Ionic and Covalent Bonds

Physical Science

Name: _____ Period: _____ Date: _____

Essential Question: How is ionic bonding different from covalent bonding?

Comparison of Properties of Ionic and Covalent Compounds

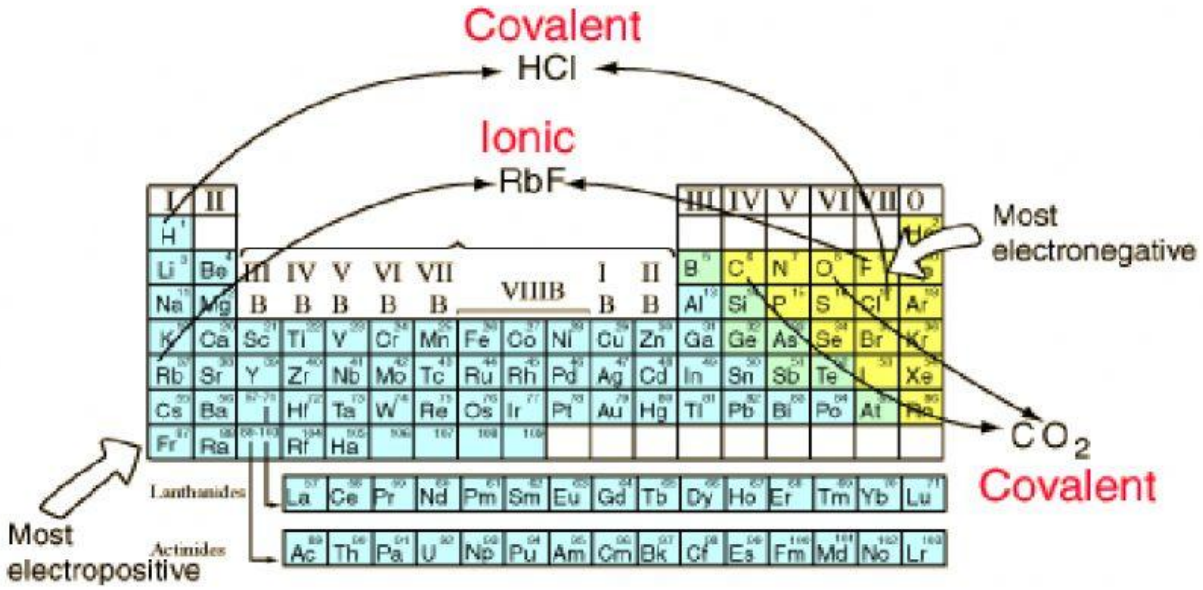
Because of the nature of **ionic** and **covalent** bonds, the materials produced by those bonds tend to have quite different macroscopic properties. The atoms of covalent materials are bound tightly to each other in stable molecules, but those molecules are generally not very strongly attracted to other 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, CCl_4. It's melting point is -23°C. By contrast, the ionic solid NaCl has a melting point of 800°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



LIVEWORKSHEETS

Clarifying Questions:

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

   _____

   _____

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

   _____

   _____

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

   _____

   _____

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 stabl
_____ 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_4	Carbon or C is a non metal	Hydrogen or H in this case is exhibiting non-metallic properties.	covalent
$MgCl_2$			
H_2O			
CCl_4			
HF		Hydrogen or H is this case is exhibiting metallic properties.	
HCl			
NaCl			
Mg_3P			

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Covalent Compounds Worksheet

1) Based on the properties of the following materials, determine whether they are made of primarily ionic compounds or covalent compounds:

   a) telephone receiver: _____

   b) concrete: _____

   c) gasoline: _____

   d) candy corn: _____

2) Name the following covalent compounds:

   a) SiF_4 _____

   b) N_2S_3 _____

   c) HBr _____

   d) Br_2 _____

3) Write the formulas for the following covalent compounds:

   a) diboron hexahydride _____

   b) nitrogen tribromide _____

   c) sulfur hexachloride _____

   d) diphosphorus pentoxide _____

4) Write the empirical formulas for the following compounds:

   a) $C_2H_4O_2$ _____

   b) boron trichloride _____

   c) methane _____

   d) $C_6H_{12}O_6$ _____

5) List three differences between ionic and covalent compounds:

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6) Explain why ionic compounds are formed when a metal bonds with a nonmetal but covalent compounds are formed when two nonmetals bond.

7) What are the shapes of the following molecules?

a) carbon disulfide _____

b) boron trifluoride _____

c) carbon tetrafluoride _____

8) What does electronegativity have to do with bond polarity?

9) Explain how hydrogen bonding takes place.

10) Why is the bond length of nitrogen much shorter than the bond length of chlorine?

11) What is an organic compound?

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