City College, Chemistry Department
Chemistry 10301, sections T and T2, Prof. T. Lazaridis
Third Midterm exam, Dec 1, 2005
Name (last name first): _____
I.D. Number: _____
Workshop leader: _____

Note: There are 9 questions in this exam. Fill in your answer in the blank space provided immediately following each question. 1/2 point will be subtracted every time you report a numerical result with an incorrect number of significant figures.

Useful data: **Speed of light : 2.9979×10^{8} m/s**
Planck's constant : 6.626×10^{-34} Js
$E_n = -2.179 \times 10^{-18}$ J/n^2

1. (12) Which of the following sets of quantum numbers are allowed and which are not? For those which are not allowed, state why.

a) n=2, l=1, m_l=0 Allowed Not allowed because …

b) n=2, l=2, m_l=2 Allowed Not allowed because …

c) n=2, l=1, m_l=-1 Allowed Not allowed because …

d) n=2, l=1, m_l=-2 Allowed Not allowed because …

2. (10) How many electrons are in

a) a filled p subshell?

b) a filled d subshell?

3. (15) Use the periodic table to identify the following elements and write their abbreviated ground-state electron configurations:

a) Z=17

b) Z=39

c) Z=28

4. (5) Write the following elements in order of increasing atomic radius:
Rb, Kr, K

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5. (8) Use the periodic table to predict which atom in each pair has the smaller first ionization energy:

a) P or Ga

b) Sr or S

6. (15) Draw Lewis structures that obey the octet rule for the following molecules:

a) hydrazine (N_2H_4)

b) hydronium ion (H_3O^+)

c) carbon disulfide (CS_2)

7. (10) Draw a Lewis structure and indicate the formal charge of each atom for cyanamide (H_2NCN, the NCN atoms are bonded in the indicated sequence and the H to the first N)

8. (15) Draw resonance structures for hydrazoic acid (HNNN) and indicate which ones contribute the most.

9. (10) Use bond energy data to calculate the standard enthalpy for the following reaction:

$$2HCl(g) + F_2(g) \text{ ---------> } 2HF(g) + Cl_2(g)$$