Electronic structure

Schweitzer

Monatomic vs. Polyatomic

- Monatomic ion: single atom ion
  - Na^+
- Polyatomic Ion (Family)
  - NH_4^+ Ammonium

Ion Quizes

- You will be quizzed on the names and formulas of these common ions
- Quiz
- All Cations
- -1 anions
- -2/-3 anions
- All ions

IONS… THINGS TO REMEMBER

- Some metals have more then one charge we denote this charge by the Name as a Roman Numeral

- Copper (I) Cu^{+1}
- Copper (II) Cu^{+2}

- Iron (II) Fe^{2+}
- Iron (III) Fe^{3+}

IONS… THINGS TO REMEMBER

- F^{-1} Flouride is an anion. It has a special ending "ide"
- Flourine: F_2 is a very deadly gas!
- Flouride: F^{-1} is in your tooth paste!

- This special ending is for a anions specific charge

IONS… THINGS TO REMEMBER

- Nitrate vs. Nitrite
  - NO_3^- vs. NO_2^-
  - ate vs. ite
    - Both contain oxygen
    - ate contains one more oxygen then ite

  Example:
  - Sulfate: SO_4^{-2}
  - Sulfite: SO_3^{-2}

IONS… THINGS TO REMEMBER

- Some prefixes also give you information as well.
- "per" 1 more oxygen
- "hypo" 1 less oxygen

Perchlorate	ClO_4^{-1}
Chlorate	ClO_3^{-1}
Chlorite	ClO_2^{-1}
Hypochlorite	ClO^{-1}

Typical Practice Questions

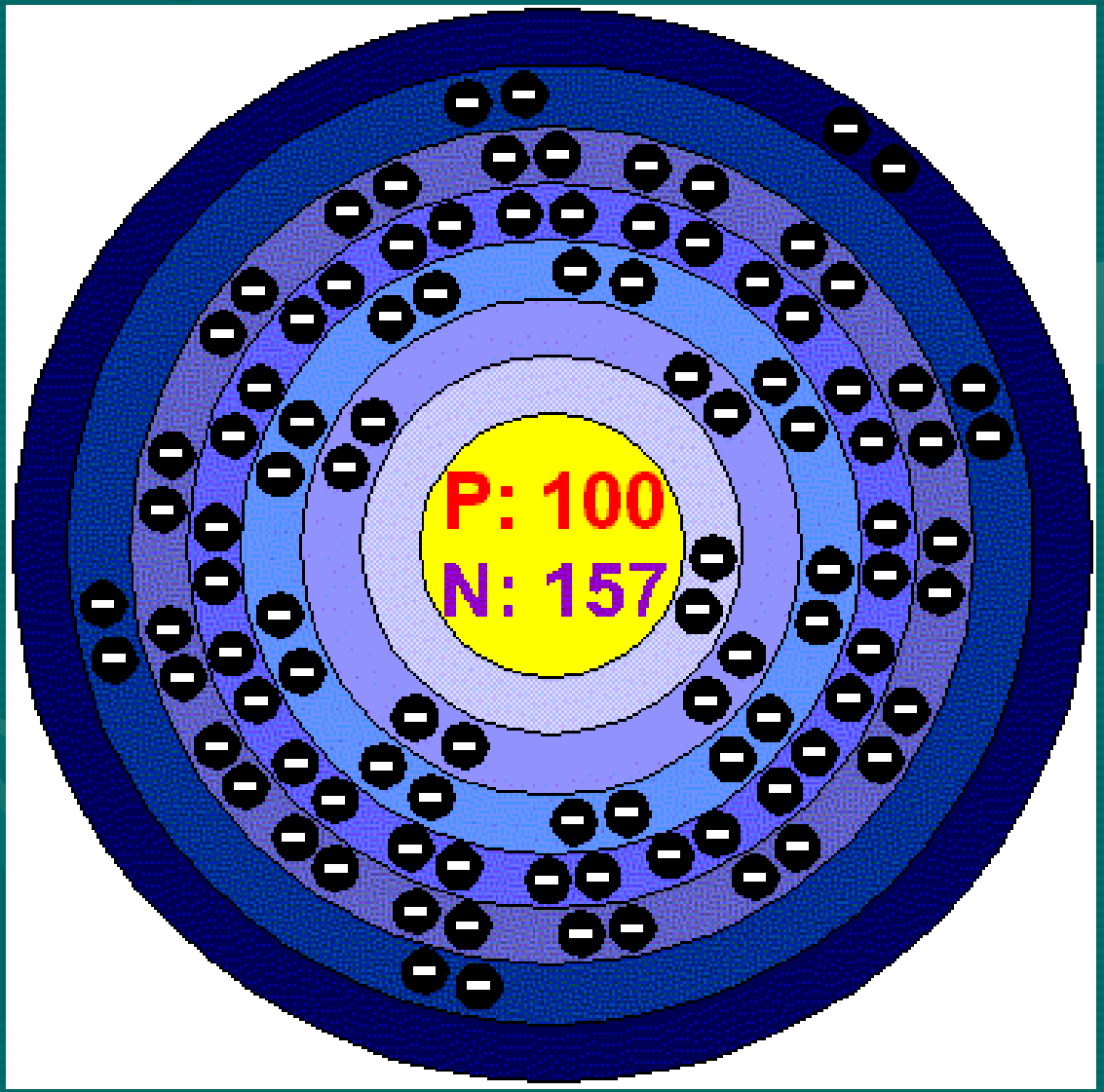
- Ammonium:
- Lead (IV):
- $C_2H_3O_2^{-1}$:
- ClO_4^{-1} :

