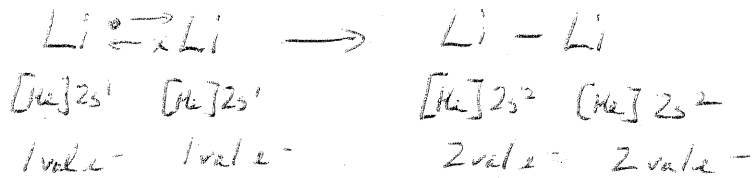


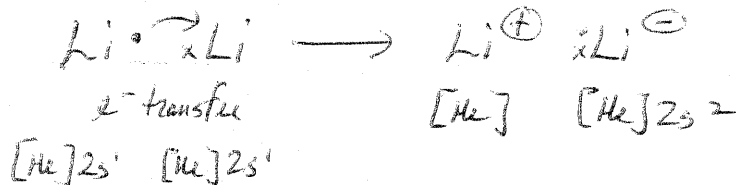
1) (5 points) While dilithium (Li_2) crystals are mined in the 24th century (they power warp drives in Star Trek spaceships), they do not exist in the 21st century.

a) Why doesn't Li_2 exist as a molecule (covalent compound)?



Covalent bonding does not give either lithium a complete highest energy level, i.e. the octet rule is not satisfied.

b) Why doesn't Li_2 exist as a formula unit (ionic compound)?

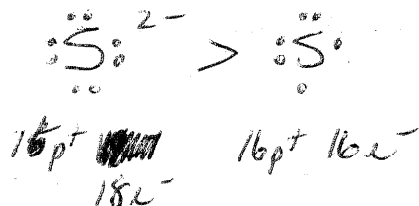


Ionic bonding satisfies the duvet rule for Li^+ but neither the \uparrow duvet or octet rule for Li^- . Energy would be required to separate \uparrow charge.

2) (2 points) A fluorine atom can

2) (2 points) A sulfur atom can capture an electron to become sulfide. When this occurs in the gas state energy is released and this is called electron affinity.

Predict the size of the sulfide compared to the size of the sulfur atom, i.e. smaller or larger. Explain your choice. Be sure to consider electrostatics in your explanation.



Sulfide is larger than fluorine because the positive charge in the S^{2-} nucleus is less relative to that in S . Electron repulsion between the extra e^- and original e^- causes the e^- to spread out.

3) (2 points) TRUE or FALSE

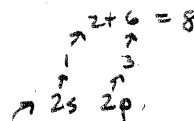
a) Energy is released when an electron moves from the ground state to an excited state.

F

b) Orbits are 3-dimensional regions of space where there is a high probability of finding an electron of a given energy.

F

c) A 3p orbital is lower in energy than a 3s orbital.

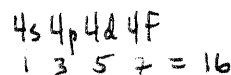


F

d) The total number of electrons that could fill all the orbitals of just the 2nd energy level is 4.

F

e) The total number of orbitals (sub-shells) in just the 4th energy level is 8.

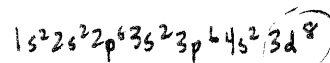


F

f) Elements of the same family have the same number of valence electrons.

T

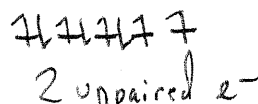
g) The ground state, neutral nickel atom has 8 unpaired electrons



F

h) Non-metals have high ionization energies relative to metals.

T



4) (8 points)

chlorine and selenium react.

a) For **each** element write the short form ground-state electron configuration.

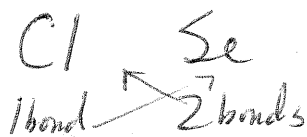


b) For **each** element write the element symbol with Lewis Dots representing the valence electrons.



c) If the compound is ionic, write the **ion symbols**, apply the crossing rule, write the **formula unit**, and **name** the compound.

If the compound is covalent, determine the **number of bonds** for each element, apply the crossing rule for bonds, write the **molecular formula**, and **name** the compound.



Selenium dichloride

5) (8 points)

nitrogen and lithium react.

a) For **each** element write the short form ground-state electron configuration.

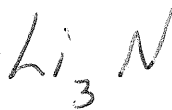


b) For **each** element write the element symbol with Lewis Dots representing the valence electrons.



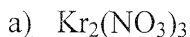
c) If the compound is ionic, write the **ion symbols**, apply the crossing rule, write the **formula unit**, and **name** the compound.

