



Unit 1: The Solar System

Chapter 1: Where are we on the earth?

Where is the equator?

What continents does the equator run through?

Chapter 2: Why are there four seasons?

Why does the sun move across the sky?

The earth' tilt

Chapter 3: The solar system

The planets

Unit 2: The Atom

Chapter 1: Conceptualizing the atom

Where does coal come from?

What do you call the smallest piece of coal that can possibly exist and still be coal?

Resembling the solar system

Chapter 2: Structure of the atom

Nucleus

Electrons

Shells

Chapter 3: Comparing atoms

Carbon vs. aluminum

Size of an atom vs. an atom's weight

Unit 3: Electrons, Protons, and Neutrons

Chapter 1: The electron

Removing an electron from an atom
van der Graaf generator
Allowing electrons to flow into your body

Chapter 2: Properties of electrons

Electrons have a negative electrical charge on them
Negatively charged electrons always repel each other
Why do electrons orbit together instead of repelling each other?

Chapter 3: The nucleus

Positive charge in the nucleus
Number of protons equals number of electrons
Protons, like electrons, repel each other
Why do protons stay together in the nucleus?
The “strong force”
The neutron
Atoms with different numbers of neutrons in the nucleus are called isotopes.

Unit 4: The Periodic Table

Chapter 1: Organizing all the different atoms

The periodic table
Mendeleyev
Hydrogen
Helium
Lithium
The complete periodic table
The most common atoms in our bodies

Chapter 2: The atomic number

Atomic number: the number of electrons and protons in each atom
Carbon

Chapter 3: Structure of the periodic table

Each horizontal row of the periodic table indicates the number of shells
Each column indicates the number of electrons in the outermost ring
What determines atomic size?

Chapter 4: Elements

Why is each atom called an element?
Combining elements

Unit 5: The Molecule

Chapter 1: Bonding atoms

Examples of common molecules
Everything is made up of single atoms or molecules

Unit 6: The Equal Sharing Bond

Chapter 1: Filling up the outer shell

In the first shell, up to 2 electrons are allowed to orbit the nucleus
In the second shell, up to 8 electrons are allowed to orbit the nucleus
The electrons in shell 2 have more energy than the electrons in shell 1
Once 8 electrons enter shell 3, the next electron must enter ring 4

Chapter 2: Two hydrogen atoms sharing electrons to fill shell 1

Chapter 3: The law of entropy

Chapter 4: The four ways atoms bond to each other

Equal sharing
Give and take
Unequal sharing
Metallic

Unit 7: Ring 2 of the Periodic Table

Chapter 1: Elements in the second row of the periodic table

Chapter 2: The give-and-take (ionic) bond

Lithium fluoride

Unit 8: Row 3 of the Periodic Table

Chapter 1: Combining elements in row 3 of the periodic table

Chapter 2: Comparing strength of the ionic bond

Chapter 3: Chemical properties of elements in the same column of the periodic table

Unit 9: Why Atoms Bond

Chapter 1: Creating electrical differences

Ionic bond
Covalent bond

Unit 10: States of Matter

Chapter 1: Solids, liquids, and gases

Chapter 2: Crystal lattice

The formula unit

Chapter 3: The covalent bond

Electrical neutrality
Formation of gases

Chapter 3: Partial electrical difference

Formation of liquids

Chapter 4: Intermolecular vs. intramolecular bond

Strength of the intermolecular bond

Unit 11: Crystals

Chapter 1: Breaking intermolecular bonds

Heat energy
Mechanical energy

Chapter 2: Cracking a crystal

Chapter 3: Breaking metallic bonds

Unit 12: The Metallic Bond

Chapter 1: Formation of the metallic bond

Chapter 2: Properties of the metallic bond

Chapter 3: Strength of the metallic bond

Chapter 4: Alloys

Unit 13: Transition Metals

Chapter 1: Gold

Chapter: Formation of the transition metals

Chapter 3: Properties of transition metals

Unit 14: Heat Conduction

Chapter 1: Heat conduction in metals

Chapter 2: Measuring heat

Graphing heat and molecular movement

Chapter 3: Scales to measure heat

Kelvin scale

Celsius scale

Fahrenheit scale.

