An Introduction to Chemistry and Biology

What are we doing today?

Chemistry! And the basics of reactions

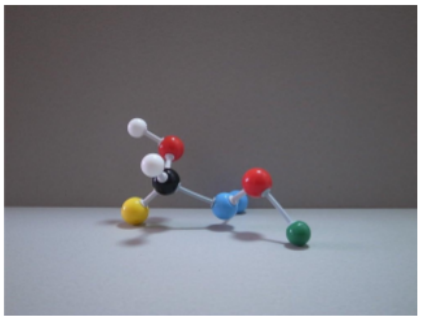
- Reactions with a catalyst
- Reactions from the sun

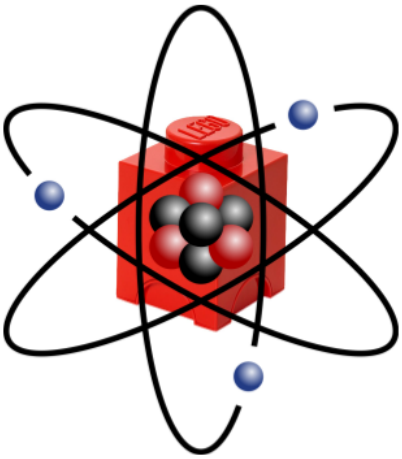
Biology

- Introduction into the scientific method
- Angiosperm and gymnosperm plant classifications

What is an Atom?

- Incredibly small- ~1/254,000,000 of an inch
- Basic unit of matter - building blocks





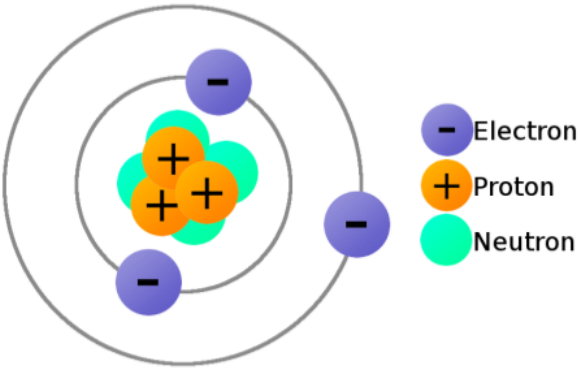
Slide 3

Image 1: Top right - a typical drawing of the atom, with red and black spheres in the middle, and small blue spheres moving around them, representing an atom.

Image 2: Bottom left - a couple of spheres with various colors connected together with gray sticks, representing a molecule.

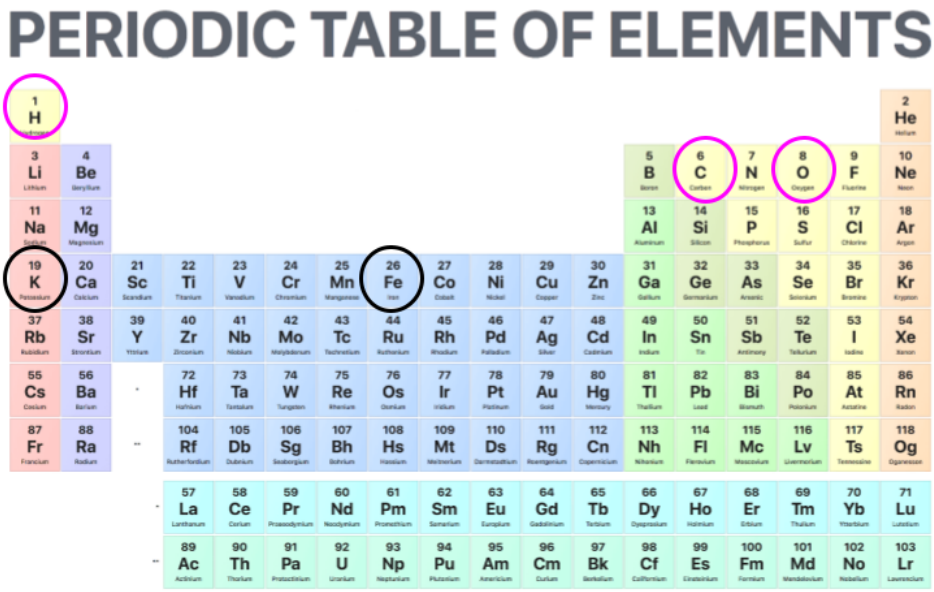
Elements

- Atoms are made of protons, neutrons, electrons
- # of protons determines what we call the atom

