

2.6 Resonance Structures and Formal Charge Worksheet

- 1) Calculate the formal charge on each atom in O_3 .
- 2) There are two possible structures for CO_2 . One has two double bonds, and the other has a single and a triple bond.
 - a. Find the formal charge on every atom in each structure.
 - b. Select the most likely structure. Justify your choice.
- 3) There are three possible structures for the cyanate ion, NCO^- . Carbon is the least electronegative, so it is always in the centre. The different structures result from the placement and choice of multiple bonds (double or triple).
 - a. Find the formal charge on every atom in each structure.
 - b. Which structure is most likely to occur in nature? Justify your answer.
- 4) Draw Lewis diagrams for the following compounds:
 - a. SO_4^{2-}
 - b. POCl_3
- 5) The following questions pertain to the phosphate ion, PO_4^{3-} .
 - a. Draw the resonance structures for the phosphate ion.
 - b. What is the bond order between the phosphorus atom and each oxygen atom in the phosphate ion?
- 6) The following questions pertain to the carbonate ion and carbon dioxide.
 - a. Draw all of the resonance structures for the carbonate ion.
 - b. What is the effective bond order between the carbon atom and each oxygen atom in the carbonate ion?
 - c. What is the effective bond order between the carbon atom and each oxygen atom in carbon dioxide?
 - d. In which structure, carbonate or carbon dioxide, is the bond length between the carbon atom and each oxygen atom the shortest? Explain.
 - e. In which structure, carbonate or carbon dioxide, is the bond energy between the carbon atom and each oxygen atom the greatest? Explain.
 - f. Which structure has the most potential energy associated with its individual bonds? Justify your answer.