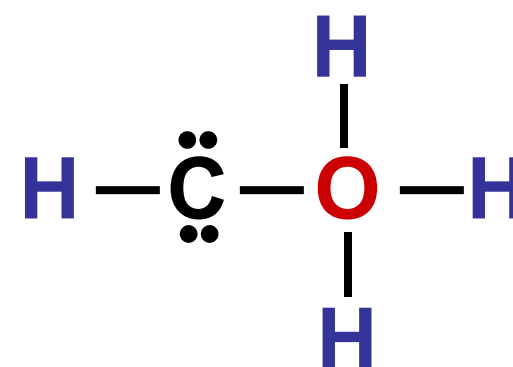
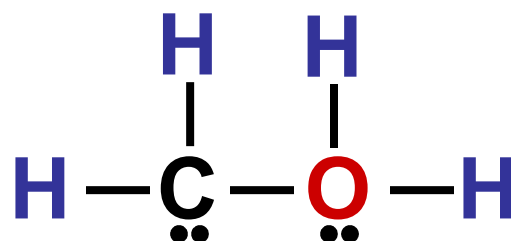
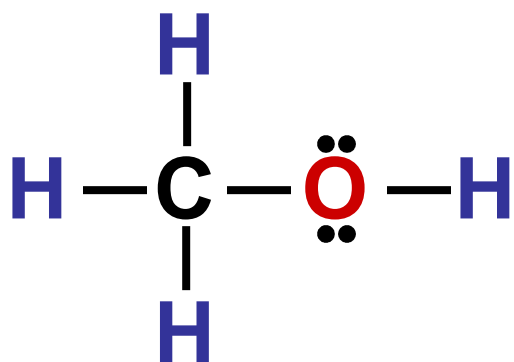


# Formal Charges:


*Determining the most correct Lewis Structure*



$$4 \text{ Valence } e^- + 1 \text{ Valence } e^- \times 4 + 6 \text{ Valence } e^- = 14 \text{ Valence } e^-$$



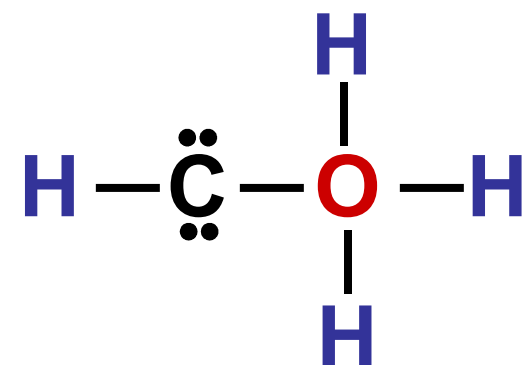
How do we decide which Lewis Dot Structure is correct?

By determining the Formal Charge for each atom and deciding which F.C. arrangement is most reasonable. 

# Formal Charges:

## *Determining the most correct Lewis Structure*

**Formal Charge (F.C.)** = # **V**alence e<sup>-</sup> - # **U**nshared e<sup>-</sup> - # **B**onds



$$FC_C = 4 \text{ Ve}^- - 4 \text{ Ue}^- - 2 \text{ Bonds} = -2$$

$$FC_H = 1 \text{ Ve}^- - 0 \text{ Ue}^- - 1 \text{ Bond} = 0 \times 4$$

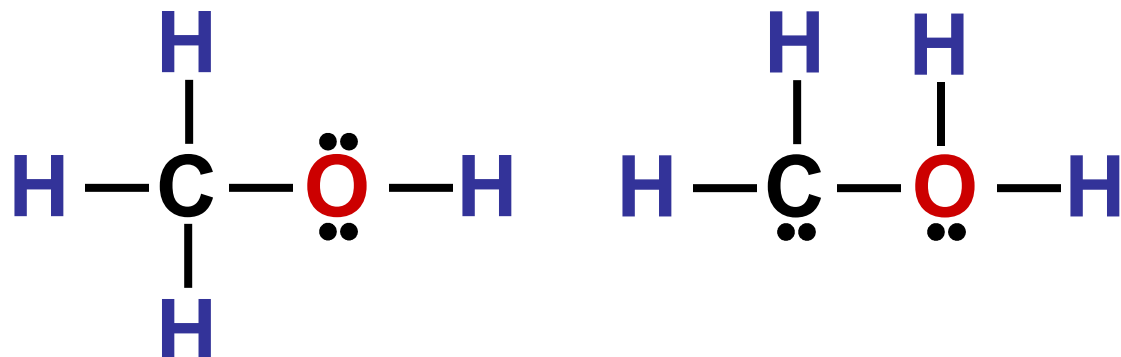
$$FC_O = 6 \text{ Ve}^- - 0 \text{ Ue}^- - 4 \text{ Bonds} = +2$$

The total of all F.C.'s must equal the charge on the molecule. = 0 CORRECT! 

