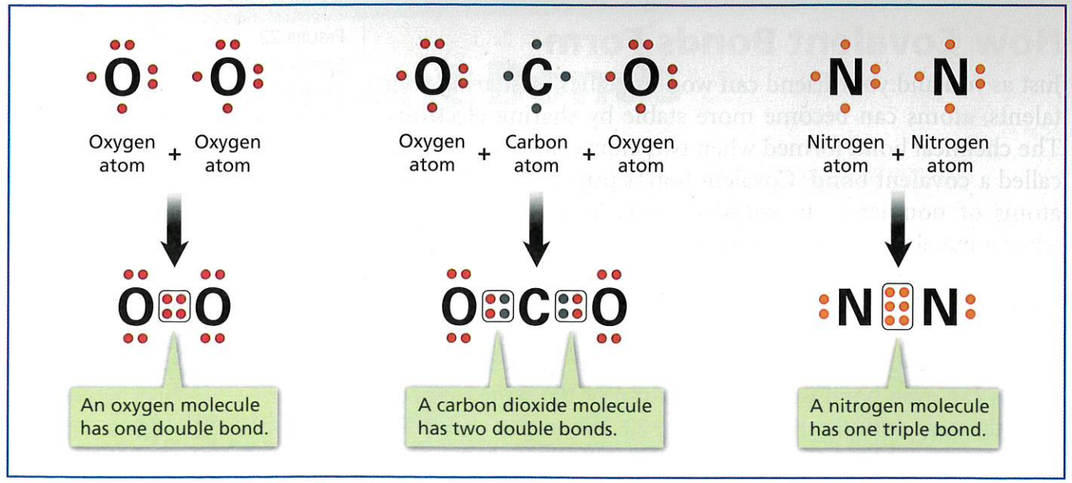

FIGURE 24
Double and Triple Bonds
Double and triple bonds can form when atoms share more than one pair of electrons.
Interpreting Diagrams *In a nitrogen molecule, how many electrons does each nitrogen atom share with the other?*

Double Bonds and Triple Bonds Look at the diagram of the oxygen molecule (O_2) in Figure 24. What do you see that's different? This time the two atoms share two pairs of electrons, forming a **double bond.** In a carbon dioxide molecule (CO_2), carbon forms a double bond with each of two oxygen atoms. Elements such as nitrogen and carbon can form **triple bonds** in which their atoms share three pairs of electrons.

Reading Checkpoint **What is the difference between a double bond and a triple bond?**

Molecular Compounds

A **molecular compound** is a compound that is composed of molecules. The molecules of a molecular compound contain atoms that are covalently bonded. Molecular compounds have very different properties than ionic compounds. **Compared to ionic compounds, molecular compounds generally have lower melting points and boiling points, and they do not conduct electricity when dissolved in water.**

Low Melting Points and Boiling Points Study the table in the Analyzing Data box on the next page. It lists the melting points and boiling points for a few molecular compounds and ionic compounds. In molecular solids, forces hold the molecules close to one another. But, the forces between molecules are much weaker than the forces between ions in an ionic solid. Compared with ionic solids, less heat must be added to molecular solids to separate the molecules and change the solid to a liquid. That is why most familiar compounds that are liquids or gases at room temperature are molecular compounds.

Go Online SCILINKS NSTA
For: Links on molecular compounds
Visit: www.SciLinks.org
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Math Analyzing Data

Comparing Molecular and Ionic Compounds

The table compares the melting points and boiling points of a few molecular compounds and ionic compounds. Use the table to answer the following questions.

1. **Graphing** Create a bar graph of just the melting points of these compounds. Put the molecular compounds on the left and the ionic compounds on the right. Arrange the bars in order of increasing melting point. The *y*-axis should start at −200°C and go to 900°C.
2. **Interpreting Data** Describe what your graph reveals about the melting points of molecular compounds compared to those of ionic compounds.
3. **Inferring** How can you account for the differences in melting points between molecular compounds and ionic compounds?
4. **Interpreting Data** How do the boiling points of the molecular and ionic compounds compare?

Melting Points and Boiling Points of Molecular and Ionic Compounds

Substance	Formula	Melting Point (°C)	Boiling Point (°C)
Methane	CH_4	−182.4	−161.5
Rubbing alcohol	C_3H_8O	−89.5	82.4
Water	H_2O	0	100
Zinc chloride	$ZnCl_2$	290	732
Magnesium chloride	$MgCl_2$	714	1,412
Sodium chloride	NaCl	800.7	1,465

Molecular compound Ionic compound

5. **Predicting** Ammonia's melting point is −78°C and its boiling point is −34°C. Is ammonia a molecular compound or an ionic compound? Explain.

Poor Conductivity Most molecular compounds do not conduct electricity. No charged particles are available to move, so electricity cannot flow. Materials such as plastic and rubber are used to insulate wires because these materials are composed of molecular substances. Even as liquids, molecular compounds are poor conductors. Pure water, for example, does not conduct electricity. Neither does table sugar or alcohol when they are dissolved in pure water.

Unequal Sharing of Electrons

Have you ever played tug of war? If you have, you know that if both teams pull with equal force, the contest is a tie. But what if the teams pull on the rope with unequal force? Then the rope moves toward the side of the stronger team. The same is true of electrons in a covalent bond. **Atoms of some elements pull more strongly on shared electrons than do atoms of other elements. As a result, the electrons are pulled more toward one atom, causing the bonded atoms to have slight electrical charges.** These charges are not as strong as the charges on ions.