Typical Practice Questions

- Ammonium: NH_4^{+1}
- Lead (IV): Pb^{+4}
- $C_2H_3O_2^{-1}$: Acetate
- ClO_4^{-1} : Chlorate

Energy levels

- How many electrons are in each energy level?



1st energy level

Energy level	Number of electrons
1	
2	
3	
4	

1st energy level

Energy level	Number of electrons
1	2e-
2	
3	
4	

1st energy level

Energy level	Number of electrons
1	2e-
2	8e-
3	
4	

1st energy level

Energy level	Number of electrons
1	2e-
2	8e-
3	18e-
4	

1st energy level

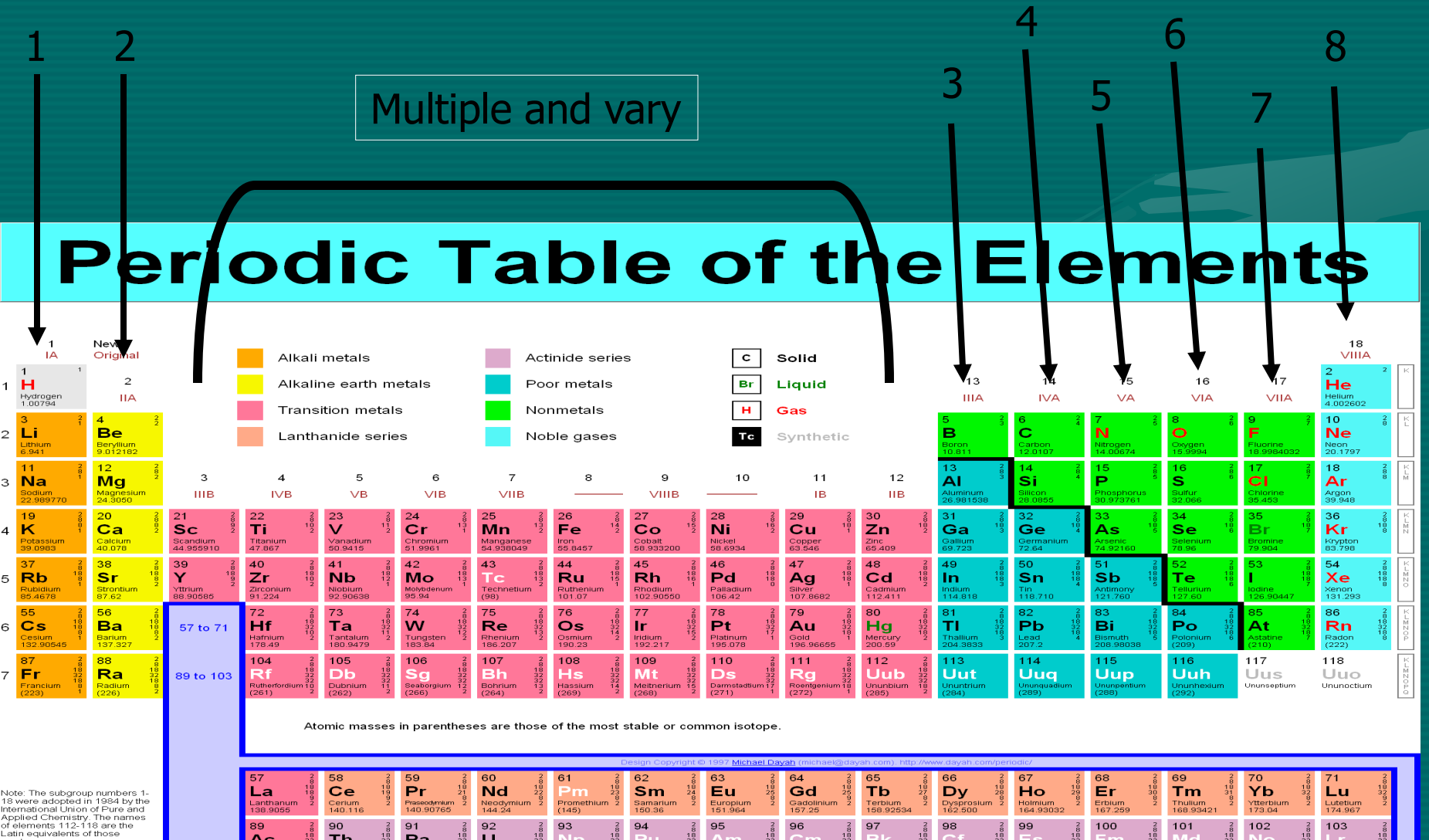
Energy level	Number of electrons
1	2e-
2	8e-
3	18e-
4	32e-