If the compound is covalent, determine the **number of bonds** for each element, apply the crossing rule for bonds, write the **molecular formula**, and **name** the compound.



Lithium nitride

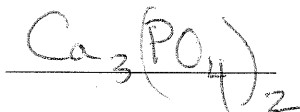
6) (3 pts) Each of the following formulas is *incorrect*. Write the correct formula for each compound.



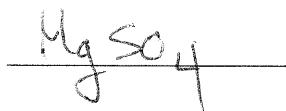
potassium nitrite



calcium phosphate

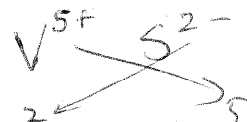
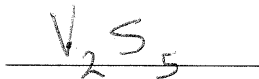


magnesium sulfate



7) (4 pts) Give the chemical formula or chemical name for the following.

a) vanadium(V) sulfide



b) MgI_2

magnesium iodide

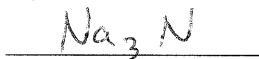
c) scandium(III) acetate



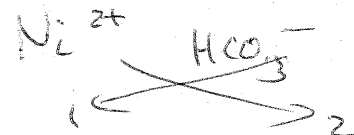
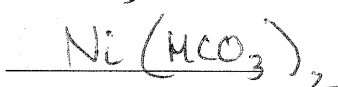
d) $Ca(OH)_2$

calcium hydroxide

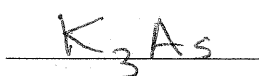
e) sodium nitride



f) nickel(II) hydrogen carbonate



g) potassium arsenide



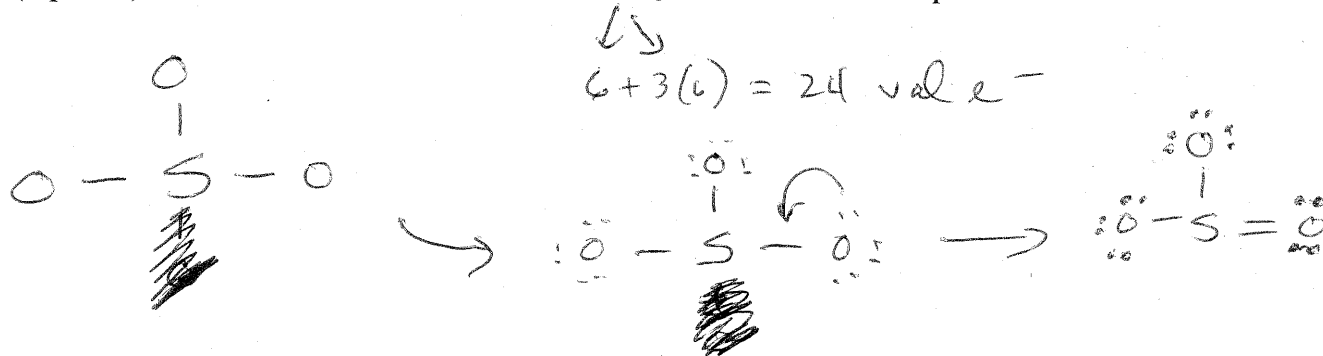
h) Cu_2SO_4

copper (I) sulfate



Extra Credit:

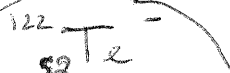
1) (2 points) Draw the Lewis Dot structure for SO_3 . Show all electron pairs.



2) (2 points) Write the isotope symbol for an ion that has a mass number of 122, a charge of -1, and a s^2p^5 configuration in its outer most shell or valence shell.

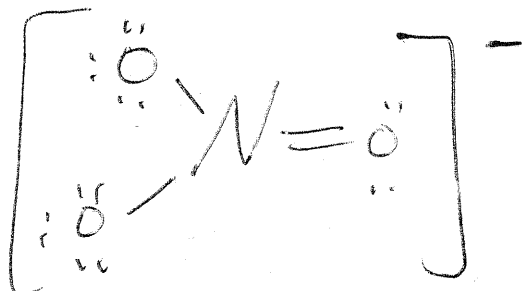
like a halogen, but negative, so an e^- was added to a s^2p^4 element

Based on the mass # = 122 it can only be Te.



Extra Credit:

1) (2 points) Draw the Lewis Dot structure for NO_3^- . Show all electron pairs.



$$5 + 6(3) + 1 = 24 \text{ val } e^-$$