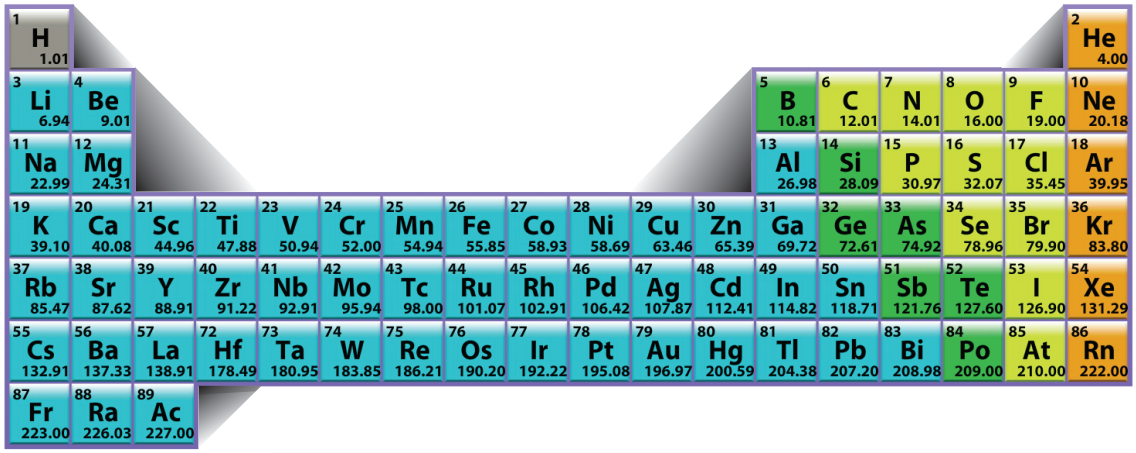
STEM Sims™

Periodic Table



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Periodic Table

Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Start learning right now about the periodic table. Take the following brief quiz to see how much you already know about this wonderful chemical tool. See the bottom of page 4 to check your answers.

1. Which element is named after the Greek word for the sun?
   a. sodium
   b. hydrogen
   c. selenium
   d. helium

2. Which element's old Latin name was "aurum"?
   a. argon
   b. gold
   c. silver
   d. arsenic

3. Mercury is one of two elements on the periodic table that exist as a liquid at normal room temperatures and standard pressures. What other element on the table exists as a liquid under these same conditions?
   a. boron
   b. cadmium
   c. bromine
   d. selenium

4. How would the majority of elements on the periodic table best be classified?
   a. metals
   b. non-metals
   c. metalloids
   d. organic

5. Which of the following elements currently sells for the highest price per gram?
   a. gold
   b. platinum
   c. plutonium
   d. rhodium

Straw Table

The periodic table demonstrates a number of useful trends that provide users with valuable data without having to look up specific values. Atomic radius is defined as the distance from the center of an atom's nucleus to it outermost electrons in the ground state. The following activity offers an excellent visualization of this trend on the table.

Materials

- About 20 straws (each student or group)
- 1- pair of scissors (each student)
- 1- centimeter ruler (each student)
- 1- 8 by 12 well microtiter plate (each student or group)

Procedure

1. Review the atomic radii data and location on the periodic table for elements 1–54.
2. Align the microtiter plate horizontally. The well labeled A1 should be at the top left of the plate.
3. The element hydrogen will be located in the A1 well. The A8 well will be helium.
4. Group 3–12 elements will ***not*** be included in this activity.
5. On the microtiter plate, you will only use columns 1–8 (for groups 1, 2, 13, 14, 15, 16,17, and 18) and rows A - E (for periods 1, 2, 3, 4, and 5).
6. Using the scale 40 pm (picometers) = 1 cm (centimeter), cut straws to the proper length to show the atomic radii trend for elements 1–54 on the microtiter plate. Remember that groups 3–12 are ***not*** included in this activity.

Element	Radius (pm)	Element	Radius (pm)
Aluminum	143	Krypton	112
Antimony	141	Lithium	152
Argon	98	Magnesium	160
Arsenic	120	Neon	70
Boron	85	Nitrogen	70
Beryllium	112	Oxygen	73
Bromine	114	Phosphorus	110
Calcium	197	Potassium	227
Carbon	77	Rubidium	248
Chlorine	99	Selenium	117
Fluorine	72	Silicon	118
Gallium	135	Sodium	186

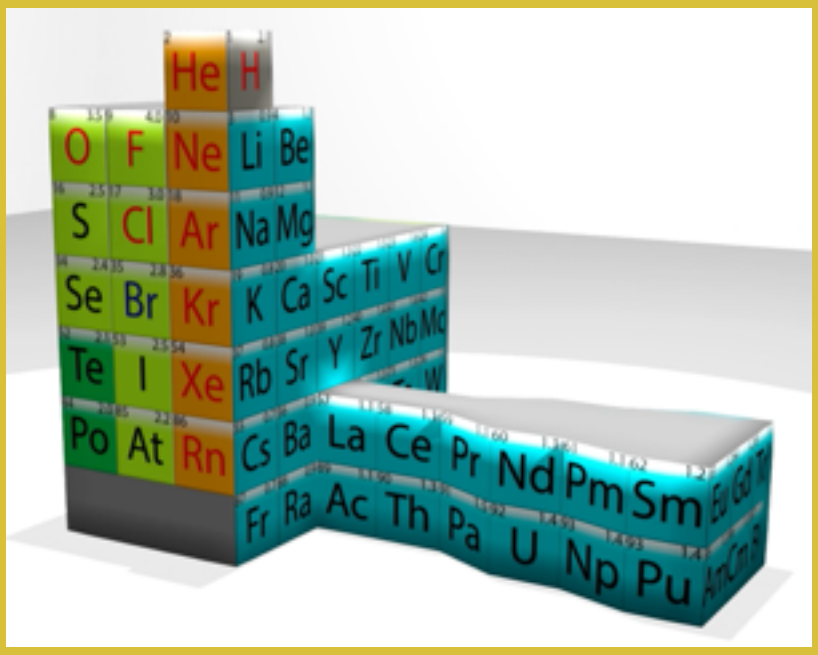
1) Discuss the horizontal and vertical trends on the periodic table for atomic radii.

Periodic Table

The 3D Periodic Table

One of the limitations of using most periodic tables is their 2D format. The 2D presentation does *not* clearly show the chemical reactivity trend demonstrated by the group 1 and 2 elements. The real reactivity trend is that the closer an element is to having a noble gas electron configuration, the generally more reactive the element. While group 17 on the table clearly shows this by their closeness to group 18, groups 1 and 2 are on the opposite side of the table, which might lead some to *incorrectly* believe that they are *not* very reactive. However, if the 2D table is formed into a cylinder, this new 3D table with group 1 adjoining group 18 would effectively illustrate the reactivity trend.

Another limitation of the 2D table model involves the lanthanide and actinide series. Typically on the periodic table, the closer elements are together, the more similar their properties. The 2D table presents the elements of each series in a horizontal fashion when in fact, most of the elements in each series have very similar properties. The 3D presentation better shows this relationship.



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Answers: Page 2 Answers: 1) d, 2) b, 3) c, 4) a, 5) c. **Page 3 Straw Table Answer:** 1) Moving horizontally across a period from left to right, the radii decrease with increasing atomic number. Moving vertically from bottom to top, the radii decrease with decreasing atomic number.

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