ANSWER KEY

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1.5 Atomic Structure and Electron Configuration

AP Chemistry | ANSWER KEY

Use a periodic table. Use full configurations unless a question asks for noble gas shorthand.

1. Write the complete electron configuration for each atom. (a) P (b) Fe (c) Br

(a) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
(b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$
(c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^5$

2. Write the noble gas shorthand for each. (a) Zn (b) S^{2-} (c) Mn^{2+} (d) Fe^{3+}

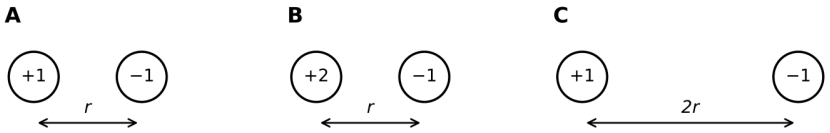
(a) [Ar] $4s^2\ 3d^{10}$ (b) [Ne] $3s^2\ 3p^6$ = [Ar] (c) [Ar] $3d^5$ (d) [Ar] $3d^5$
Cations lose the 4s electrons before the 3d electrons.

3. Identify the atom or ion. (a) A neutral atom with the configuration [Kr] $5s^2\ 4d^{10}\ 5p^3$ (b) An ion with a $2-$ charge and 18 electrons

(a) Sb (antimony, 51 electrons) (b) S^{2-} (16 protons + 2 extra electrons = 18)

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4. Using Coulomb's law, rank the three ion pairs from strongest to weakest attraction. Explain your ranking.



B > A > C. F is proportional to q_1q_2/r^2. B has double the charge of A at the same distance (2 times as strong). C has the same charges as A but twice the distance, so it is 1/4 as strong.

5. In a sodium atom, which takes more energy to remove, a 2p electron or the 3s electron? Explain using Coulomb's law.

A 2p electron. It is in a lower shell, closer to the nucleus (smaller r), and is shielded by fewer electrons, so it feels a stronger attraction to the nucleus.

6. How many core electrons and valence electrons does each atom have? (a) Si (b) Ga

(a) Si, [Ne] $3s^2$ $3p^2$: 10 core, 4 valence
(b) Ga, [Ar] $4s^2$ $3d^{10}$ $4p^1$: 28 core (including the filled 3d), 3 valence

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