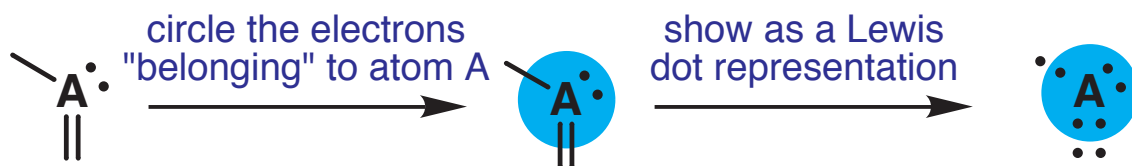


# Formal Charge

Calculating formal charge is a two-step process. First we determine the number of electrons that contribute to the charge of the atom in the building block. Next we compare this result to the number of valence electrons for this element. We want to know if there is a shortage, surplus, or perfect balance of electrons in the building block atom, compared to the element.

Step 1 - determine the number of electrons that contribute to the charge of atom "A" in the building block shown at right



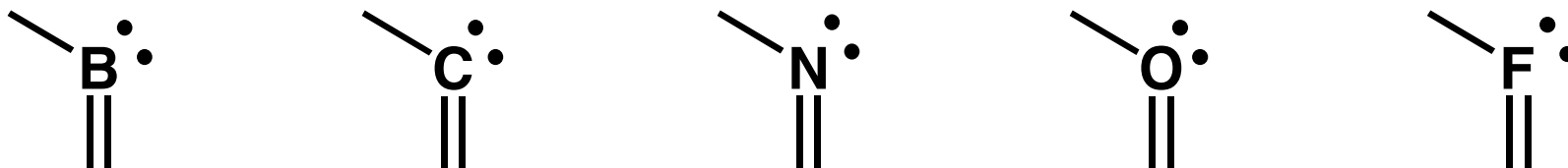
Step 2 - The table below shows that the formal charge of atom "A" depends on which element "A" happens to be.

How many electrons contribute to the charge of atom A? \_\_\_\_\_

| atom "A" in building block | valence electrons for this element | electron imbalance (compare the number of valence electrons to the electron count from step 1) | formal charge |
|----------------------------|------------------------------------|--|---------------|
| boron                      |                                    | "B" in building block has a surplus of 2 electrons   | -2            |
| carbon                     |                                    |  |               |
| nitrogen                   |                                    |  |               |
| oxygen                     |                                    |  |               |
| fluorine                   |                                    |  |               |

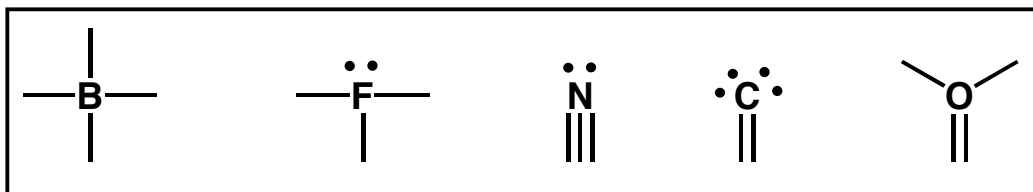


# Formal Charges Range from -1 to +1



Assign formal charge to the building blocks shown above. Formal charges of period-two atoms are generally in the range of  $-1$  to  $+1$ . As you can see from these examples, larger values of formal charge are possible, in theory. In practice, however, such values are generally too unstable to be important. Thus, we will typically ignore building blocks having formal charges of  $+2$  and  $-2$ .

All the atoms in these building blocks have an octet of electrons. Assign formal charges. Strike through any that can be ignored due to unreasonably large charge.



Some of building blocks on the right are also not reasonable, either because they have large formal charge or an incomplete octet. Strike through all that can be ignored and state the reason.

