

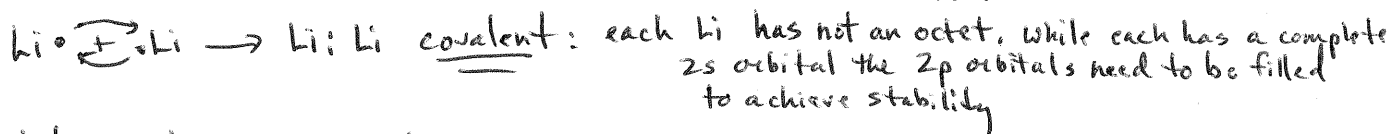
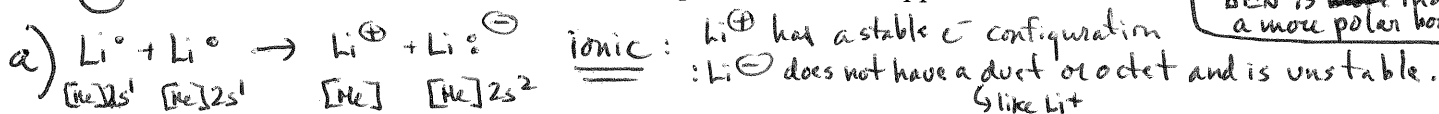
1) (4 points) Answer only one of the following three questions.

a) Suggest reasons why dilithium, Li_2 , does not exist, despite what Star Trek says. In your discussion propose both ionic and covalent structures (draw them) for Li_2 and indicate why neither form is stable.

b) Do the elements become more metallic or less metallic as you (a) go down a group in the periodic table **and** (b) move left to right across a period in periodic table. Explain and support your answers with examples. *Boron is a metalloid + Aluminum is a metal. Fluorine is a non-metal*

Boron's Electronegativity will be more similar to Fluorine's EN as they are in the same period. Aluminum's EN will be much smaller than that of F's. The ΔEN for Al-F > ΔEN B-F. A greater ΔEN is more indicative of a more polar bond.

c) Suggest reasons why BF_3 is a covalent compound and AlF_3 appears to be ionic.



b) What does it mean to be metallic? Metals lose e^- s. It is easier for an element to lose e^- s if they are not attracted strongly to the nucleus. As one goes down a group the e^- s (valence) are held less tightly as they are in progressively higher principle energy levels, further from the nucleus. As one goes across the PT from left to right, the valence e^- s are held more tightly due to progressively greater pull of the nucleus within a principal energy level. Thus, elements become more metallic going down a group and less metallic going L to R across a period. Example for going down a group: C (non-metal), Si (metalloid), Ge (metalloid), Sn (metal), Pb (metal). Example for going across a period: K (metal), Ca (metal), Ga (metal), Ge (metalloid), As (metalloid), Se (non-metal), Br (non-metal).

2) (4 points) Circle the bond type that would form for the following element combinations.

- a) Cr and Cu ionic covalent metallic
- b) Fe and I ionic covalent metallic
- c) Sr and Se ionic covalent metallic
- d) As and F ionic covalent metallic

3) (8 points) Give the name for the given formula or the formula for the given name.

a) iron(II) phosphide Fe_3P_2 c) Li_3As lithium arsenide

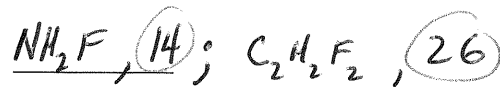
b) aluminum nitrate $\text{Al}(\text{NO}_3)_3$ d) PBr_3 phosphorus tribromide

a) ScPO_4 scandium(III) phosphate c) magnesium iodide MgI_2

b) sodium sulfite Na_2SO_3 d) silicon diselenide SiSe_2

4) (12 points) Answer the following questions for the molecule and ion shown on the whiteboard.

a) What is the total number of valence electrons in the molecule?



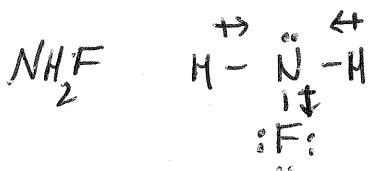
b) What is the total number of valence electrons in the ion?



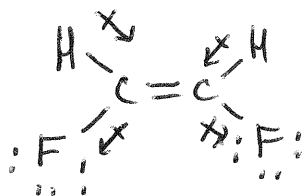
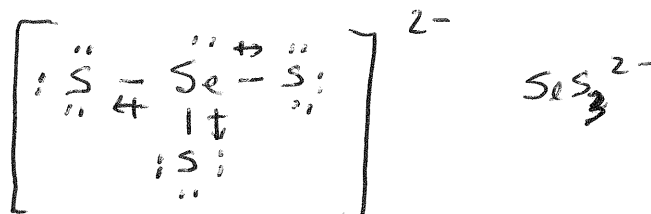
c) Clearly draw the Lewis dot structure for both the molecule and the ion.

Show all lone pairs and bond pairs.

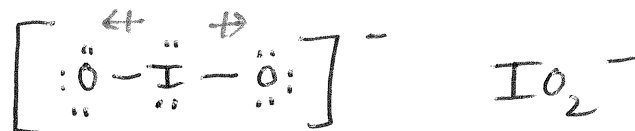
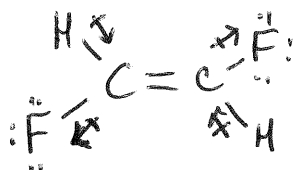
molecule



ion



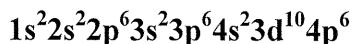
or



d) Are the bonds polar? Why? Show partial charges or dipole moment arrows on your structures in part c as part of your answer.

yes, differences in atom electronegativity
 $EN_H < EN_C < EN_N < EN_F$ | $EN_{Se} < EN_S$, $EN_I < EN_O$

5) (2 points) A monoatomic ion with a 2- charge has a ground state electron configuration



a) Write the symbol of the neutral noble gas atom has the same configuration?



b) Write the symbol of the monoatomic ion with a 2- charge that has this configuration?



c) Write the symbol of an ion with a 1+ charge that is isoelectronic with the species in (a) and (b).

