

Unit 1 Review: Structure and Properties of Matter

Concepts:

- The Nuclear Model of the Atom
 - Contributions of Dalton, Thomson, Rutherford, Chadwick, Bohr
 - Describe Rutherford's goldfoil experiment
 - What observations lead to Bohr's discovery?
- Quantum Numbers
 - Contrast orbits and orbitals
 - What are the four quantum numbers needed to describe the location of an electron
 - What l value is associate with each orbital shape?
 - What are the allowed values for each?
- Electron Configurations
 - Outline the Aufbau Principle, Hund's Rule, and the Pauli Exclusion Principle. How do each apply to electron configurations.
- Periodic Trends
 - Describe the concept of shielding effect and net nuclear attraction
 - Describe the atomic trend for: atomic radius, ionic radius, electronegativity, electron affinity, ionization energy.
 - What is larger, first ionization energy or second ionization energy
- VSEPR and Lewis Structures
 - What is meant by the term co-ordinate covalent bond?
 - What is meant by the term expanded valency and incomplete valency?
 - What takes up more space, lone pairs or bonded pairs?
 - Name each of the secondary structures of VSEPR notation
 - What determine if a structure is polar?
- Molecular Forces
 - List and describe the four types of intramolecular forces
 - List and describe the three types of intermolecular forces
- Bonding in Solids
 - What is the difference between an amorphous and crystalline solid?
 - List the five types of crystalline solids and the properties associated with each

Be able to:

- Fill out electron diagram, full electron configurations and condensed electron configurations of any given atom
- Draw Lewis diagrams for a given molecule (included co-ordinate covalent bonds, polyatomic atoms, expanded valency and incomplete valency)
- Describe VSEPR notation and draw molecules with correct molecular shape
- Describe polarity based on VSEPR notation

Practice Questions:

Which of the following atoms would have the largest atomic radius. Justify your answer.

C N O

Which of the following quantum numbers feature pairs that are not allowed. Justify.

$n=3$ $l=3$ $ml=-3$ $m_s=0.5$

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$n=5$ $l=2$ $m_l = -3$ $m_s = 0.5$

$n=1$ $l=0$ $m_l = 0$ $m_s = 1$

$n=1$ $l=0$ $m_l = 0$ $m_s = 0.5$

State the electron configuration of the following atoms:

Ti

S

Ba

Draw Lewis Diagrams of the following atoms

NH_4^{1+}

CH_4

ClF_3

BCl_3

IF_5

Sketch the molecular structure of each of the following and identify them as polar or non-polar

SF_2

ClF_5

BCl_3

Cl_2O

Label the following molecules as polar or non-polar.

CF_4

CH_3Cl

H_2S

CBr_2

NH_3

SF_6

H_2O