# Formal Charges:

## *Determining the most correct Lewis Structure*

**Formal Charge (F.C.)** = # **V**alence e<sup>-</sup> - # **U**nshared e<sup>-</sup> - # **B**onds



$$FC_C = 4 \text{ Ve}^- - 0 \text{ Ue}^- - 4 \text{ Bonds} = 0$$

$$FC_H = 1 \text{ Ve}^- - 0 \text{ Ue}^- - 1 \text{ Bond} = 0 \times 4$$

$$FC_O = 6 \text{ Ve}^- - 4 \text{ Ue}^- - 2 \text{ Bonds} = \underline{0}$$

0

$$FC_C = 4 \text{ Ve}^- - 2 \text{ Ue}^- - 3 \text{ Bonds} = -1$$

$$FC_H = 1 \text{ Ve}^- - 0 \text{ Ue}^- - 1 \text{ Bond} = 0 \times 4$$

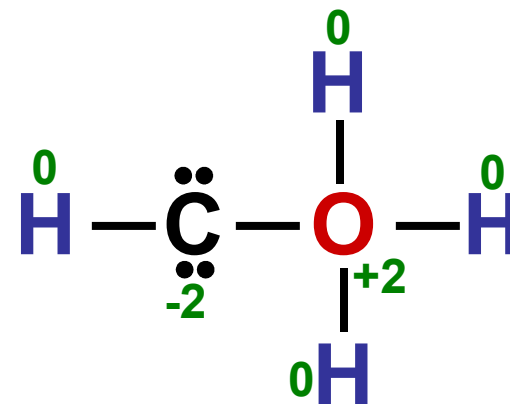
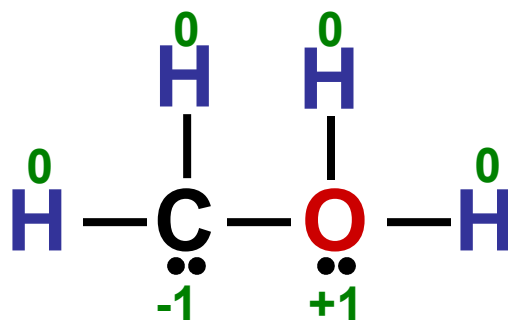
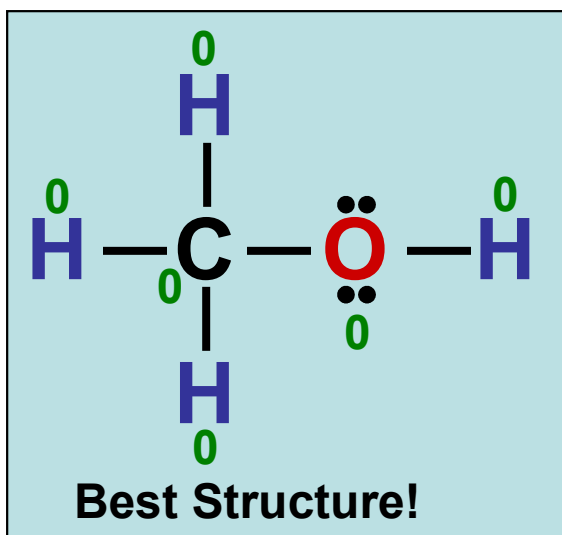
$$FC_O = 6 \text{ Ve}^- - 2 \text{ Ue}^- - 3 \text{ Bonds} = \underline{+1}$$



# Formal Charges:

## *Determining the most correct Lewis Structure*

Formal Charge (F.C.) = # Valence e<sup>-</sup> - # Unshared e<sup>-</sup> - # Bonds



*Time to choose!* • Smaller formal charges are preferable to larger ones

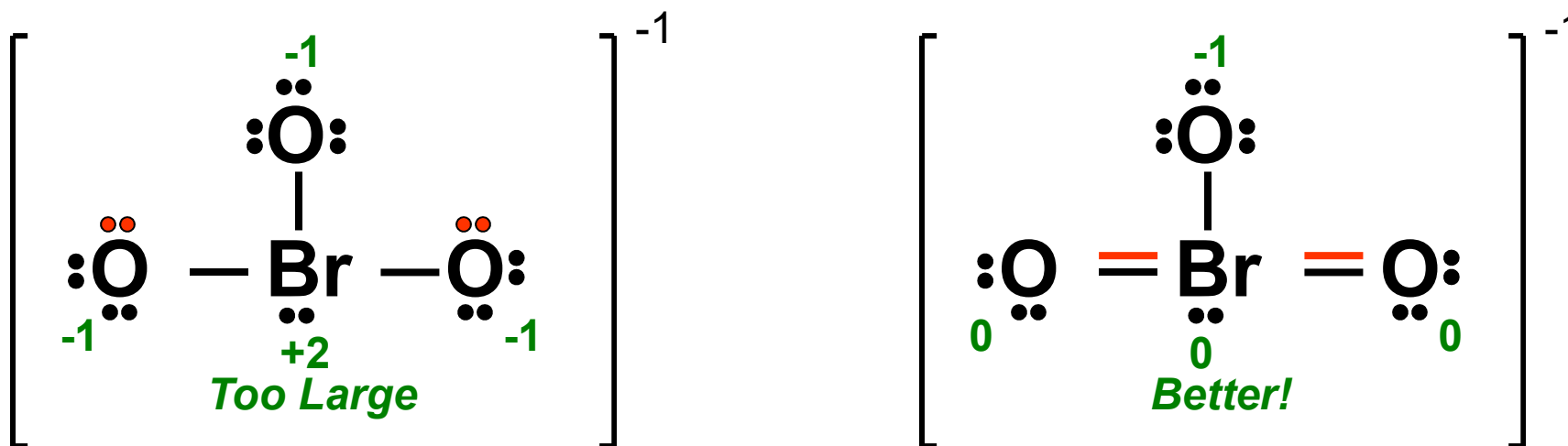
- “Like” formal charges on neighboring atoms are not desirable
- A more negative formal charge should be associated with atoms having higher electronegativity.



# Formal Charges:

## *Determining the best Lewis Structure*

**Problem 10.17** Draw a Lewis structure for the most important resonance form of the  $\text{BrO}_3^-$  ion, showing formal charges and oxidation numbers of the atoms (26 Valence  $e^-$ )



Convert lone pair electrons into bonding electrons to improve formal charge values.

