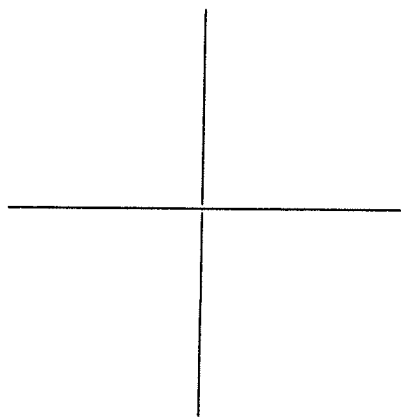


CHEMISTRY 121 MIDTERM 2

Oct. 26, 2007

Show all your reasoning/work/sig. figs. for full marks

- (3) 1) An electron moves from some unknown energy level to a new energy level where $n=2$. The energy released is 3.03×10^{-19} J. At what energy level did the electron initially begin?
- (3) 2) Calculate the number of electrons which could specifically exist at $n = 4$. Give a detailed listing of where to find these electrons using appropriate atomic orbitals.
- (2) 3) Complete the graph for probability of finding an electron vs its distance from the nucleus for a p orbital. Label axes etc.



(3) 4) Using Aufbau thinking, explain why a carbon atom can never exceed the octet rule.

(4) 5) Consider the table of IEs below. Predict the expected IE trend and then use electron configurations/rules to explain arsenic's behaviour.

Element	First Ionization Energy (Volts)
Germanium	7.89
Arsenic	9.81
Selenium	9.75

(4) 6) Assign A-D to an element space on the blank periodic table.

A = element whose highest energy electron begins occupying the $n=5, l=2$.

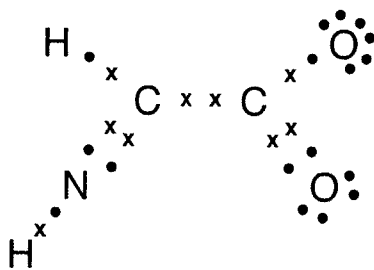
B = lowest electropositive element.

C = trianionic element which is isoelectronic to Ca^{2+} .

D = An element containing 5 valence electrons at $n = 2$

The image shows a blank periodic table grid with 7 rows and 18 columns. The grid is shaped like a standard periodic table, with the first two columns on the left, a gap in the third and fourth columns, and the remaining columns on the right. The rows represent periods 1 through 7.

- (2) 7) Assign any necessary formal charges directly on the atom(s) based on your understanding of Lewis structures/valence electrons/bonding. Briefly explain your reasoning. Do not add or subtract any electrons!



- (8) 8) Complete the following table. Do not add/subtract any electrons from the molecular formula.

Formula	Most Stable Lewis Structure	Molecular Geometry Name	Bond Angle(s)	Polar molecule? (Y or N)
H ₂ CS				
Br ₄ Ne				

- (2) 9) Draw one resonance hybrid structure for the molecule in 7) above.

- (1) Bonus. What was the class average on Quiz 3? (recorded to 2 significant figures.)