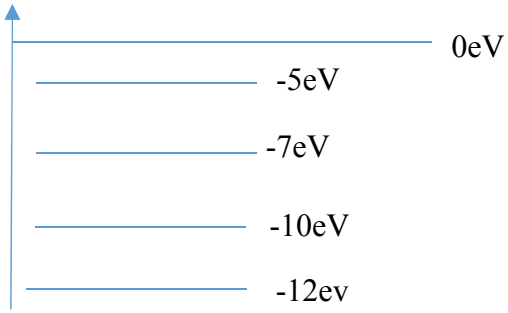
Friday:

1. (2 points) What are the oxidation number for each atom in the following molecules:

   a. KH K=+1 H=−1

   b. CH_3OH; C=−2 H=1 O=−2

2. (4 points) An atom emits light of energy at 2 eV, 5 eV and 7 eV, and has an ionization energy of 12 eV. Each of the emission lines corresponds to a natural frequency of the electron cloud resulting from the mixing of an electron wave with more than one loop with the electron wave with 1 loop (i.e. the atom ends up in its ground state in each emission). Draw the energy level diagram for this hypothetical atom.



   a. For an atom in the problem choose what is possible:
      i. **<u>Energy of 12 eV can only be absorbed</u>**.
      ii. Energy of 12 eV can only be emitted.
      iii. Energy of 12 eV can be both absorbed and emitted.
      iv. Atom is transparent to 12 eV.

   b. Calculate the kinetic energy (in eV) of the electron being ionized from the ground state if a photon of 14eV is absorbed?

$$KE=\Delta E_{light}-IE= 14\text{-}12=2eV$$

3. (4 points) Write down electron configuration and the correct numerical value for Z_{eff} for the electron in Mg atom if the first ionization energy of Mg is 1.24×10^{-18} J. **Hint: $IE = E_{\infty}\text{-}E_{initial} = 2.18 \times 10^{-18}\left(\frac{Z_{eff}^2}{n^2}\right)$ J**

   n=3

$$Z_{eff} = \sqrt{\frac{IE\times n^2}{2.18\times10^{-18}}}=2.26$$

Z_{eff}= 2.26

Electron configuration of Mg = $[Ne]3S^2$

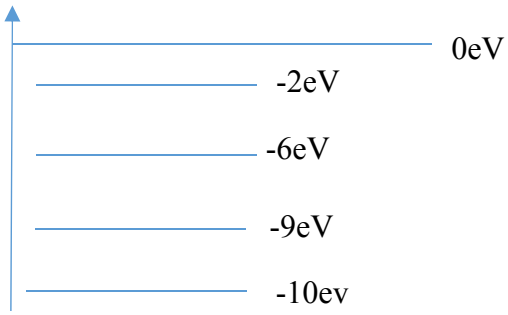
Thursday:

1. (2 points) What are the oxidation number for each atom in the following molecules:

   a. NaH Na=+1 H=−1

   b. OCN^- O=−2 C=+4 N=−3

2. (4 points) An atom emits light of energy at 1 eV, 4 eV and 8 eV, and has an ionization energy of 10 eV. Each of the emission lines corresponds to a natural frequency of the electron cloud resulting from the mixing of an electron wave with more than one loop with the electron wave with 1 loop (i.e. the atom ends up in its ground state in each emission). Draw the energy level diagram for this hypothetical atom.



   a. For an atom in the problem choose what is possible:
      i. **Energy of 10 eV can only be absorbed**.
      ii. Energy of 10 eV can only be emitted.
      iii. Energy of 10 eV can be both absorbed and emitted.
      iv. Atom is transparent to 10 eV.

   b. Calculate the kinetic energy (in eV) of the electron being ionized from the ground state if a photon of 12 eV is absorbed?

      $KE=\Delta E_{light}-IE= 12-10=2eV$

3. (4 points) Write down electron configuration and the correct numerical value for Z_{eff} for the electron in Na atom if the first ionization energy of Na is 8.24×10^{-19} J. **Hint: $IE = E_{\infty}-E_{initial} = 2.18 \times 10^{-18}\left(\frac{Z_{eff}^2}{n^2}\right)$ J**

   n=3

   $Z_{eff} = \sqrt{\frac{IE\times n^2}{2.18\times10^{-18}}}=1.84$

   $Z_{eff}= 1.84$

   Electron configuration of Na = $[Ne]3S^1$