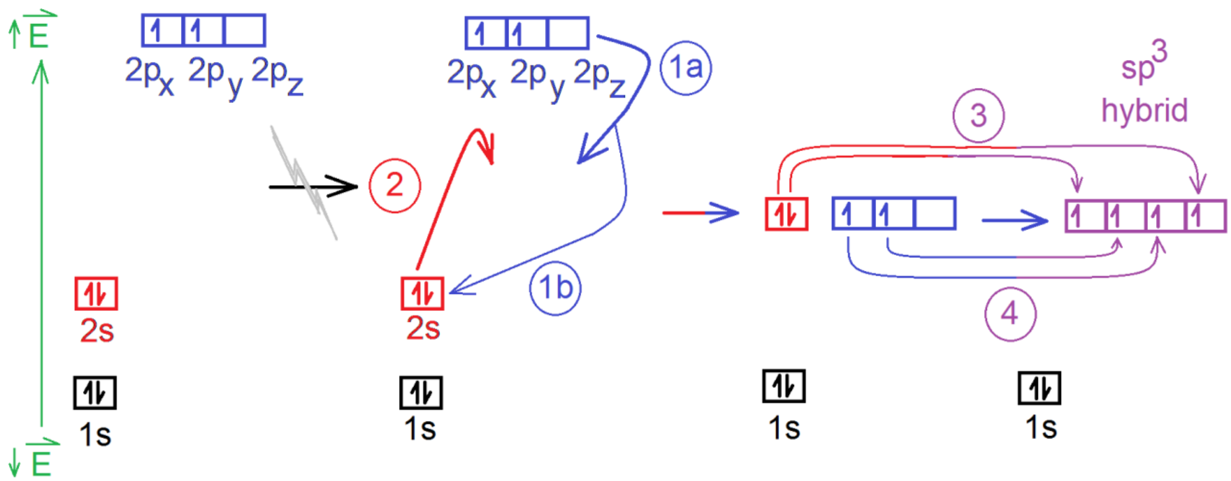
Worksheet 10 – CHEM 121 Fall 2015

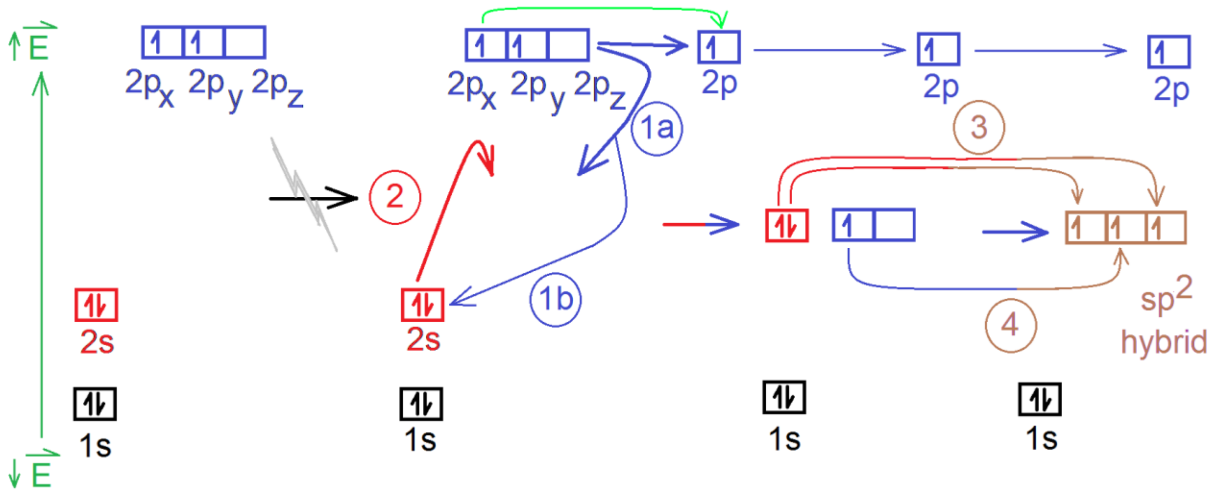
Monday Name: ______________________

Wednesday Name: ______________________

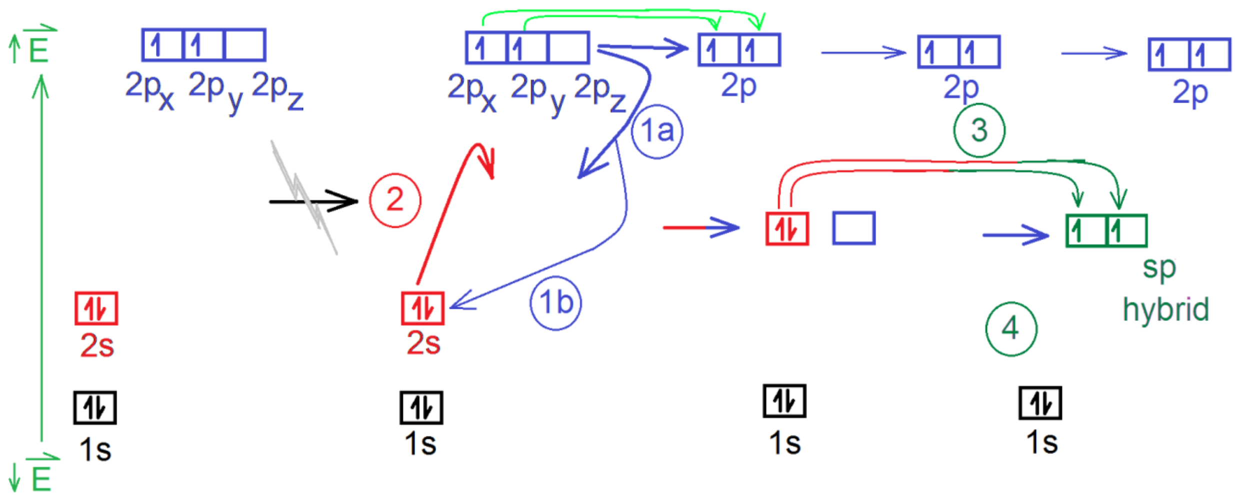
Directions: As usual – 40 minutes without notes, with partner and with non-programmable calculator; 10 minutes with notes; remaining 25 minutes on the board.



1) The above image represents the formation of an sp^3 hybrid set of orbitals for carbon. It's called an sp^3 hybrid because it took one of the s shells and three of the p orbitals to combine in such a manner that instead of having one pair of 2s electrons (that can't bond anything) with 2 unbonded, 2p, single electrons, there are now four single unbonded electrons (in an sp^3 hybrid orbital), each of which is capable of sharing with another atom's electron to form a covalent bond. In the space below, explain what is happening in the graphic.



2) The above image represents the formation of an sp^2 hybrid set of orbitals for carbon. It's called an sp^2 hybrid because it took one of the s shells and two of the p orbitals to combine in such a manner that instead of having one pair of 2s electrons (that can't bond anything) with 2 unbonded, 2p, single electrons, there are now three single unbonded electrons (in an sp^2 hybrid orbital), each of which is capable of sharing with another atom's electron to form a covalent bond; an additional 2p electron is available for a double bond. In the space below, explain what is happening in the graphic.



3) The above image represents the formation of an sp hybrid set of orbitals for carbon. It's called an sp hybrid because it took one of the s shells and one of the p orbitals to combine in such a manner that instead of having one pair of 2s electrons (that can't bond anything) with 2 unbonded, 2p, single electrons, there are now two single unbonded electrons (in an sp hybrid orbital), each of which is capable of sharing with another atom's electron to form a covalent bond; an additional two 2p electrons are available for a triple bond. In the space below, explain what is happening in the graphic.

