

02/24/14  
Workshop 4  
Chem. 103, Spring 2014  
(Full points 20)

Completed reports to be submitted by **03/06/2014**, 2.00 PM (no late submission)

A. In-class exercise (~20-30 minutes) : Prediction of bonding in elements

Element	Formula of the stable ion	Name of the ions	Ground-state electron configuration (noble gas)	Charge
H				
He				
Li				
Be				
B				
C				
N				
O				
F				
Ne				
Na				
Mg				
Al				
Si				
P				
S				
Cl				
Ar				
K				
Ca				
Ga				
Ge				
As				
Se				
Br				
Kr				
Comments				

D-Block elements			
Element	Formulae of <u>Ions</u>	Ground-state electron configuration (noble gas)	Charge
Sc			
Ti			
V			
Cr			
Mn			
Fe			
Co			
Ni			
Cu			
Zn			

  

The diagram illustrates the common oxidation states of d-block elements from Scandium (Sc) to Zinc (Zn). The x-axis represents the atomic number (21 to 30) and the y-axis represents the oxidation state (0 to 8). Red dots indicate the most common oxidation states for each element. Scandium (Sc) has a common oxidation state of +3. Titanium (Ti) has +2 and +3. Vanadium (V) has +2, +3, +4, and +5. Chromium (Cr) has +2, +3, +4, +5, and +6. Manganese (Mn) has +2, +3, +4, +5, +6, and +7. Iron (Fe) has +2, +3, +4, +5, and +6. Cobalt (Co) has +2, +3, +4, and +5. Nickel (Ni) has +2, +3, +4, and +5. Copper (Cu) has +1, +2, and +3. Zinc (Zn) has +1 and +2.

02/24/14, Workshop 4 (continued)

Chapter 4: Periodic trends of the Elements

**B. Shielding and *Effective Nuclear Charge***

- Carry out calculation of the effective nuclear charge,  $Z_{\text{eff}}$  for the 2<sup>nd</sup>-row elements
- Calculate the net force on the outermost shell using the effective nuclear charge for a constant distance,  $d$
- Explain the trend of size along periods
- Explain the trend of size along groups

**C. Short lecture on *Ionization Energy* (page 115)**

- Calculate the  $Z_{\text{eff}}$  for Li, Na, and K.
- Calculate the force on the outermost shell electron (information of radius on page 114) for Li, Na, and K.
- Explain the trend of ionization energies along groups

**D. Explain the trend of *Ionization Energies* along periods**

**E. Short lecture on *Electron Affinity* (page 118)**

- Calculate the  $Z_{\text{eff}}$  for Cl, Br, and I
- Calculate the force on the outermost shell electron (information of radius on page 114) for Cl, Br, and I.
- Explain the trend of electron affinity along groups

**F. Explain the trend of *Electron Affinities* along periods**

**G. Define isoelectronic species**

**H. Problems.4.47, 4.49, 4.53, 4.56, 4.57, 4.89, 4.91, 4.93, 4.101, 4.104**