Introductory to Chemistry Prep Tutoring
Eight Week Summer Tutoring Plan

This is an eight-week tutoring course that is aligned to the eight Indiana Department of Education standards for high school Chemistry. Each session is designed to provide an introductory overview of each topic, familiarizing the student with the basic concepts of Chemistry prior to the start of Chemistry class. The familiarization of these concepts should help the student proactively prepare for entry-level Chemistry, enabling a productive transition into the lesson material. It is not expected that students will be completely proficient in each topic.

The PHeT simulations linked are useful for demonstrating concepts. If the tutor needs additional help on how to teach a session, other resources such as Kahn Academy are available.

Resources for all sessions:

- Periodic Table
  - https://ptable.com/#Properties
- Khan Academy
  - https://www.khanacademy.org/

Week One: Properties and States of Matter

- Differences between pure and mixed substances
  - https://quizlet.com/83161524/identifying-pure-substances-and-mixtures-flash-cards/
- Physical vs Chemical changes
  - https://quizlet.com/323034601/physical-or-chemical-change-diagram/
  - https://byjus.com/chemistry/difference-between-physical-and-chemical-change/
- States of matter: solids, liquids and gasses
  - https://phet.colorado.edu/en/simulation/states-of-matter-basics
- Law of conservation of mass
  - https://phet.colorado.edu/en/simulation/reactants-products-and-leftovers
- Density and density calculations
  - https://www.basd.k12.wi.us/faculty/cnichols/Density%20Calculations%20WS%201.pdf

Week Two: Atomic Structure and the Periodic Table

- Determine the number of protons, neutrons, and electrons in isotopes and calculate the average atomic mass from isotopic abundance data.
    - https://phet.colorado.edu/en/simulation/build-an-atom
    - http://www.physics-chemistry-interactive-flash-animation.com/chemistry_interactive/mendeleev_periodic_classification_table_elements_molar_mass_isotopes.htm
- Write the full and noble gas electron configuration of an element, determine its valence electrons, and relate this to its position on the periodic table.
    - https://www.everettcc.edu/files/programs/academic-resources/transitional-studies/support/tutoring-center/chemistry/w311-electron-configuration-worksheet.pdf
- Octet Rule
    - https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Electronic_Structure_of_Atoms_and_Molecules/Electronic_Configurations/The_Octet_Rule
- Use the periodic table as a model to predict the relative properties of elements based on the pattern of valence electrons and periodic trends.
    - https://www.thoughtco.com/chart-of-periodic-table-trends-608792

Week Three: Bonding and Molecular Structure

- Ionic vs Covalent
    - https://www.thoughtco.com/ionic-and-covalent-chemical-bond-differences-606097
- Draw structural formulas for simple molecules and determine their molecular shape.
    - https://thinktv.pbslearningmedia.org/resource/lsps07.sci.phys.matter.molecularshp/molecular-shapes/
    - https://phet.colorado.edu/en/simulation/molecule-shapes
- Naming ionic and molecular compounds
    - https://www.quia.com/rr/180365.html

Week Four: Reactions and Stoichiometry

- Classifying types of reactions and predicting products
    - http://www2.ucdsb.on.ca/tiss/stretton/CHEM1/stoich2.html
    - https://www.youtube.com/watch?v=P0jG2TjLyGI
- Balancing equations
    - https://phet.colorado.edu/en/simulation/balancing-chemical-equations
    - https://education.jlab.org/elementbalancing/
- Stoichiometry
    - https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:chemical-reactions/x2eef969c74e0d802:stoichiometry/a/stoichiometry
    - https://sciencegeek.net/Chemistry/taters/Unit4Stoichiometry.htm

Week Five: Behavior of Gases

- Kinetic Molecular Theory
  - https://preparatorychemistry.com/KMT_Canvas.html
- Gas Law
  - https://phet.colorado.edu/en/simulation/gas-properties
  - https://www.everettcc.edu/files/programs/academic-resources/transitional-studies/support/tutoring-center/chemistry/w338-mixed-gas-laws-worksheet.pdf
- With any extra time, review any material from past sessions that need more attention
  - Extra Stoich practice: https://www.hillsboro.k12.oh.us/userfiles/355/Classes/18210/Stoichiometry%20Test%20Review-0.pdf

Week Six: Thermochemistry

- Motion increases as thermal energy increases
  - https://phet.colorado.edu/sims/html/gases-intro/latest/gases-intro_en.html
- Thermodynamics
  - https://www.khanacademy.org/science/chemistry/thermodynamics-chemistry
- Endothermic vs Exothermic Reactions
  - https://www.khanacademy.org/test-prep/mcat/chemical-processes/thermochemistry/a/endothermic-vs-exothermic-reactions#:~:text=An%20exothermic%20process%20releases%20heat,heat%20and%20cools%20the%20surroundings.%E2%80%9D
  - https://jackpot.ecsdnv.net/UserFiles/Servers/Server_140485/File/9th%20endo%20v%20exo%20WS.pdf
- Specific Heat
  - http://www.algebralab.org/practice/practice.aspx?file=Algebra_SpecificHeatCapacity.xml

Week Seven: Solutions

- Solutions
  - https://web.gccaz.edu/~debis71431/152%20Lab/Solutions.pdf
- Concentrations
  - https://phet.colorado.edu/en/simulation/concentration
  - https://www.sciencegeek.net/Chemistry/taters/Unit6SolutionConcentrationA.htm
- Molarity
  - https://phet.colorado.edu/en/simulation/molarity
  - https://hs.pequannock.org/ourpages/auto/2015/5/19/57982961/Molarity_Molality_Concentration_Worksheets_KEY.pdf

Week Eight: Acids and Bases

- Classify Acids and Bases
    - https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Principles_of_Modern_Chemistry_(Oxtoby_et_al.)/Unit_4%3A_Equilibrium_in_Chemical_Reactions/15%3A_Acid%E2%80%93Base_Equilibria/15.1%3A_Classifications_of_Acids_and_Bases
    - https://www.mlbgsd.k12.pa.us/cms/lib/PA09000085/Centricity/Domain/83/introduction_to_acids_and_bases_webquest.pdf
- Comparing and contrasting strengths of Acids and bases
    - https://phet.colorado.edu/en/simulation/acid-base-solutions