You will get the use of a calculator only for the first 7 minutes. Show your work for all questions; answer all parts of all questions. No work = no credit.

1. (8 pts) Place the following in order of increasing energy.
    A. Yellow light

    B. Light emitted as part of the Paschen series

    C. Light of wavelength = 5.03×10^4 Å

    D. An electron (mass = 9.11×10^{-31} kg; hint: don't change the units.)

                        Ans: (Write the letters.)   _____ , _____ , _____ , _____

2. (6 pts) Label the following as permissible (P) or forbidden (F) quantum number sets.
    - If permissible, write which shell and subshell it represents.
    - If forbidden, <u>briefly</u> describe why the set is forbidden.
      a. (3, 2, 1, ½)

      b. (1, 1, 0, - ½)

3. (3 pts) Choose any three of the four items below and record the color. Circle the letter (a → d) of the three that you would like graded.
      a. The most common elemental form of sulfur

      b. A flame test of strontium

      c. A solution of iron (III)

      d. The most common elemental form of chlorine

4. (5 pts) Give the noble gas electronic configurations for:
   a. Vanadium

   b. Chromium

   c. Describe the Aufbau principle and how it applies/does not apply to the electronic configurations of the above elements.

5. (9 pts) For each of the following element sets, circle the item that correctly fits the description, then provide a brief explanation (in 1 to 2 sentences) for your choice in terms of atomic structure.

   a. $(S^{2-} / Cl^{1-} / Ar / K^{1+})$ has the largest radius because…

   b. (Magnesium / aluminum / silicon) has the greatest second ionization energy because…

   c. (Boron / carbon / nitrogen) has the greatest (most negative) electron affinity because…

You will get the use of a calculator only for the first 7 minutes. Show your work for all questions; answer all parts of all questions. No work = no credit.

1. (8 pts) Place the following in order of decreasing energy.
    A. Green light

    B. Light of frequency $= 4.21$ x 10^{15} $(ns)^{-1}$

    C. Light emitted as part of the Lyman series

    D. A proton (mass $= 1.67$ x 10^{-21}kg; hint: don't change the units.)

                              Ans: (Write the letters.)   _____ , _____ , _____ , _____

2. (6 pts) Label the following as permissible (P) or forbidden (F) quantum number sets.
    - If permissible, write which shell and subshell it represents.
    - If forbidden, <u>briefly</u> describe why the set is forbidden.
      a. (2, 0, 1, ½)

      b. (4, 2, 1, - ½)

3. (3 pts) Choose any three of the four items below and record the color. Circle the letter (a → d) of the three that you would like graded.
    a. The most common elemental form of iodine

    b. A flame test of barium

    c. A solution of zinc (II)

    d. The most common elemental form of phosphorus

4. (5 pts) Give the noble gas electronic configurations for:
   a. Manganese

   b. Iron

   c. Describe Hund's rule and how it applies/does not apply to the electronic configurations of the above elements.

5. (9 pts) For each of the following element sets, circle the item that correctly fits the description, then provide a brief explanation (in 1 to 2 sentences) for your choice in terms of atomic structure.

   a. (P^{3-} / S^{2-} / Ar / Ca^{2+}) has the smallest radius because…

   b. (Aluminum / silicon / phosphorus) has the lowest third ionization energy because…

   c. (Lithium / beryllium / boron) has the lowest (least negative) electron affinity because…

You will get the use of a calculator only for the first 7 minutes. Show your work for all questions; answer all parts of all questions. No work = no credit.

1. (8 pts) Place the following in order of decreasing frequency.
    A. Orange light

    B. Light emitted as part of the Brackett series

    C. Light of wavelength = 2.13 x 10^{-2} pm

    D. X-rays

                    Ans: (Write the letters.)   _____ , _____ , _____ , _____

- (6 pts) Label the following as permissible (P) or forbidden (F) quantum number sets.
- If permissible, sketch and name the shape of the subshell it represents (may be more than one possible answer.)
- If forbidden, <u>briefly</u> describe why the set is forbidden.
    a. (3, 1, 1, ½)

    b. (5, 2, 0, - ½)

- (3 pts) Choose any three of the four items below and record the color. Circle the letter (a → d) of the three that you would like graded.
    a. The most common elemental form of bromine

    b. A flame test of copper

    c. A solution of nickel (III)

    d. The most common elemental form of fluorine

- (5 pts) Give the noble gas electronic configurations for:
    a. Actinium

    b. Cerium

    c. Describe Paul's principle and how it applies/does not apply to the electronic configurations of the above elements.

- (9 pts) For each of the following element sets, circle the item that correctly fits the description, then provide a brief explanation (in 1 to 2 sentences) for your choice in terms of atomic structure.

    a. (O^{2-} / O / Mg / Mg^{2+}) has the largest radius because…

    b. (Aluminum / silicon / phosphorus) has the lowest second ionization energy because…

    c. (Carbon / nitrogen / oxygen) has the lowest (least negative) electron affinity because…