4) Define n, l, m and s in the space below:

5) Hybridizations that we don't go into (in detail, hence, they need to be cold memorized) in CHEM 121 include the dsp^2, dsp^3 and d^2sp^3 hybridizations. Diagram these three hybridizations' geometries and give one example of each; in addition, name the shape of the orbitals.

6) The ΔEN Range for a non-polar covalent bond is:

7) The ΔEN Range for a polar covalent bond is:

8) The ΔEN Range for an ionic bond is:

9) The EN for the following elements are tabulated for your use, below:

Fr = 0.5	Sr = 1	Mg = 1.2	Sb = 1.9
B = 2	S = 2.5	I = 2.5	Cl = 3
F = 4			

10) Determine the ΔEN for the following combinations and determine the kind of bond:

A) Sb_2S_3

C) SrI_2

B) $MgCl_2$

D) FrF

E) BF_3

11) You have now completed the lab on Lewis Structures. Draw the following polyatomic ions' Lewis structures using dots, x's, circles, using different colors, anything but lines!, in the space, below (don't forget the charges!).

A) Nitrate

C) Sulfate

B) Phosphate

D) Bicarbonate

12) Given your knowledge of quantum numbers, does the following set of quantum numbers, 2, 0, -3, +½ follow the rules? Explain your response in detail.

13) Given your knowledge of quantum numbers, does the following set of quantum numbers, 2, 0, 0, -½ follow the rules. Explain your response in detail.

14) Given your knowledge of quantum numbers, does the following set of quantum numbers, 1, 0, 1, -½ follow the rules. Explain your response in detail.

15) Draw the following hybridizations (geometrically) and label them with their names:

A) sp B) sp^2 C) sp^3 D) dsp^3 E) d^2sp^3

16) Predict the hybridization of the following elements upon reaction:

A) B B) Be C) Ca D) C (all single bonds)

E) C (1 double bond and 2 single bonds) F) C (1 triple bond and 1 single bond)

G) Xe (in XeF_6) H) Al (in AlF_3) I) N (in NH_3)

17) Draw out the hybrids, below, using the style of the first three questions on this worksheet:

A) B^0

B) sp^2 hybrid of B

C) C^0

D) sp^2 of C

E) sp^3 hybrid of C

F) sp hybrid of C

G) sp^2 hybrid of N

H) sp^3 hybrid of N

I) N^0

J) Ne^0