A6 · Double and triple bonds · Worked examples and practice

Name: _____ Date: _____

Worked examples

Read these first. There is one for each kind of question in this lesson.

Example 1 · Place a double bond

Ethene is C_2H_4. Each carbon atom is joined to the other carbon and to 2 hydrogen atoms. Find the bonds in ethene.

1. Join the atoms with single bonds: C to C, and 2 hydrogen atoms on each carbon.
2. Find atoms with single dots left over: carbon forms 4 bonds and has used 3, so each carbon has 1.
3. Pair left-over dots of two joined atoms: the two carbon atoms share a second pair.
4. Count the electrons around each atom: each carbon has 4 + 4 = 8, and each hydrogen has 2.

Answer: The two carbon atoms share a double bond. Every other bond is a single bond.

Example 2 · Count the electrons around an atom with a double bond

In CO_2, carbon shares a double bond with each oxygen atom. How many electrons are around the carbon atom?

1. A double bond counts as 4 electrons.
2. Carbon has 2 double bonds.
3. 4 + 4 = 8 electrons.

Answer: Carbon has 8 electrons around it.

Practice

Questions 1 to 4 are easy. Questions 5 to 8 are medium. Questions 9 and 10 are harder.

EASY

1. How many shared pairs are in a double bond? How many dashes show it in a structural formula?

EASY

2. How many electrons does a triple bond count as? Show your count.

EASY

3. Each fluorine atom forms 1 bond. What kind of bond joins the two atoms in F_2? Say why it is not a double bond.

EASY

4. In the structural formula of CO_2, how many dashes join carbon to each oxygen atom? Say why.

MEDIUM

5. A molecule has the formula N_2H_2. Each nitrogen atom forms 3 bonds, and is joined to the other nitrogen and to 1 hydrogen. Use the four steps to find its bonds.

MEDIUM

6. In N_2, the two nitrogen atoms share a triple bond. How many electrons are around each nitrogen atom? Show your count.

MEDIUM

7. Hydrazine is N_2H_4. Each nitrogen forms 3 bonds. Use the three steps for two middle atoms to find its structural formula.

MEDIUM

8. In ethene, C_2H_4, each carbon has 2 single bonds to hydrogen and 1 double bond to the other carbon. How many electrons are around one carbon atom?

HARDER

9. Carbonyl fluoride is COF_2. Carbon is the middle atom. Use the four steps to find its bonds. Then count the electrons around carbon.

HARDER

10. A student draws N_2 with a single bond and says each nitrogen atom is full. Count the electrons to show the mistake. What is the correct bond?