

Science 1206
Unit 2: Chemical Reactions
Worksheet 9: Properties of Ionic and Molecular Compounds



The two major classes of compounds

1) Molecular compounds are formed when nonmetallic atoms share attractions for each other's electrons

2) Ionic compounds are formed by the attractions between oppositely charged ions. (metal + nonmetal or complex ion)

Due to their different ways of bonding, each class of compounds has its own unique properties

1. State of Matter refers to matter as either solid, liquid, or gas.

- Ionic compounds are solids at room temperature
- Molecular substances as a group are variable in their states of matter - some are solids, but many are liquids or gases.
- Since all ionic compounds are solids, you can classify any pure liquid or gas substance as molecular.

2. Melting point is the temperature at which a substance changes from solid to liquid state.

- Molecular substances melt at temperatures below 300°C,
- Ionic substances tend to have melting points above 300°C
- However, melting point data alone is usually insufficient evidence to classify a substance as ionic or molecular.

3. Solubility of a substance is the maximum amount of a material (called the solute) that can be dissolved in given quantity of solvent at a given temperature.

- Aqueous Solution - a solution in which water is the solvent. Chemists use the symbol (aq) to the lower right of the symbol or formula to represent an aqueous solution.


$\text{NaCl}_{(aq)}$ - sodium chloride dissolved in water.

- Both ionic and molecular compounds may or may not dissolve in water, so this evidence alone cannot be used to classify a solid compound.

4. Electrical Conductivity is the ability of a substance to allow an electric current to exist within it.

- Ionic compounds are composed of ions. When dissolved in water the ionic compounds break up into its ions to form electrically conductive solutions (electrolytic solutions).
- Molecular compounds are composed of neutral molecules. When dissolved in water they stay as neutral molecules. Molecules do not allow the movement of electrons, thus do not conduct electricity. (nonelectrolytic solutions)
- All known ionic compounds which dissolve in water to form aqueous solutions will conduct electricity
- Molecular compounds that dissolve in water to form aqueous solutions do not conduct electricity.

	IONIC	COVALENT
Example	Salt	Sugar
Bonding Type	Transfer e ⁻	Share e ⁻
Types of Elements	Metal & Nonmetal	Nonmetals
Physical State	Solid	Solid, Liquid, or Gas
Melting Point	High (above 300°C)	Low (below 300 °C)
Solubility	Some Dissolve in Water	Varies
Conductivity	Good	Poor



PART A: MULTIPLE CHOICE

Instructions: Shade the letter of the correct answer on the computer scorable answer sheet provided.

1. Which of the following is a solid?

- (A) CO_(g)
- (B) Br_{2(l)}
- (C) MgCl_{2(s)}
- (D) HCl_(aq)

2. Which of the following is true?

	Melting Point for Molecular Compounds	Melting Point for Ionic Compounds
(A)	Above 300 °C	Below 300 °C
(B)	Above 300 °C	at 0 °C
(C)	Below 300 °C	Above 300 °C
(D)	0 °C	Above 300 °C

3. Which terms is used to describe a solution in which water is the solvent?

- (A) Aqueous
- (B) Conductivity
- (C) Electrolytic
- (D) Non electrolytic

4. Which symbol does a chemist use to represent an aqueous solution.?

- (A) aq
- (B) g
- (C) l
- (D) s

5. Which of the following terms describes the flow of electricity in a substance?
- (A) Conductivity
 - (B) Melting Point
 - (C) State of Matter
 - (D) Solubility
6. A unknown compound is a liquid at room temperature. What is its identity?
- (A) Sodium chloride
 - (B) Carbon tetrachloride.
 - (C) Lead (ii) acetate
 - (D) Lithium nitrate
7. An unknown compound is a white solid at room temperature. What is the identity of the compound?
- (A) Sodium chloride
 - (B) Glucose
 - (C) Ammonium nitrate
 - (D) Not enough information given to make an accurate identification.
8. Compound X is a gas at room temperature, that dissolves in water to form a non-conducting solution. Compound X is best classified as an?
- (A) Molecular acid
 - (B) Ionic compound
 - (C) Molecular compound
 - (D) None of the above
9. Which property is the only way to positively classify a compounds as ionic or molecular?
- (A) Color
 - (B) State of matter
 - (C) Solubility in water
 - (D) Electrical conductivity of solutions
10. A compound is a white solid at room temperature that does not dissolve in water. However, when the substance was melted it was found to conduct electricity. The identity of the compound is most likely?
- (A) Water
 - (B) Silver chloride
 - (C) Carbon monoxide
 - (D) Ethanol
11. Which of the following properties would you use to distinguish between an ionic and molecular compound?
- (A) Electric Conductivity
 - (B) State of Matter
 - (C) Solubility
 - (D) A and B