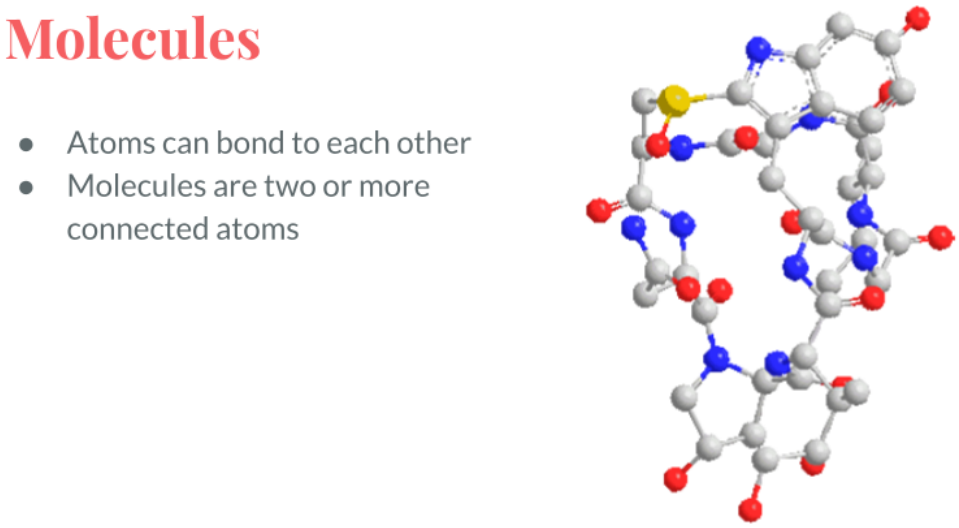


Slide 4

Image 1:several coloured circles to represent an element. Blue is the electrons, orange the protons, and green neutrons.



Slide 5:
Image 1: Periodic table with H, C, O, K, and Fe circled.

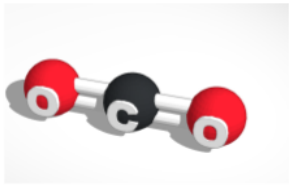


Slide 6:
Image 1: an example of a molecule using circles and lines. With differing colours representing different elements.

Can You Think of Any Molecules?

- Water
- Table Salt

- Carbon Dioxide



Slide 7:
Images, drawings to represent the different molecules. Water (H_2O), Table salt (NaCl) and Carbon Dioxide (CO_2)

Chemical Reactions

$$C_3H_8\,(g) + 5O_2\,(g) \rightarrow 3CO_2\,(g) + 4H_2O\,(g)$$

Combustion of propane, to make water

- When molecules break down into elements and recombine in different ways

Slide 8:
Image: picture of lego character to represent the multiple ways molecules can combine and change with a reaction.

Chemistry questions
(Check-in)

GASEOUS REACTIONS
Elephant Toothpaste

Elephant Toothpaste (Procedure)

1) Add ½ Cup of Hydrogen Peroxide into empty water bottle
2) Add a big squirt of of Dish Soap into Water Bottle
3) Put 3 Tablespoons of Warm Water into separate bowl
4) Add 1 Tablespoon of Yeast into the bowl and mix contents together
5) Pour the solution in the bowl into the Water Bottle and step back
6) Watch the Reaction!

Image of foam leaving the top of a beaker, representative of the reaction of hydrogen peroxide into constituents

Key Reaction

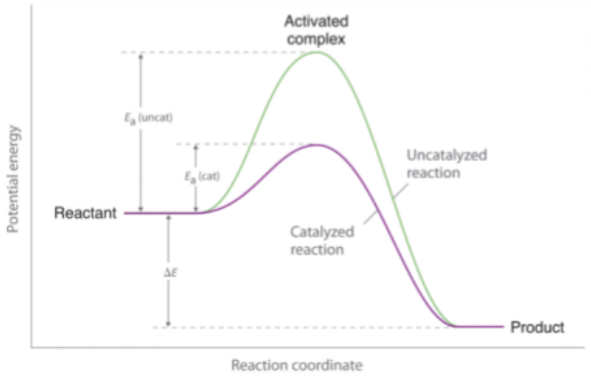
Main Point:

- Hydrogen Peroxide is broken down into water and oxygen
- But how is it able to break down so quickly?

