

PART C: PERIODIC TABLE TRENDS

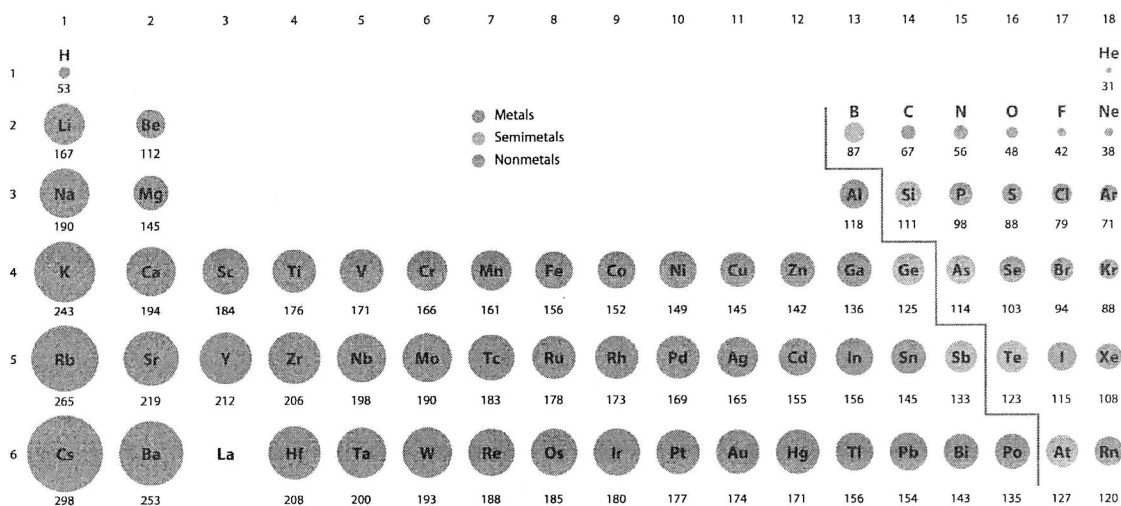
In chemistry the term trend refers to a regular pattern in the properties of elements based on their atomic structure.

This is the pattern that Mendeleev predicted. When the pattern repeated, he began a new period.

The periodic table is a powerful tool for analyzing trends in atomic size and reactivity.

ATOMIC SIZE TRENDS:

Observe the sizes of the atoms in each group and period shown in the diagram below. Do you see a pattern?



1. Atomic size increases moving DOWN a group/column.

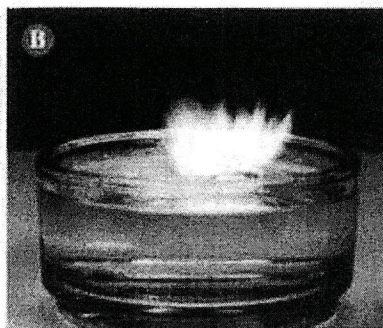
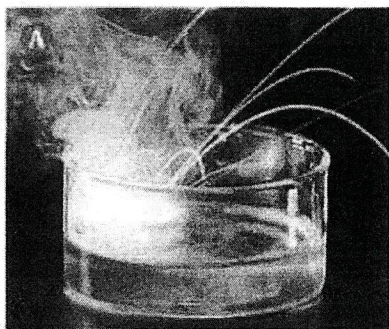
- as you move **down** a group, elements have atoms with more energy shells.
- the greater the number of electron shells, the farther away from the nucleus the **valence electrons** are
- if the electrons are farther away, the atom is larger.

2. Atomic size decreases moving LEFT to RIGHT across a period/row.

- elements have greater numbers of electrons in their valence shells as you move LEFT to RIGHT.
- as the number of electrons increases, so does the number of protons in the nucleus.
- the attraction between the negative valence electrons and the positive nucleus is **very strong**.
- with each electron added, the outer shell is pulled closer to the nucleus and the atomic size decreases.

REACTIVITY TRENDS:

Compare what happens when **potassium (A)** and **sodium (B)** are added to water:



You can see that the reaction is more vigorous and violent in 'A', water + potassium.

Why is this the case?

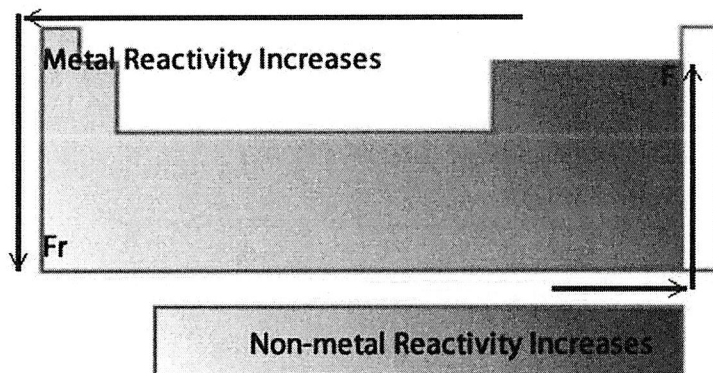
What is **similar** about potassium and sodium? alkali metals, 1 valence electron

What is **different** about potassium and sodium? potassium has an extra electron shell

- Because potassium's valence electrons are farther away from the nucleus than the electrons in a sodium atom, the attraction to the nucleus is lower.
- Electrons further from the nucleus require less energy (*are easier*) to remove.
- The adding and removing of electrons is what is involved in chemical reactions.
- This is why we would say that potassium is **more reactive** than sodium.

This pattern repeats throughout the periodic table with the **exception of the noble gases**.

- the noble gases have a FULL valence shell, they are stable and inert
(non-reactive)



PRACTICE

1. Explain why atoms get larger down a group on the periodic table:
2. Explain why atoms get smaller from LEFT to RIGHT across a periodic table:
3. Why is an alkali metal MORE reactive than an alkaline-earth metal in the same period?