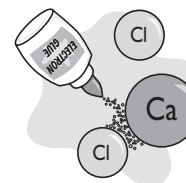


**LESSON**  
**26**  
**ACTIVITY**

# Electron Glue Bonding

Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_



## Purpose

To investigate the different types of bonding found in substances and to relate bonding to the physical properties of substances.

## Procedure

Read the handout Four Models of Bonding. Study the information on the Substance cards. Your job is to match each substance to its appropriate type of bonding on the handout.

Use the information on the cards to sort the 16 substances into the four categories of bonding. Write your results in the table.

Ionic	Network covalent	Metallic	Molecular covalent

- Are there any substances that don't seem to fit properly in the categories you have placed them in? List them here and explain.

Use the handout to answer these questions.

- What do the pictures of the four models of bonding attempt to show?
- Give the type of bonding for each substance described here.
  - A substance made up entirely of metal atoms
  - A substance made up of both metal and nonmetal atoms
  - A substance made up entirely of nonmetal atoms

4. Some substances made up entirely of nonmetal atoms are soluble in water, while others are not. Use the bonding models to explain why.
5. How might the model for network covalent bonding explain the incredible hardness of a diamond?
6. Both sugar and salt dissolve in water, but they bond differently. Use the models to explain how these two substances might be different after they dissolve.
7. Which bonding model would you predict for the following substances? Which are compounds and which are elements?
  - a. KI, potassium iodide
  - b. CO<sub>2</sub>, carbon dioxide gas
  - c. Au, gold
  - d. Cl<sub>2</sub>, chlorine gas
8. Which of the bonding models are found in elemental substances? Explain, using examples.
9. **Making Sense** If you have the chemical formula of a substance, what can you figure out about its properties? Explain. Use the compound silver nitrate, AgNO<sub>3</sub>, as an example.

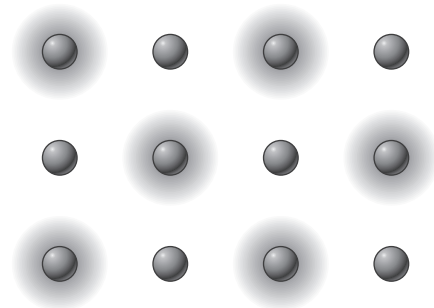
## FOUR MODELS OF BONDING

Each sphere in the drawing represents an atom. The gray shaded areas represent places where the negatively charged valence electrons might be found with each type of bond.

### Model 1: Ionic

#### Properties:

Dissolve in water  
Conduct electricity when dissolved  
Brittle solids  
Made of metal and nonmetal atoms combined

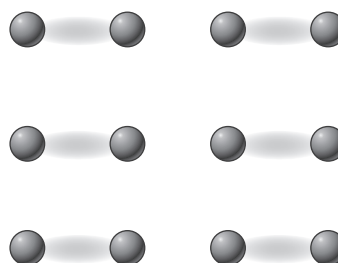


Metal atoms "give up" their valence electrons to nonmetal atoms.

### Model 2: Molecular Covalent

#### Properties:

Some dissolve in water; some do not  
Do not conduct electricity  
Some are liquids or gases  
Made entirely of nonmetal atoms

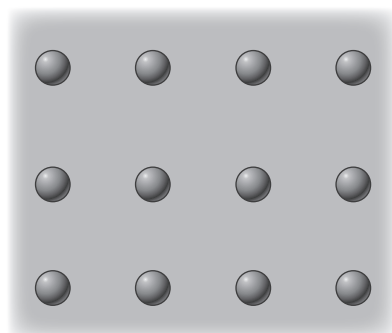


Valence electrons are shared between some atoms. This creates small stable units within the substance.

### Model 3: Metallic

#### Properties:

Do not dissolve in water  
Conduct electricity  
Bendable and hard solids  
Made entirely of metal atoms

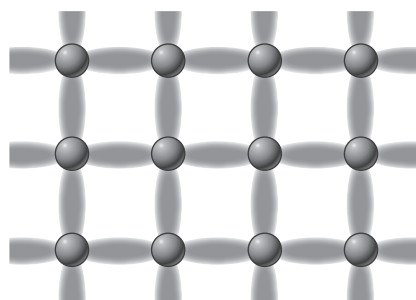


Valence electrons are free to move about the substance.

### Model 4: Network Covalent

#### Properties:

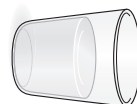
Do not dissolve in water  
Do not conduct electricity  
Extremely hard solids  
Made entirely of nonmetal and metalloid atoms



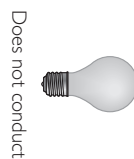
Valence electrons connect atoms with each other in all directions, like a grid or network.

## SUBSTANCE CARDS

Water,  
 $\text{H}_2\text{O}(l)$

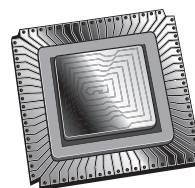


Liquid

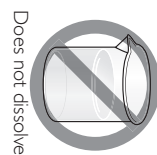


Does not conduct

Silicon,  
 $\text{Si}(s)$



Hard solid



Does not dissolve



Sometimes conducts

Mercury,  
 $\text{Hg}(l)$



Liquid



Does not dissolve



Conducts

Methane,  
 $\text{CH}_4(g)$



Gas

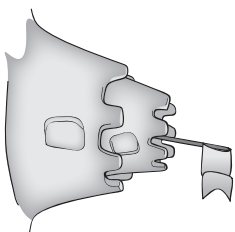


Does not dissolve

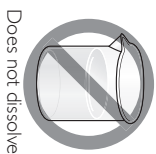


Does not conduct

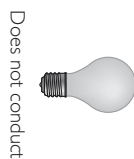
Sand,  
 $\text{SiO}_2(s)$



Hard solid



Does not dissolve



Does not conduct

Sodium,  
 $\text{Na}(s)$



Soft, very malleable solid



Does not dissolve

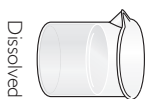


Conducts

Salt Water,  
 $\text{NaCl}(aq)$



Aqueous solution



Dissolved



Conducts

Platinum,  
 $\text{Pt}(s)$



Malleable, ductile solid



Does not dissolve



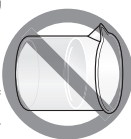
Conducts

# SUBSTANCE CARDS

**Diamond,**  
 $C(s)$



**Very hard solid**



Does not dissolve

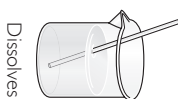


Does not conduct

**Table Salt,**  
 $NaCl(s)$



**Brittle solid**

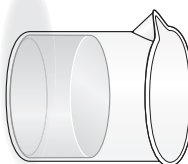


Dissolves

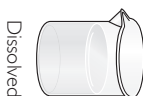


Does not conduct  
(as a solid)

**Aqueous Copper Chloride,**  
 $CuCl_2(aq)$



**Aqueous solution**

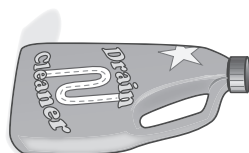


Dissolved

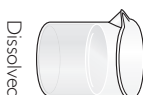


Conducts

**Drain Cleaner,**  
 $NaOH(aq)$



**Aqueous solution**

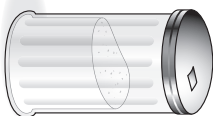


Dissolved

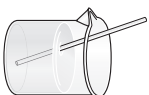


Conducts

**Table Sugar,**  
 $C_{12}H_{22}O_{11}(s)$



**Soft solid**



Dissolves



Does not conduct

**Copper,**  
 $Cu(s)$



**Malleable, ductile solid**



Does not dissolve

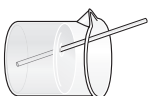


Conducts

**Ethanol,**  
 $C_2H_6O(l)$



**Liquid**



Dissolves

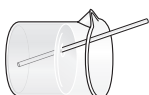


Does not conduct

**Epsom Salt,**  
 $MgSO_4(s)$



**Brittle solid**



Dissolves



Does not conduct  
(as a solid)