AP Chemistry Final Exam
Version N
Fall 2005

3 Free Response questions, 45 minutes

CALCULATORS MAY BE USED. You will also have a periodic table, equation sheets, and the standard reduction potential table.

Clearly show the method used and the steps involved in arriving at your answers. It is to your advantage to do this, since you may obtain partial credit if you do and you will receive little or no credit if you do not. Attention should be paid to significant figures.

Note: For all questions, assume that the temperature is 298 K, the pressure is 1.00 atmospheres, and solutions are aqueous unless otherwise specified.

Record all your work on this exam; you will only be given credit for answers showing work.

NAME:

PERIOD: 1 2 3 4

January 10-12, 2006

SCORE: _____ - _____/4 = _____
Correct Incorrect M.C. Total

_____
Blank

_____
F.R. Total

_____
Raw Score

+ _____
Curve

_____
Overall

Version N

1. (23 pts) When 5.000 g of a hydrocarbon is combusted, the combustion is incomplete, forming carbon dioxide, water, and carbon monoxide. The water is absorbed by calcium chloride in a dessicator, which gains 6.432 g in the process. The carbon dioxide is absorbed by lithium hydroxide, which gains 11.125 g.
    a. (5 pts) What is the empirical formula of the unknown compound?

    b. (3 pts) At 25ºC, 1.000 g of the compound is introduced to an empty 1.000-L flask. The pressure of the gas is 663 torr. What is the molecular mass of the compound?

    c. (3 pts) What is the molecular formula of the compound?

    d. (3 pts) Draw a Lewis structure for this compound and name it.

    e. (3 pts) Label the type of hybridization present in each carbon in your Lewis structure.

    f. (3 pts) How many sigma bonds are present in the molecule you have drawn in part d?

    g. (3 pts) How many pi bonds are present in the molecule you have drawn in part d?

2. (15 pts) Consider the Bohr model of the atom.
    a. (3 pts) Briefly describe one aspect of Bohr's model that is still considered to be correct, and that was different from previous models.

    b. (3 pts) Calculate the energy of light associated with an electron's transition from the fourth energy level to the second energy level in the hydrogen atom.

    c. (3 pts) Calculate the wavelength of the light.

    d. (3 pts) Is light emitted or absorbed?

    e. (3 pts) In what region of the electromagnetic spectrum is the energy of light found? Briefly state two unique ways to determine this using the information in the problem.

3. (12 pts) Using basic principles of structure and bonding, explain the following differences, making sure to refer to each of the substances or situations.
    a. (3 pts) KCl has a lower melting point than $CaCl_2$.

    b. (3 pts) The first ionization energy of Na is smaller than the first ionization energy of Mg.

    c. (3 pts) A molecule of NO_2 will react with another NO_2 molecule, but a molecule of N_2O will not react with another N_2O molecule.

    d. (3 pts) A 0.10-molal aqueous solution of hydrochloric acid has a higher boiling point than a 0.10-molal aqueous solution of hydrofluoric acid, but pure hydrochloric acid has a lower boiling point that pure hydrofluoric acid.