Visual representation of decomposition of Hydrogen peroxide. Two moles of hydrogen peroxide break down into two moles of water and one mole of oxygen.

Catalyst

- Catalysts help increase the rate of the reaction
- Yeast contains an enzyme called Catalase, which acted as the Catalyst for the Reaction
- How is does the rate increase?
    - Catalysts help bring down the activation energy for the reactants to turn into the products



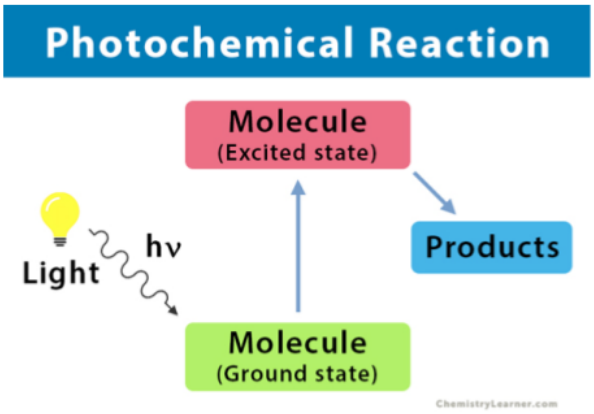
Visualization of the effect of a catalyst on the activation energy of a reaction. When a catalyst is added, the amount of energy required for the reaction to occur decreases.

Catalyst questions (Check-in)

Photochemical Reactions

What it is: A reaction that receives the energy necessary for reaction from light sources

- UV (sunlight)
- Mercury Vapor Lamps
- X-ray



Examples:

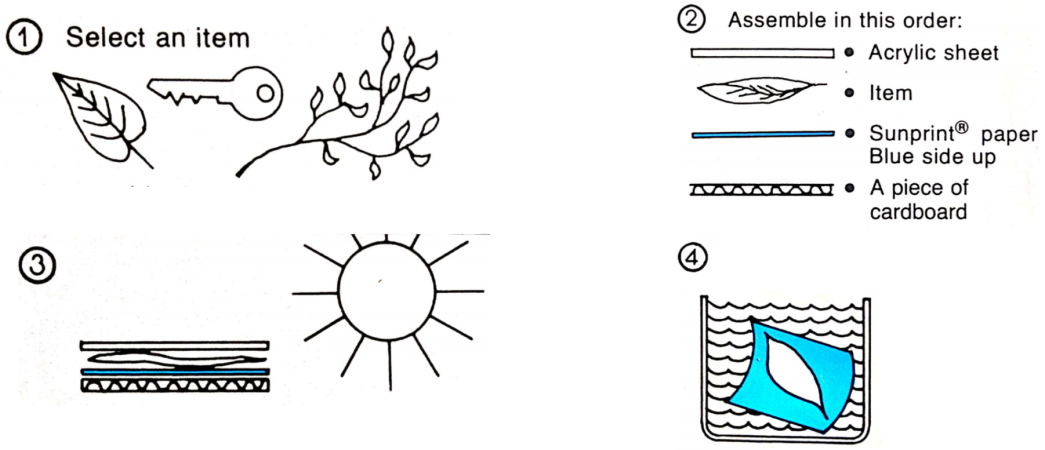
- Photosynthesis
- Vitamin D
- Fireflies

CyanoType

- A photographic printing process that produced early blueprints.
- Guess why they're called blueprints?
- Early low cost copying process now used for art.

CyanoType Experiment

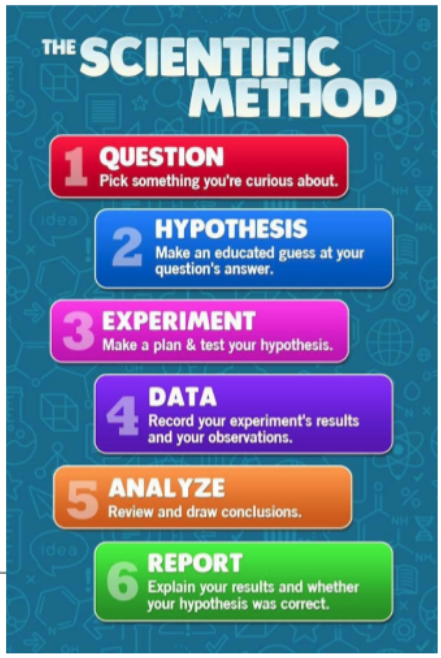
Today's experiment will model this phenomenon in a fun and easy way!



