

Review #2: Bonding, Structure and Properties of Substances (Chapter 4)

1. Know the meanings of, and be able to apply, the following terms:

allotropes	expanded valence	London dispersion forces	polar covalent bond
coordinate covalent bond	hydrogen bonding	metallic bonding	polar molecule
crystal lattice	inter-molecular attraction	network solid	resonance structures
dipole-dipole forces	intra-molecular attraction	octet rule	VSEPR Theory

2. Compare the four types of bonding that were discussed in this course by completing the chart:

Type of Bond	Types of Atoms involved	ΔEN	Ionization Energies Of Bonding Atoms	Describe How the Electrons are Arranged in the Bond	Describe the Polarity of the Bond
pure covalent					
polar covalent					
ionic					
metallic					

3. Describe how you could distinguish between the following substances using their properties:

- a metal and an ionic substance
- a pure covalent compound and a polar covalent compound
- a pure covalent compound and a network solid
- polar covalent compound and an ionic compound

4. Explain the following:

- How a compound may contain polar bonds, but not be a polar molecule.
- How the physical properties of a substance are related to the nature of the inter-molecular attractions.
- Why metals are good conductors of electricity.
- Why network solids have such high melting points.

5. Use "the System" to draw the following molecules that obey the octet rule:

Compound	Draw the Lewis Structure	General Formula (AX _n E _m)	Name of the Shape of Molecule	Molecule Polar or Non-Polar?	Type(s) of Inter-Molecular Attraction	Properties (state at SATP, melting point, solubility, electrolyte?)
NF ₃						
NH ₄ ⁺						
CO ₂						
CH ₂ O						
NO ₂ ⁻¹						
PO ₃ ³⁻						
SO ₃ ²⁻						
SO ₃						
BrO ₂ ⁻						

6. Referring to the molecules in question 5:

- Put a * beside the structures which are resonance structures.
- Put a ‡ beside the structures that show coordinate covalent bonding.

7. Draw the following molecules that do **NOT** obey the octet rule:

Compound	Draw the Lewis Structure	General Formula (AX _n E _m)	Name of the Shape of Molecule	Molecule Polar or Non-Polar?	Type(s) of Inter-Molecular Attraction	Properties (state at SATP, melting point, solubility, electrolyte?)
XeCl ₂						
BeCl ₂						
SiF ₅ ⁻						
FCl ₃						
BI ₃						
ClF ₄ ⁺						
OCl ₆						
ICl ₄ ⁻						
FIO ₃						