Valence electrons

- Outer most electrons
- Take part in bonding
- Octet rule
  - Atoms are most stable after attaining a full octet or a full outer shell.
  - Will gain or loose or share to attain the same configuration of a noble gas.

How many valence electrons?

Multiple and vary



Atomic charges

- Given the opportunity atoms will be gaining or losing electrons to fill the outer shell. They want to be isoelectric with a nobel gass

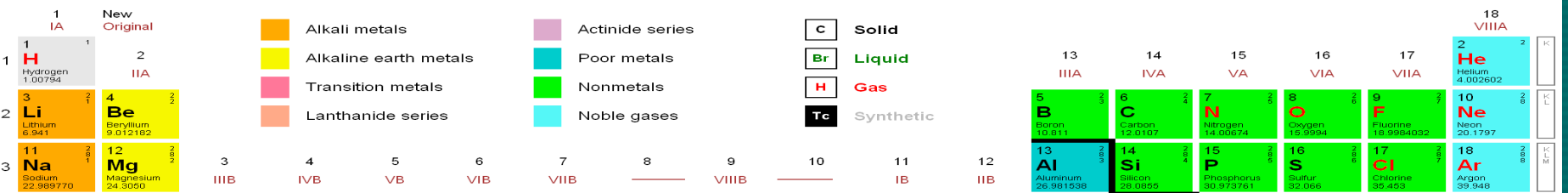
- IsoElectric: Same number of electrons
- Ion: A charged particle
- Anion: gained electrons to be isoelectric with nobel gas
- Cation: Lost electrons to isoelectric with nobel gas

What does it mean to be isoelectric?

- Isoelectric with a nobel gas:
- Na^{+1} Mg^{2+} Al^{3+}

- How many electrons does each of these atoms have?

