

III. Trends in Atomic Properties

A. Effective Nuclear Charge (Z_{eff})

The amount of positive charge experienced by the valence electrons of an atom/ion

for
neutral
atoms

1. Down a group: Constant, and approximately equal to the number of valence e^{-} 's

$$\text{eg } Z_{\text{eff}}(\text{Li}) = Z_{\text{eff}}(\text{Na}) = \dots = 1$$

* core electrons "shield" or "screen" valence electrons from nucleus *

2. Across a period: Increases

* valence e^{-} 's can't shield each other *

B. Atomic and Ionic Radii (average size)

1. Measure size with light!

Ionic Compounds - x-rays

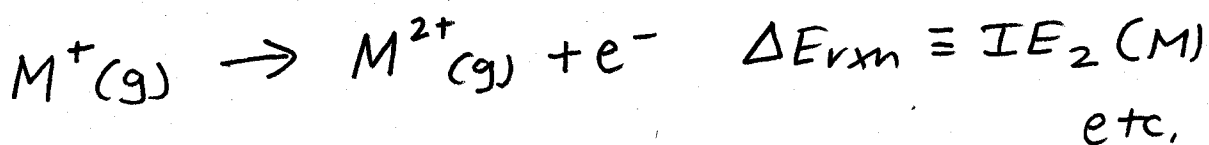
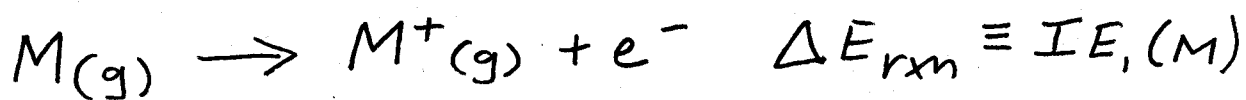
Covalent Compounds - microwaves

2. Across a period:

3. Down a group:

4. Ionic Radii:

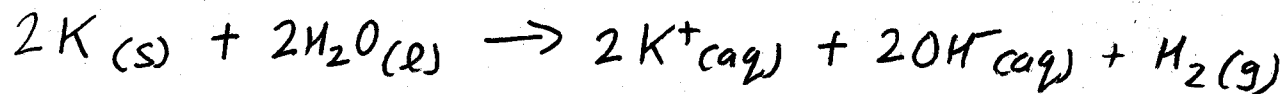
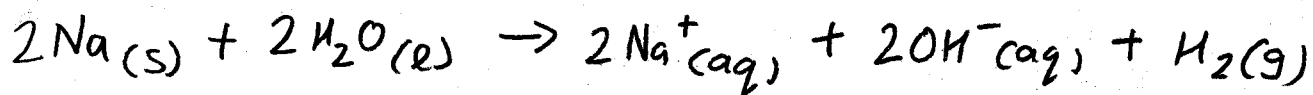
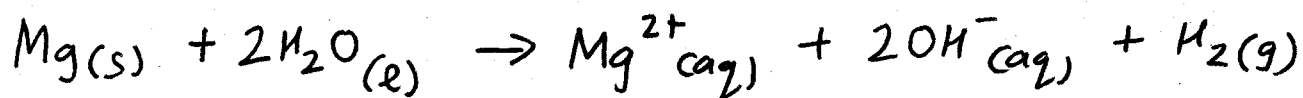
C. Ionization Energy (IE)



1. Across a period ...

2. Down a group ...

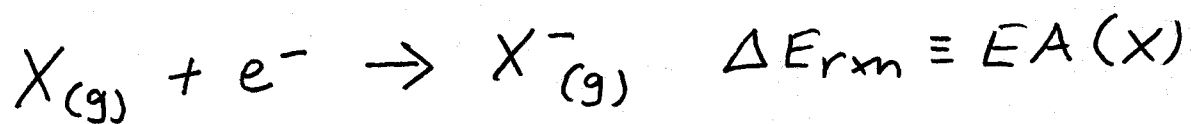
Reaction of $H_2O(l)$ with ...



[not on Test 2!]

Chem III-4

D. Electron Affinity (EA)



If X^{-} is more stable than X , $EA < 0$

(consistent with atomic spectroscopy sign convention)

* Very rough trends *

1. Most negative EA's: Group 7A
2. Second most negative EA's: Group 6A
3. $EA > 0$ for Groups 2A and 8A