Name: ____________________________
Section: __________________________
LA Name: _________________________

Chemistry 171 Exam 1
Dr. R. Sweeder
Sep. 23, 2005

In the spirit of fairness, please do not open your booklets until all students have received their exams.

There are 7 pages in this exam booklet, including this cover page and a periodic table at the end. Before beginning work, check to see if all pages are present. You may detach the periodic table sheet and equation sheet.

You have 50 minutes to complete this exam. It is worth one hundred (100) points. READ all questions carefully before attempting to answer. Show all your work on numerical and equation balancing problems. I can only grant partial credit if I can see your reasoning. Of course, adherence to the LBS academic honesty policy is expected. Cheating will result in a 0.0 grade for the course in accordance with the syllabus.

Running short on time? You can get partial credit for problems where you set up any necessary multiplication, even if you do not complete the calculation. Also, you can use the concept method of solving a problem to get partial credit. This is the method that we sometimes use in class to show in theory the calculation that we wish to do like:

Also, you can get the formula for any named compound at a 2 pt penalty (except for naming specific problems.)

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1) Provide the correct chemical formula for the following compounds: (5 pts total)

a) magnesium iodide

b) potassium oxide

c) nickel (II) chloride tetrahydrate

2) Provide the correct chemical name for the following compounds: (5 pts total)

a) Na₂S

b) FeCl₃

c) SrBr₂

3) Place the following in order: (2pts each)

Kr, Ar, As and Br (by increasing atomic size)

Cl, K, Ar, Ca²⁺ (by increasing ionization energy) (Explain your reasoning for your ordering…6 additional pts.)

4) Give a potential set of quantum numbers (n, ℓ and mₗ) for the following orbital in the 6th electron shell. What is the name of this orbital? (8 pts)
5) Sketch the orbital that corresponds for each of the following sets of quantum numbers and give the name of the orbital you drew. (4 pts each) Be sure to draw the size correctly relative to each other. (2 pts)

\[ n = 3, \ell = 1, m_\ell = 0 \]

\[ n = 4, \ell = 2, m_\ell = 1 \]

6) Briefly explain why elements emit colors when they burn and why different elements burn different colors. (15 pts)
7) (20 pts) The shape of the periodic table is directly related to the restrictions on the quantum numbers. One could imagine a periodic table that was based on a different set of rules. List the selection criteria for the other 3 quantum numbers (not \( m_\ell \)) (6 pts) and then draw the first 4 periods of the periodic table (8 pts) that would follow all of our familiar rules for the quantum numbers with the following exception:

\( m_\ell = 1, 0, -1 \)

Indicate which of the elements are unlikely to react (equivalent to noble gases.) (4pts) Which element number will have the greatest electron affinity? (1 pts) What will be the most likely charge on the element 19 ion? (1 pts)
8) (20 pts) Magnetism is a property exhibited by many different metals. Pick an example of one of the \(d\)-block metals that you would expect to be paramagnetic and show the electron configuration. (6pts) Using this electron configuration, explain why the metal should be paramagnetic (4 pts). Repeat the process for a diamagnetic \(d\)-block metal (6 pts) and be sure to explain why the metal should be diamagnetic (4pts). (You may use the noble gas core configuration method if you wish.)

10) The laser used for the CD player is typically an AlGaAs laser diode with a wavelength in air of 780 nm. What is the energy of a photon of this wavelength of light? (4 pts) What is the energy in kJ/mol for photons of this wavelength? (3 pts)