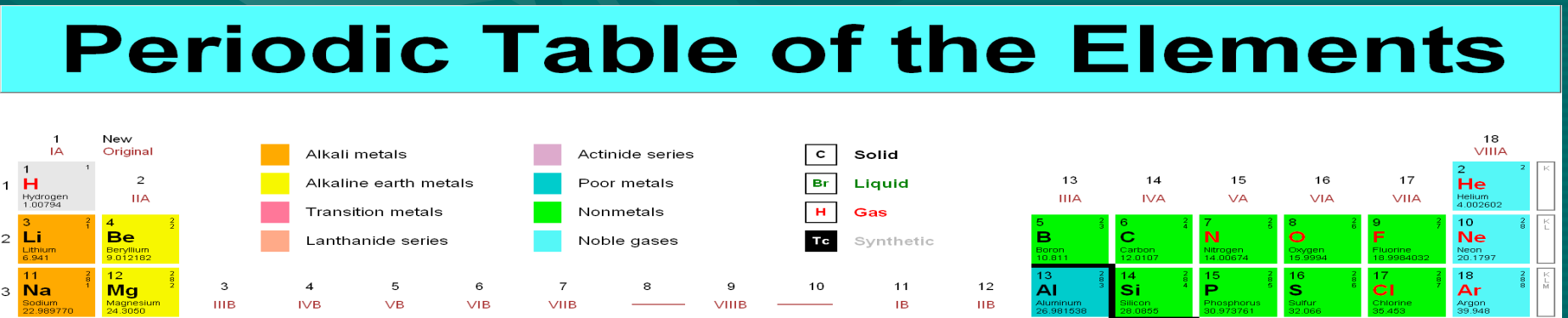
Periodic Table of the Elements



What does it mean to be isoelectric?

- Isoelectric with a nobel gas:
- Na^{+1} Mg^{2+} Al^{3+} Ne

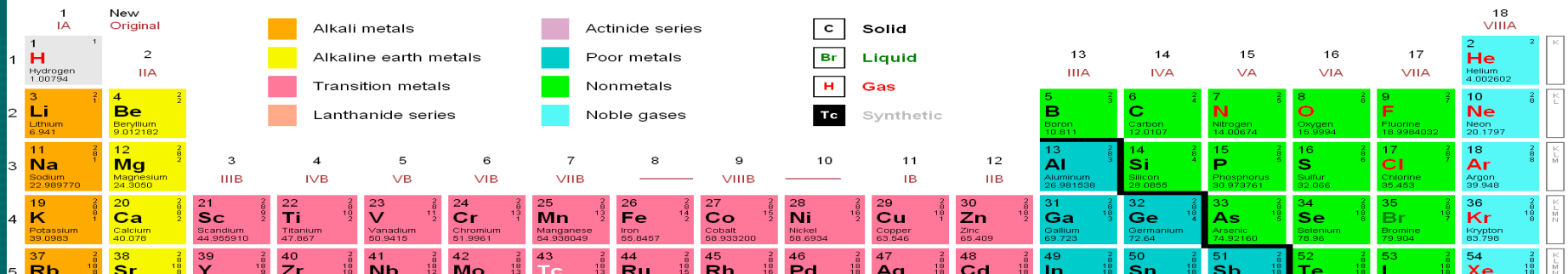
- How many electrons does each of these atoms have? 10…



