

# 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  $3.03 \times 10^{-19}$  J. At what energy level did the electron initially begin?

$$-3.03 \times 10^{-19} \text{ J} = -2.178 \times 10^{-18} \text{ J} \left( \frac{1}{2^2} - \frac{1}{n_i^2} \right)$$

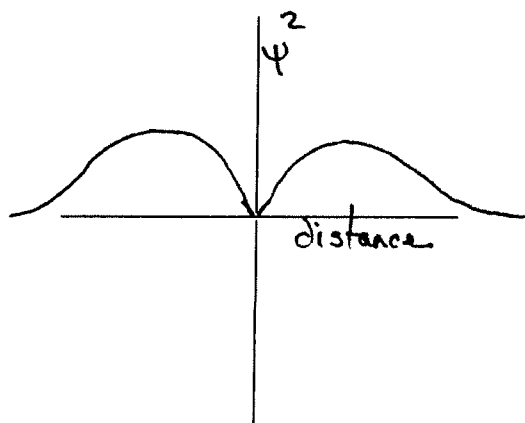
$$\boxed{n_i = 3}$$

- (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.

$$e^- \text{ capacity} = 2n^2 \Rightarrow 2(4)^2 \Rightarrow 32 \text{ electrons}$$

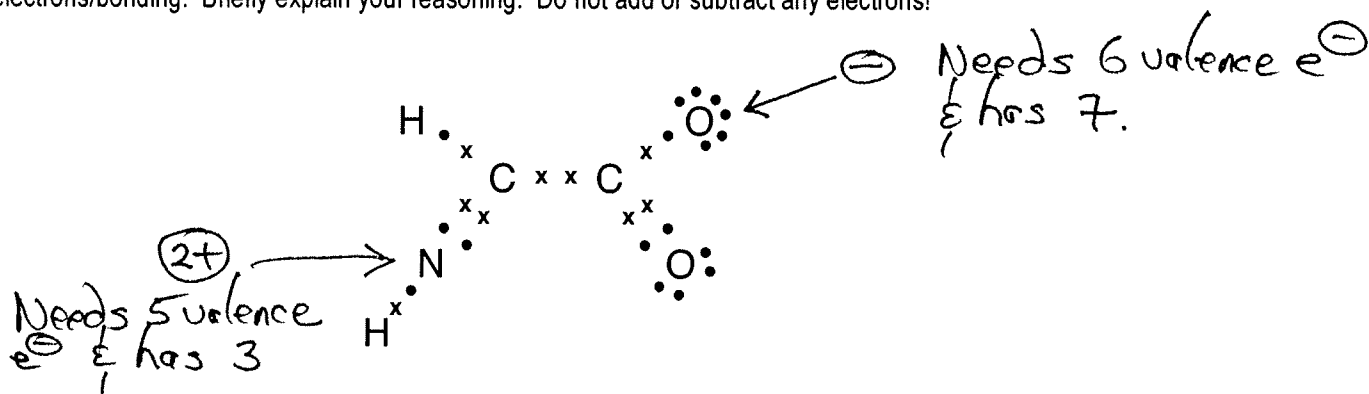
$$4s^2 4p^6 4d^{10} 4f^{14} = 32 e^-$$

- (2) 3) Complete the graph for probability of finding an electron vs its distance from the nucleus for a p orbital. Label axes etc.





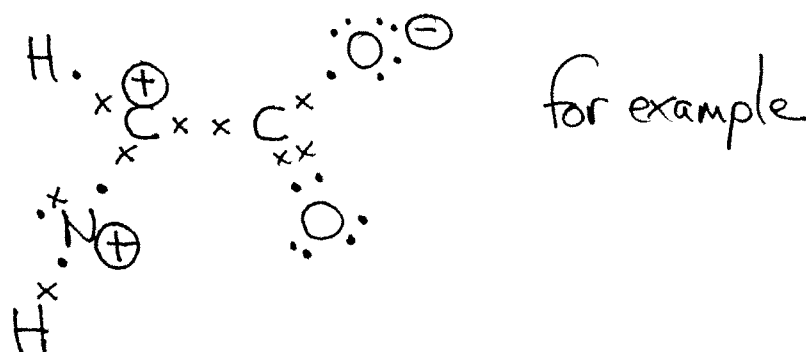
- (2) 7) Assign any necessary formal charges directly on the atom(s) based on your understanding of Lewis structures/valence electrons/bonding. Briefly explain your reasoning. Do not add or subtract any electrons!



- (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 <sub>2</sub> CS		Trig. Planar	120°	Y
Br <sub>4</sub> Ne		Sq. Planar	90° 180°	N

- (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.)

51. %