Chem 1063 J-Term 2007. Exam 1
Name Key

129

(1)(4 points) Define the following

(a) the Pauli Exclusion Principle

No 2 electrons in the same atom can have the same 4 quantum #'s.

(b) the Aufbau principle

Electrons fill orbitals from lowest energy to high. energy

(2)(4 points) List and name the four quantum numbers for an electron.

n - principal

ℓ - angular momentum

m_ℓ - magnetic

m_s - spin

(3)(3 points) List the possible quantum numbers for the following orbitals

(a) 4p $n=4$ $\ell=1$ $m_\ell = -1, 0, \text{or } 1$ $m_s = +\frac{1}{2} \text{ or } -\frac{1}{2}$

(b) 3p $n=3$ $\ell=1$ $m_\ell = -1, 0, \text{or } 1$ $m_s = +\frac{1}{2} \text{ or } -\frac{1}{2}$

(c) 5d $n=5$ $\ell=2$ $m_\ell = -2, -1, 0, 1, \text{or } 2$ $m_s = +\frac{1}{2} \text{ or } -\frac{1}{2}$

(4)(4 points) Write out the ground state electron configuration for the following atoms or ions (do not use the noble gas shortcut)

(a) S $1s^2 2s^2 2p^6 3s^2 3p^4$

(b) Mg $1s^2 2s^2 2p^6 3s^2$

(c) Ca^{2+} $1s^2 2s^2 2p^6 3s^2 3p^6$

(d) Cl^- $1s^2 2s^2 2p^6 3s^2 3p^6$

(5)(4 points) Label each of the following as a ground state, an excited state, or an impossible electron configuration

(a) $1s^2 2s^2 2p^5 3s^2 3p^4$ excited state

(b) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$ ground state

(c) $1s^2 2s^2 2p^6 3s^2 3p^4 4s^3$ impossible

(d) $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 4p^2$ excited state

(6)(2 points) Place the following elements in order from smallest to largest atomic radii.

Zn, Ca, Rb, Al, B

B, Al, Zn, Ca, Rb

(7)(2 points) Which of the following should have the largest first ionization energy?

O, Mg, S, Tc, or Na

O

(9)(2 points) Place the following in order from smallest to largest radius.

Li+, He, Be^{2+} Be^{2+}, Li^+, He

(10) (2 points) Place the following in order of increasing electronegativity

Cl, Rb, Ge

Rb, Ge, Cl

(11) (2 points) What are the possible values of l and m_l for the following orbital?

$l = 1$ $m_l = +1, 0, -1$

Extra Credit(4 points) Can an electron ever be trapped motionless in one spot? Explain why or why not

No, then x + v would both be known exactly, & violate the Heisenburg Uncertainty Principle.