1st Family - Alkali metals

- 1 Valence electron
  - Gain 7 electrons
  - Lose 1
- Which is easiest?
- K^+

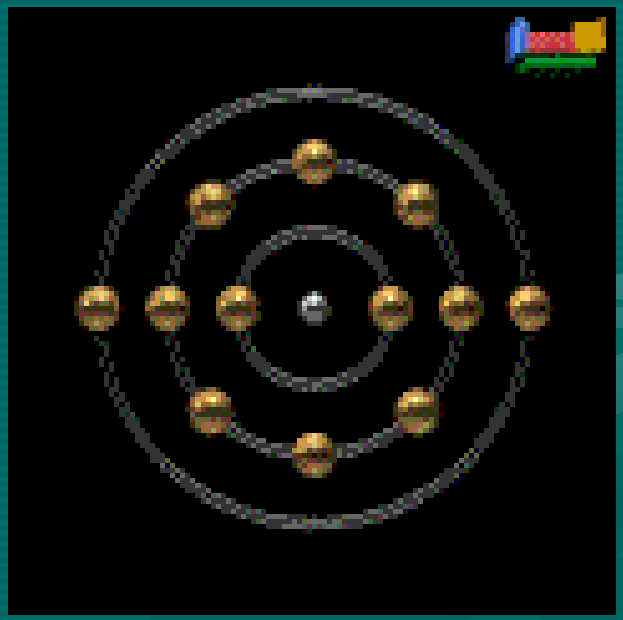
Periodic Table of the Elements



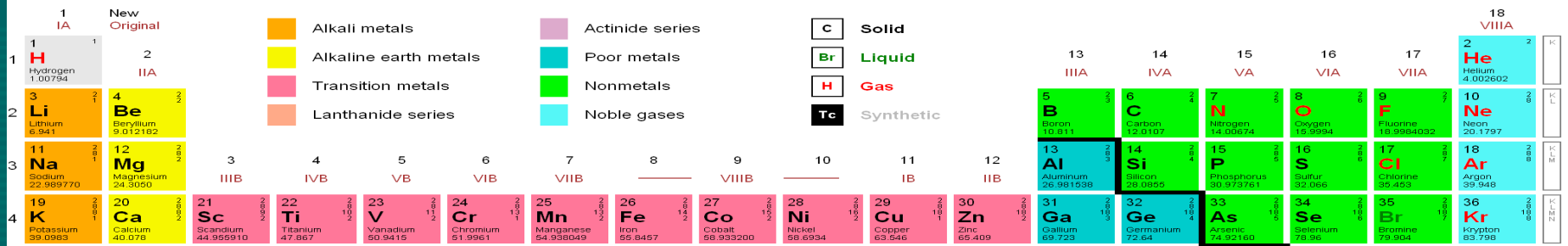
2nd Family – Alkaline Earth metals

- 2 Valence electron
  - Gain 6 electrons
  - Lose 2
- Which is easiest?

Mg^{+2}



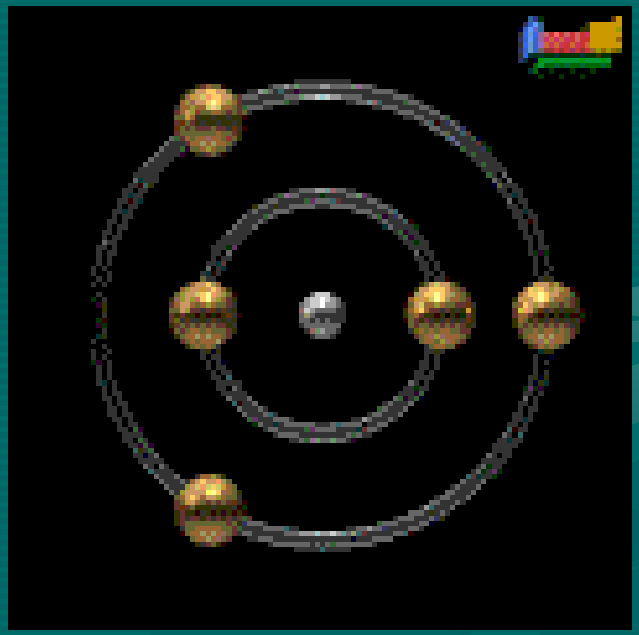
Periodic Table of the Elements



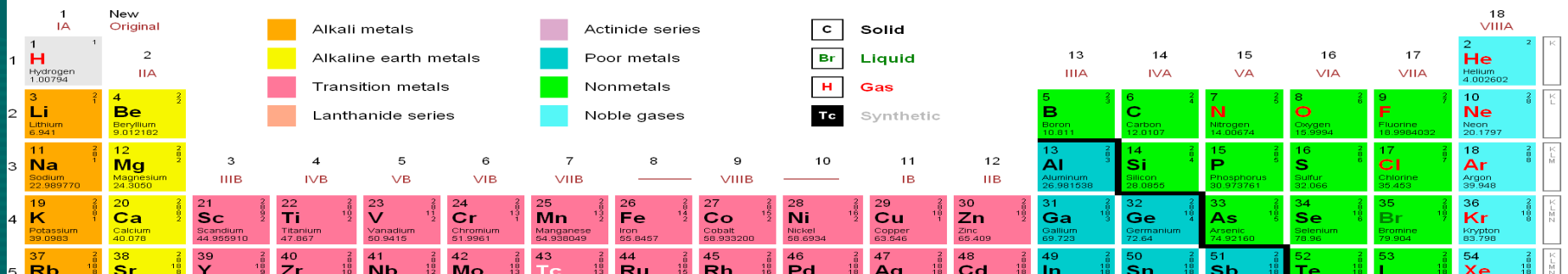
3rd Family Boron Family

- 3 Valence electron
  - Gain 5 electrons
  - Lose 3
- Which is easiest?

