanium	74.9216 As 33 Arsenic	78.96 Se 34 Selenium	79.904 Br 35 Bromine	83.80 Kr 36 Krypton
5	85.4678 Rb 37 Rubidium	87.62 Sr 38 Strontium	88.9059 Y 39 Yttrium	91.224 Zr 40 Zirconium	92.9064 Nb 41 Niobium	95.94 Mo 42 Molybdenum	(98) Tc 43 Technetium	101.07 Ru 44 Ruthenium	102.906 Rh 45 Rhodium	106.42 Pd 46 Palladium	107.868 Ag 47 Silver	112.41 Cd 48 Cadmium	114.82 In 49 Indium	118.71 Sn 50 Tin	121.75 Sb 51 Antimony	127.60 Te 52 Tellurium	126.905 I 53 Iodine	131.29 Xe 54 Xenon
6	132.905 Cs 55 Cesium	137.33 Ba 56 Barium	138.906 La 57 Lanthanum	178.49 Hf 72 Hafnium	180.948 Ta 73 Tantalum	183.85 W 74 Tungsten	186.207 Re 75 Rhenium	190.2 Os 76 Osmium	192.22 Ir 77 Iridium	195.08 Pt 78 Platinum	196.967 Au 79 Gold	200.59 Hg 80 Mercury	204.383 Tl 81 Thallium	207.2 Pb 82 Lead	208.980 Bi 83 Bismuth	(209) Po 84 Polonium	(210) At 85 Astatine	(222) Rn 86 Radon
7	(223) Fr 87 Francium	226.025 Ra 88 Radium	227.028 Ac 89 Actinium	(261) Rf 104 Rutherfordium	(262) Db 105 Dubnium	(263) Sg 106 Seaborgium	(262) Bh 107 Bohrium	(265) Hs 108 Hassium	(266?) Mt 109 Meitnerium	(269?) 110								

Mass numbers in parentheses are those of the most stable or most common isotope.

140.12 Ce 58 Cerium	140.908 Pr 59 Praseodymium	144.24 Nd 60 Neodymium	(145) Pm 61 Promethium	150.36 Sm 62 Samarium	151.96 Eu 63 Europium	157.25 Gd 64 Gadolinium	158.925 Tb 65 Terbium	162.50 Dy 66 Dysprosium	164.930 Ho 67 Holmium	167.26 Er 68 Erbium	168.934 Tm 69 Thulium	173.04 Yb 70 Ytterbium	174.967 Lu 71 Lutetium
232.038 Th 90 Thorium	231.036 Pa 91 Protactinium	238.029 U 92 Uranium	237.048 Np 93 Neptunium	(244) Pu 94 Plutonium	(243) Am 95 Americium	(247) Cm 96 Curium	(247) Bk 97 Berkelium	(251) Cf 98 Californium	(252) Es 99 Einsteinium	(257) Fm 100 Fermium	(258) Md 101 Mendelevium	(259) No 102 Nobelium	(260) Lr 103 Lawrencium

Intro to Periodic Table Questions

1. Beryllium is classified as
   a. an alkaline earth metal
   b. an alkali metal
   c. a transition metal
   d. a noble gas

2. More than two-thirds of the elements of the periodic table are
   a. metalloids
   b. metals
   c. nonmetals
   d. noble gases

3. Which element is a member of the halogen family?
   a. K
   b. B
   c. I
   d. S

4. Which compound contains an alkali metal and a halogen?
   a. $CaCl_2$
   b. CaS
   c. RbCl
   d. Rb_2S

5. The metalloids that are included in Group 15 are antimony (Sb) and
   a. N
   b. P
   c. As
   d. Bi

6. In which group does each element have a total of four electrons in the outermost energy level?
   a. 1 c. 16
   b. 18 d. 14

7. The elements known as the alkaline earth metals are found in group
   a. 1
   b. 2
   c. 16
   d. 17

8. Which element is an alkali metal?
   a. Na
   b. Mg
   c. Al
   d. Cl

9. Which element is classified as a noble gas?
   a. Hydrogen
   b. Oxygen
   c. Neon
   d. Nitrogen

10. Which group 15 element exists as diatomic molecules at STP?
    a. Phosphorous
    b. Nitrogen
    c. Bismuth
    d. Arsenic

11. Which list of elements consists of a metal, a metalloid, and a nonmetal?
    a. Li, Na, Rb
    b. Cr, Mo, W
    c. Sn, Si, C
    d. O, S, Te

12. Given the following Lewis electron-dot diagrams, identify the group each element belongs to: