

# Ionic vs Covalent Compounds

## Practice Worksheet

### Comparison of Properties of Ionic and Covalent Compounds

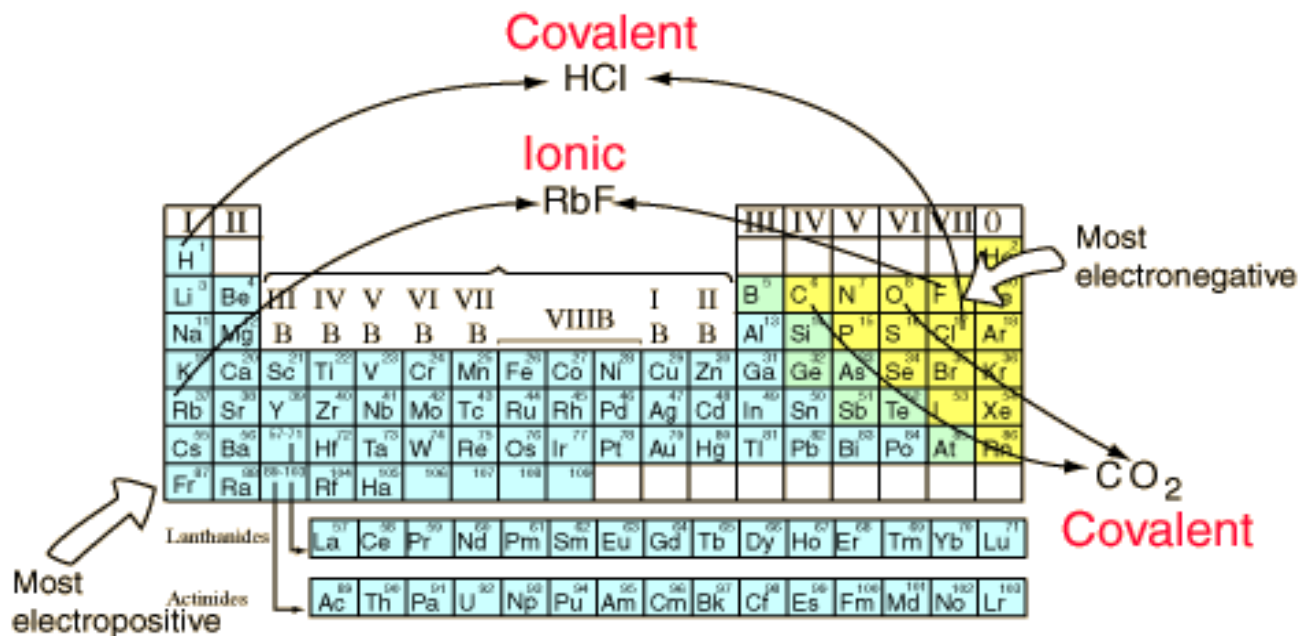
Because of the nature of **ionic** and **covalent** bonds, the materials produced by those bonds tend to have quite different macroscopic properties. The atoms of covalent materials are bound tightly to each other in stable molecules, but those molecules are generally not very strongly attracted to other molecules in the material. The atoms (ions) in ionic materials show strong attractions to other ions in their vicinity. This generally leads to low melting points for covalent solids, and high melting points for ionic solids. For example, the molecule carbon tetrachloride is a non-polar covalent molecule,  $\text{CCl}_4$ . It's melting point is  $-23^\circ\text{C}$ . By contrast, the ionic solid  $\text{NaCl}$  has a melting point of  $800^\circ\text{C}$ .

### Properties of Covalent Compounds

- Gases, liquids, or solids (made of molecules)
- Atoms share electrons to become stable.
- Usually occurs between non-metals.
- Hydrogen and another non-metal chemically combines through covalent bonding.
- Low melting and boiling points
- Poor electrical conductors in all phases
- Many soluble in non-polar liquids but not in water

### Properties of Ionic Compounds

- ▶ Crystalline solids (made of ions)
- ▶ Metal atoms give electrons while non metal atoms get electrons to become stable.
- ▶ Usually occurs between metals and non-metals.
- ▶ High melting and boiling points
- ▶ Conduct electricity when melted
- ▶ Many soluble in water but not in non-polar liquid



### Clarifying Questions:

1. Why do solid covalent compounds ( molecules) have low melting points?

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2. Why do solid ionic compounds ( ions) have high melting points?

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3. How are carbon tetrachloride and sodium chloride different from each other?

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**Instructions:** Classify the following properties as either Ionic or Covalent compounds. Write ionic or covalent on the space before each property.

- \_\_\_\_\_ 4. Atoms share electrons to become stable.  
\_\_\_\_\_ 5. High melting and boiling points  
\_\_\_\_\_ 6. Conduct electricity when melted  
\_\_\_\_\_ 7. Usually occurs between non-metals.  
\_\_\_\_\_ 8. Poor electrical conductors in all phases  
\_\_\_\_\_ 9. Many soluble in non-polar liquids but not in water  
\_\_\_\_\_ 10. Crystalline solids (made of ions)  
\_\_\_\_\_ 11. Metal atoms give electrons while non metal atoms get electrons to become stable  
\_\_\_\_\_ 12. Usually occurs between metals and non-metals.  
\_\_\_\_\_ 13. Hydrogen and another non-metal chemically combines through covalent bonding.  
\_\_\_\_\_ 14. Low melting and boiling points  
\_\_\_\_\_ 15. Many soluble in water but not in non-polar liquid

**Classify the following as metal or non-metal and ionic or covalent compounds.**

Compound	First element/atom (metal or non –metal )	Second element/atom (metal or non –metal )	Ionic or Covalent
CH <sub>4</sub>	Carbon or C is a non metal	Hydrogen or H in this case is exhibiting non-metallic properties.	covalent
MgCl <sub>2</sub>			
H <sub>2</sub> O			
CCl <sub>4</sub>			
HF		Hydrogen or H is this case is exhibiting metallic properties.	
HCl			
NaCl			
Mg <sub>3</sub> P			