B^{+3}



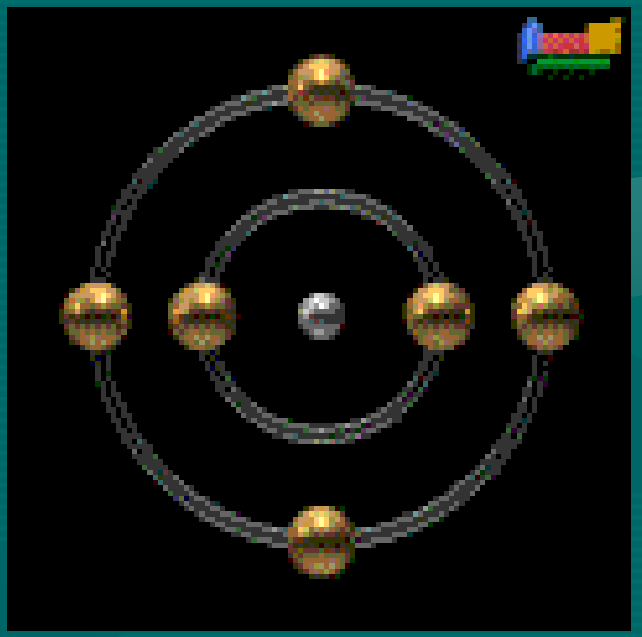
Periodic Table of the Elements



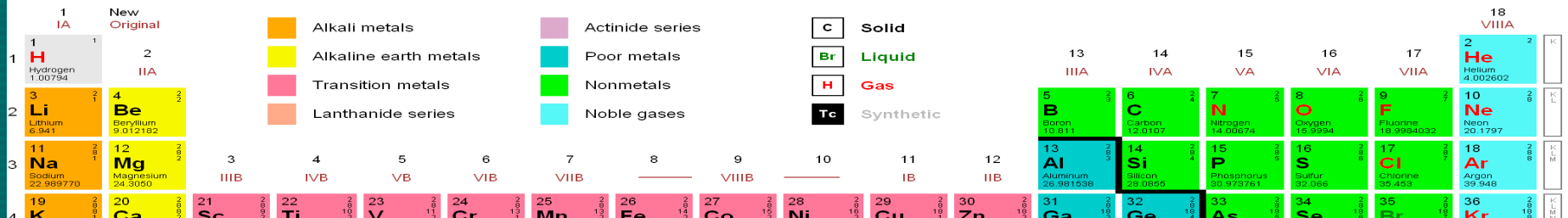
4th Family – Carbon Family

- 4 Valence electron
  - Gain 4 electrons
  - Lose 4
- Which is easiest?

C?



