

Chemistry Final Study Guide

Atomic Structure = 4 Questions (8%)

- Given the element, atomic mass, and ionic charge, be able to find the protons, neutrons, and electrons.
- Understand the valence electrons determine a substance's chemical properties.
- Know the definition of an isotope.
- Given the element, be able to identify the electron configuration.

Periodic Table = 5 Questions (10%)

- Understand how the modern periodic table is arranged.
- Be able to identify the families of the periodic table.
- Be able to identify chemical differences between families of the periodic table.
- Be able to identify the number of valence electrons for groups or families.
- Be able to identify the largest or smallest atomic radius or ionization energy given elements within a period or group.

Ionic Compounds = 5 Questions (10%)

- Be able to identify the name given the chemical formula for a binary ionic compound.
- Be able to identify the chemical formula given the name for a binary ionic compound.
- Be able to identify the name given the chemical formula for an ionic compound with a polyatomic ion.
- Be able to identify the chemical formula given the name for an ionic compound with a poly atomic ion.
- Understand the difference between an ionic compound and a covalent molecule.

Covalent Molecules = 4 Questions (8%)

- Be able to identify a molecule with covalent bonds.
- Be able to identify the geometric shape given a covalent molecule (linear, trigonal planar, tetrahedral, trigonal pyramidal, or bent)
- Be able to identify the bond angle (tetrahedral = 109.5° , trigonal pyramidal = 107° , or bent = 105°) given a covalent molecule or the geometric shape of a covalent molecule.
- Be able to identify the number of shared pairs of electrons (bonds) of the diatomic molecules such as H_2 , N_2 , O_2 , and the halogens (F_2 , Cl_2 , Br_2 , and I_2).

Chemical Reactions = 2 Questions (4%)

- Be able to identify the type of chemical reaction given a chemical reaction.
- Be able to balance a chemical reaction.

Molar Calculations = 2 Questions (4%)

- Calculate the number of grams of a substance given moles or particles.
- Understand the difference between empirical and molecular formulas.

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Stoichiometry = 2 Questions (4%)

- Calculate the number of moles of a substance given the balanced chemical reaction and moles of a different substance in that reaction.
- Calculate the number of grams of a substance given the balanced chemical reaction and grams of a different substance in that reaction.

Gases = 4 Questions (8%)

- Understand the kinetic molecular theory.
- Be able to calculate an unknown value using the combined gas law.
- Understand Avogadro's Principle concerning gases.
- Be able to calculate an unknown value using the ideal gas law.

Intermolecular Forces = 5 Questions (10%)

- Be able to identify the hydrogen bonding attractions between molecules like HF, NH₃, and H₂O.
- Understand the difference between a chemical and a physical change (breaking/forming of bonds and breaking/forming of attractions).
- Understand the polarity of a bond depends on its electronegativity difference.
- Be able to identify compounds that exhibit hydrogen bonding.
- Understand that a substance's ability to dissolve in water (or inability) depends upon the polarity of the substance.

Aqueous Solutions = 2 Questions (4%)

- Understand that aqueous salt solutions conduct electricity due to their delocalized ions.
- Be able to calculate the Molarity of a solution given the mass of a solid and the volume of water used to dissolve the solid.

Thermochemistry = 5 Questions (10%)

- Understand the effects of temperature on the rate of a chemical reaction.
- Understand that energy is absorbed in order to break bonds and energy is released when forming bonds.
- Understand the requirements for chemical reactions to occur (a sufficient amount of activation energy and the correct orientation to break bonds).
- Understand the factors that affect the rate of a chemical reaction.
- Understand that average kinetic energy is the temperature of a substance and be able to interpret that in a heating curve.

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Acids and Bases = 4 Questions (8%)

- Understand the definition of the Arrhenius Acid-Base model and know the list of strong acids and strong bases.
- Understand the Bronsted-Lowry Acid-Base model.
- Be able to calculate the volume of a titration during a neutralization reaction ($M_1V_1 = M_2V_2$).
- Be able to calculate the pH of a substance given its concentration of H^+ .

Chemical Equilibrium = 3 Questions (6%)

- Understand the definition of a reaction which is at equilibrium (constant concentrations of reactants and products and equal rates of forward and reverse reactions).
- Be able to interpret the shift of a reaction using Le Chatelier's Principle.
- Be able to interpret a concentration vs. time graph and specify when the reaction reaches equilibrium.

Organic Chemistry = 3 Questions (6%)

- Understand the components of a hydrocarbon.
- Understand the definition of an organic compound.
- Be able to identify functional groups.