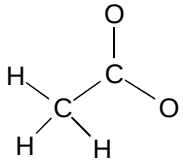
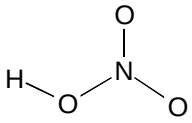
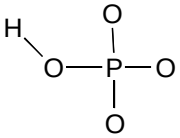
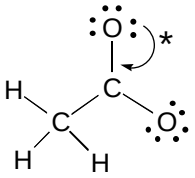
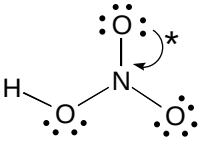
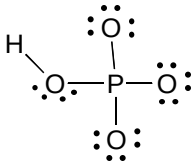
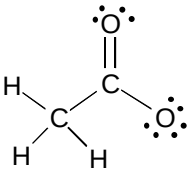
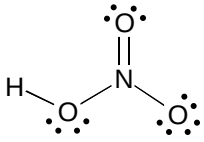
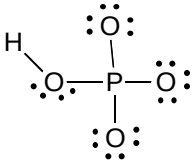
Drawing Lewis Dot Structures of Molecules

L. Cabana, Fall 1999

	e.g., Acetate ion $CH_3CO_2^-$	e.g. Nitric Acid HNO_3	e.g., Monohydrogen Phosphate ion, HPO_4^{-2}
Step 1. Start from "skeleton" (connectivity) of molecule (this information would be given).			
Step 2. Calculate the total number of valence electrons provided by the atoms in the formula (add up their Group Numbers). If the molecule is an ion (i.e. has a net charge), *add* 1 electron to the total for every *negative* charge, or *subtract* 1 electron for *positive* charge.	**C** 1 x 4 e- = 4 **H_3** 3 x 1 e- = 3 **C** 1 x 4 e- = 4 **O_2** 2 x 6 e- = 12 -1 chrg = 1 total = **24 val e-**	**H** 1 x 1 e- = 1 **N** 1 x 5 e- = 5 **O_3** 3 x 6 e- = 18 total = **24 val e-**	**H** 1 x 1 e- = 1 **P** 1 x 5 e- = 5 **O_4** 4 x 6 e- = 24 -2 chrg = 2 total = **32 val e-**
Step 3. **a)** Count the electrons already written as the bonds in the "skeleton" of the molecule (each single bond contains 2 electrons) Subtract this number from the total number of valence electrons calculated in Step 2. This gives the number of electrons to add (as dots) to the Lewis dot structure.	**24 total** val. e- minus 1**2 skeleton** e- equals **12 e- left** to add.	**24 total** val. e- minus **8 skeleton** e- equals **16 e- left** to add.	**32 total** val. e- minus **10 skeleton** e- equals **22 e- left** to add.
b) Place these remaining electrons as pairs of dots (representing electron pairs) on atoms that don't have an octet yet, starting with the most electronegative elements (O and halogens).			
Step 4. Check each atom in the structure to see if it has an **octet** of electrons. * If possible, complete the octet where needed by coverting an unshared electron pair on a neighboring atom into a bond with the deficient atom.			 (no change needed)
Step 5. Check each atom for pos/neg **Formal Charge**: F.C. = Group No. - bonds - unshared electrons F.C. = Group No. - "sticks" - "dots"