Chapter 2

Chemistry of Life: Interactive Workbook

# An Element’s Atomic Structure Determines Its Properties

* + - Simulation Link: <https://phet.colorado.edu/en/simulation/build-an-atom>

## Activity Steps:

* Drag protons, neutrons, and electrons to build atoms.
* Build Hydrogen, Oxygen, and Sodium.
* Compare their outer electrons (valence shells).

## Reflection Questions:

* How does the number of protons decide the element?
* Why does sodium (Na) react easily while neon (Ne) does not?
* What do isotopes tell us about atomic structure?

# Atoms Bond to Form Molecules

* + - Simulation Link: <https://phet.colorado.edu/en/simulation/molecule-shapes>

## Activity Steps:

* Use the simulation to build H2O, CO2, and CH4.
* Discuss why they look different (bond angles, polarity).

## Reflection Questions:

* What is the main difference between ionic and covalent bonding?
* Why does NaCl dissolve in water while methane does not?
* Which bond type is stronger inside a molecule?

# Chemical Reactions Transform Substances

* + - Simulation Link: <https://phet.colorado.edu/en/simulation/balancing-chemical-equations>

## Activity Steps:

* Observe vinegar + baking soda reaction (CO2 bubbles).
* Use the simulation to balance reactions such as Na + Cl2  NaCl and H2 + O2  H2O.

## Reflection Questions:

* What are the reactants and products in your demo?
* How do you know matter is conserved?
* What are 3 signs of a chemical reaction?

# The Properties of Water Are Critical to the Chemistry of Life

* + - Simulation Link: <https://phet.colorado.edu/en/simulation/states-of-matter>

## Activity Steps:

* Demo: Float a paperclip on water, then add soap to see it sink (surface tension).
* Use the simulation to compare water and argon molecules.
* Observe hydrogen bonds forming and breaking with temperature changes.

## Reflection Questions:

* Why does water stick to itself (cohesion) and to other surfaces (adhesion)?
* How does hydrogen bonding explain water’s high heat capacity?
* Why is water the 'universal solvent' for life?
  1. **Types of Bonds**

**Covalent bond and ionic bond**

Simulation Link <https://javalab.org/en/covalent_bond_en/>

Simulation Link <https://javalab.org/en/ionic_bond_2_en/>