Periodic Table of the Elements



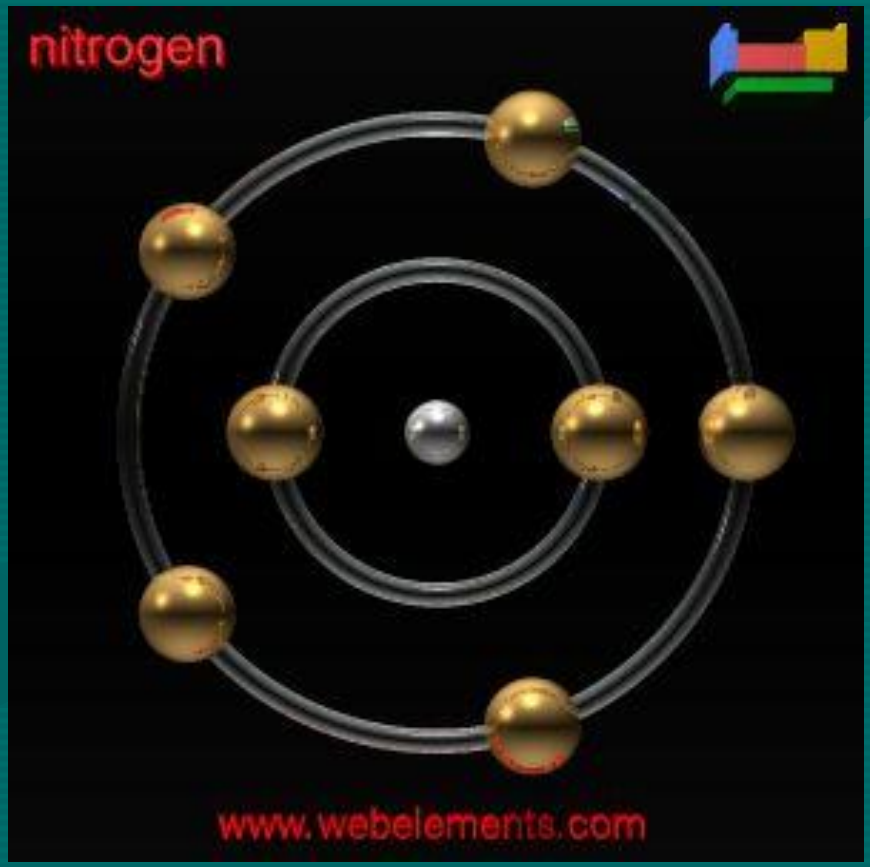
Metals vs. Non-metals

- Notice: To this points we have only lost electrons. These were all METALS!!
- METALS LOSE ELECTRONS = CATIONS
- NON-METALS GAIN ELECTRONS = ANIONS

5th Family – Nitrogen Family

- 5 Valence electron
  - Gain 3 electrons
  - Lose 5
- Which is easiest?

N^{-3}

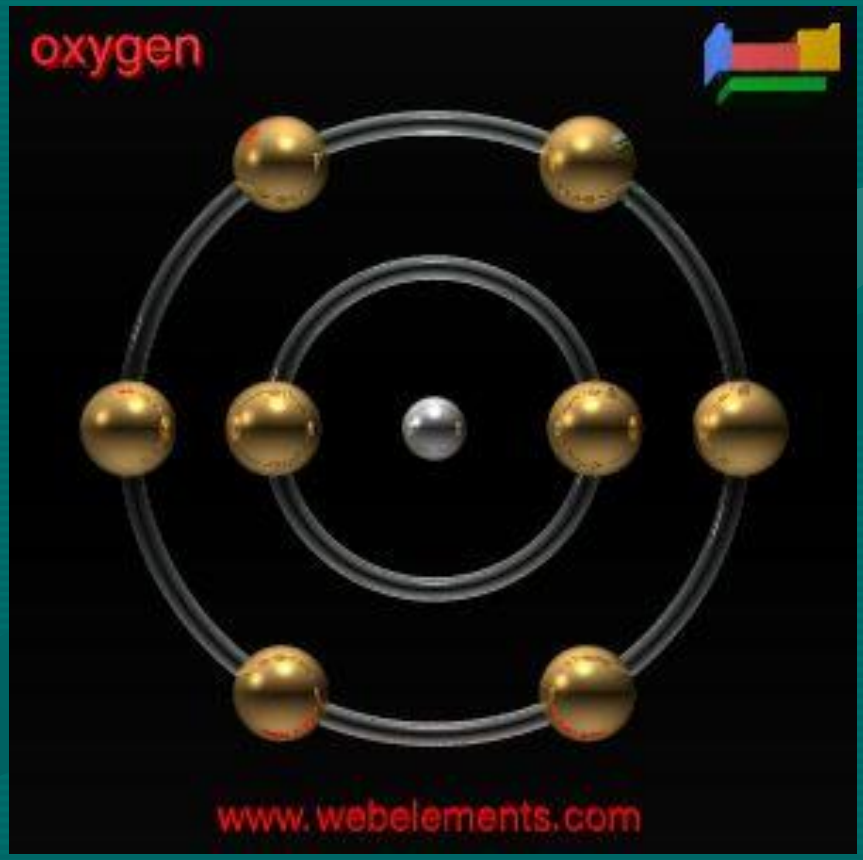


Note: Any negative ion will end with the suffix "ide".
This chemical is called Nitride
P^{-3} is called?

6^{th} Family – Oxygen Family

- 6 Valence electron
  - Gain 2 electrons
  - Lose 6
- Which is easiest?

O^{-2}



7th Family – Halogens

- 7 Valence electron
  - Gain 1 electrons
  - Lose 7
- Which is easiest?

Br^{-1}

What is the charge?

+1 +2

Multiple and vary

+3 ? -3 -2 -1 0