WKS: Chem 1
Ions & Electron Configurations I

Name: Answer Key
Period: _____ Date: _____

1. Why do atoms form ions? What is the *Octet Rule*?
   Atoms lose or gain electrons to reach the nearest Nobel gas configuration. Atoms are stable when they have 8 electrons in their highest occupied valence level.

2. How do metals form ions? What is the sign of the charge on the ion? What kind of ion is this called?
   Metals lose electrons and form positively charged cations.

3. How does the radius of the ion compare to the atom? Explain why.
   Metals ions are smaller than the neutral atom since they have fewer electrons with the same effective nuclear charge, so they are more strongly attracted and closer to the nucleus.

4. How do nonmetals form ions? What is the sign of the charge on the ion? What kind of ion is this called?
   Nonmetals gain electrons and form negatively charged anions.

5. How does the radius of the ion compare to the atom? Explain why.
   Nonmetal ions are larger than the neutral atom since they have more electrons with the same effective nuclear charge; the electrons repel each other so are less attracted to the nucleus and farther away.

Complete the following table.

Element	Config of Element	Config of Ion	#e⁻ gained/lost	Ion w/ Charge
ex Mg	[Ne] $3s^2$	[Ne]	2 e^- lost	Mg^{2+}
6. K	[Ar] $4s^1$	[Ar]	1 e^- lost	K^+
7. Cl	[Ne] $3s^2\ 3p^5$	[Ne] $3s^2\ 3p^6$ or [Ar]	1 e^- gained	Cl^-
8. Al	[Ne] $3s^2\ 3p^1$	[Ne]	3 e^- lost	Al^{3+}
9. O	[He] $2s^2\ 2p^4$	[He] $2s^2\ 2p^6$ or [Ne]	2 e^- gained	O^{2-}
10. N	[He] $2s^2\ 2p^3$	[He] $2s^2\ 2p^6$ or [Ne]	3 e^- gained	N^{3-}
11. Sr	[Kr] $5s^2$	[Kr]	2 e^- lost	Sr^{2+}
12. Te	[Kr] $5s^2\ 4d^{10}\ 5p^4$	[Kr] $5s^2\ 4d^{10}\ 5p^6$ or [Xe]	2 e^- gained	Te^{2-}
13. Rb	[Kr] $5s^1$	[Kr]	1 e^- lost	Rb^+
14. Br	[Ar] $4s^2\ 3d^{10}\ 4p^5$	[Ar] $4s^2\ 3d^{10}\ 4p^6$ or [Kr]	1 e^- gained	Br^-
15. P	[Ne] $3s^2\ 3p^3$	[Ne] $3s^2\ 3p^6$ or [Ar]	3 e^- gained	P^{3-}

16. What trend is present for the electron configurations of all of the cations above? What trend is present for the electron configurations of all of the anions?
    - Metals lose their valence electrons and the cations have the configuration of the *previous* Noble gas.
    - Nonmetals gain enough electrons so the anions will have the configuration of the *next* Noble gas.
17. Explain how the period and group trends in **ionic radii** are related to electron configuration.
    - Ionic radii **increase down a group** as outermost electrons are in higher energy levels and more inner core electrons shield the valence electrons from the increased nuclear charge.
    - Ionic radii **increase moving *right to left* across a period** as decrease in nuclear charge along with the constant shielding within a period by inner core electrons creates a weaker attraction of the electrons to the nucleus, so they are not pulled as close. The trend breaks across the change from anions to cations since the anions have gained electrons and become larger while the cations have lost electrons and become smaller.