1. Image representation of item selection for cyanotype process
2. Image representation of cyanotype assembly: a piece of cardboard followed by ite, sunprint paper, and finally the acrylic sheet.
3. Image representation of sun applied to cyannotype

Why collect plants?

Question:	How are plants related to each other?
Hypothesis:	(YOUR ideas here)
Experiment:	Collecting plant samples
Data:	Cyanotypes
Analyze:	I think these plants are related because ___
Report:	Tell the world! (or your parents)



Anna Atkins - Mid 1800's

- Chose cyanotype because complicated details are hard to draw
- First published a book photographing algae
- Moved to ferns and other land plants
- Focused more on art, using feathers, flowers, and such

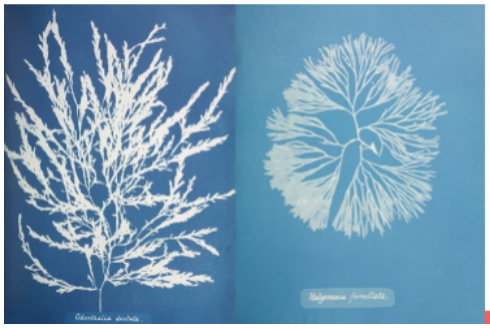


Image description: Top right - Portrait of Anna Atkins in a traditional English dress
Image description: Bottom - Pictures of her cyanotypes, which are shown chronologically from left to right and are now held in art galleries.

Categorizing plants

Vascular vs Non-vascular

Monocot vs Dicot

Angiosperm vs Gymnosperm

Seed-producing vs Spore-producing

Trees vs Shrubs

Radially Symmetrical vs
Bilaterally Symmetrical

Introduction to Botany

	Angiosperms	Gymnosperms
Flowers	Flowers	No flowers
Seeds	Enclosed	Naked
Wood	Hardwood	Softwood
Life cycle	Seasonal	Evergreen (generally)
Leaves	Flat	Needle or scale-like
Population	80% of all green plants	Smaller, older group

Image description: Top right - Shows branches that end in little brown balls and needle-like, wintergreen leaves leading up to the end.
Image description: Bottom left - Depicts a short (maybe 6 feet tall) and conical tree
Image description: Bottom middle - A Christmas tree with ornaments and presents underneath.
Image description: Bottom right - Shows a pinecone attached to a few branches with round, green, needle-like leaves.

Image description: Top right, a large, mushroom-like tree with a central trunk and rounded clusters of leaves.
Image description: Bottom left - shows a branch which ends in a cluster of 3 round, green pom-pom like seeds. Large, flat single leaves sprout from the branch sporadically
Image description: Bottom right - The same flat leaves as in the left image, but with long, frilly extensions instead of seeds.

Image description: Top right - Shows needle-like leaves sprouting from sub-branches off of the main branch

Image description: Bottom left - Shows a massive tree about 4 or 5 times the height of all other surrounding trees
Image description: Bottom middle - Shows a tiny sprout about 5 inches tall, that is entirely green. Leaves are sprouting in an alternating pattern.
Image description: Bottom right - Shows two kids attempting to wrap their arms around the trunk of a massive tree, but failing spectacularly

Image description: Top right - Depicts a white flower blooming next to a round dark red fruit
Image description: Bottom left - shows a seed growing slowly from a seed on the ground to a small sprout with flat leaves

Image description: Bottom right - Shows large clusters of spherical red fruit spread on a branch and large, flat, waxy leaves organized in an opposite pattern on the branch

Image description: Left - A field of round, short shrubs that are a mix of purple and green
Image description: Middle - a close up of the plant, showing the purple color is from the flowers sprouting at the top of the stem
Image description: Right - Shows the full anatomy of the plant, with thin roots at the bottom a main stem with thin branching leaves shooting of, and a collection of purple flowers at the top