Chapter 4: Why metals feel cold

Chapter 5: Heat conduction in alloys

Chapter 6: Chill factor

Hypothermia

Unit 15: Heat Insulation

Chapter 1: Heat transfer

Chapter 2: Preventing heat transfer

Chapter 3: Examples of insulation

Unit 16: The Polar Covalent Bond

Chapter 1: The water molecule

Chapter 2: Water's intermolecular bond

Unit 17: Properties of Water

Chapter 1: Examples of everyday phenomena

- Rainbows
- Ice expansion
- Ice floating
- Water beading
- Frozen over lakes
- Sweating
- Water and oil
- Soap
- Fire extinguishers
- Salt and ice
- Walking on water
- Steam engines
- Water climbing in trees

Chapter 2: States of water

- Steam
- Water vapor
- Ice

Unit 18: Water Density and Hydraulics

Chapter 1: Determining density

Chapter 2: Ice density

Chapter 3: Water displacement

- Salt water vs. fresh water
- Why ships float
- Why ships sink

Chapter 4: Frozen lakes

- Water temperature beneath the ice
- Salt water density

Chapter 5: Water pressure

Hydraulic pressure

Unit 19: The Mole

Chapter 1: Lowering the freezing point of water

Chapter 2: Measuring out equal numbers of molecules

Atomic weight
Weighted average
Avogadro's number

Chapter 3: Dissolving solutes in water

Chapter 4: How does salt melt ice?

Unit 20: Ocean Circulation

Chapter 1: Ice is pure water

Chapter 2: North Atlantic ice caps

The engine for ocean circulation
How Europe stays warm

Chapter 3: Global warming and ocean circulation

Unit 21: Air Pressure

Chapter 1: Why does water boil?

Why 212 degrees Fahrenheit?
Air pressure
Effect of air pressure on boiling point

Chapter 2: Measuring altitude with air pressure

The aneroid barometer

Chapter 3: Air temperature at high elevations

The difference between temperature and heat
The temperature of outer space

Unit 22: Why Airplanes Fly

Chapter 1: Airplane wing

Design of the Wright Brothers' airplane
Lowering air pressure by raising air pressure below the wing
Why pilots lower the flaps when coming in for a landing

Chapter 2: Sails

Why baseballs curve downward
Why golf balls have dimples

Chapter 3: Reducing air pressure in a pipe

Chimney
Carburetor
Perfume bottles
Prairie dog burrows

Unit 23: Evaporation and Steam

Chapter 1: Absorption of heat by water

Water as a fire extinguisher
Sweating
Wet bulb – dry bulb measure of humidity

Chapter 2: The power of steam

Steam locomotives
Underground geysers
Geothermal energy

Chapter 3: Geology

Tectonic plates
Formation of the Himalayan Mountain Range
The Pacific and North American plates

Unit 24: Humidity, Dew Point, Saturation Water Vapor Density

Chapter 1: Water vapor

Saturation limit

Chapter 2: Measuring humidity

Graphing humidity versus temperature
Saturation water vapor density
Humidity vs. relative humidity
The dew point

Chapter 3: Coriolis effect.

Unit 25: Weather

Chapter 1: The weather map

Low pressure
High pressure

Chapter 2: Storm formation

Chapter 3: Formation of a hurricane.

Unit 26: Properties of Water

Chapter 1: Surface tension

Water droplets
Gerris bug

Chapter 2: Hydrogen bonding

Chapter 3: van der Waals forces

Making gases into liquids

Chapter 4: The carbon-hydrogen bond

Electronegativity of atoms

Chapter 5: Making gases into liquids

Chapter 6: Mixing polar and non-polar molecules

Unit 27: Summation

Chapter 1: The four types of intramolecular bonds

Give-and-take (ionic)
Equal sharing (covalent)

Unequal sharing (polar covalent)
Metallic.

Chapter 2: The intermolecular bonds

Polar vs. nonpolar molecules
Hydrogen bonding
Van der Waals bonding

Unit 28: Creating a Living Cell

Chapter 1: Carbon as the building block

Chapter 2: The four types of biologic molecules

Lipids for cell walls
Carbohydrates for energy
Proteins for growth
DNA to coordinate

Chapter 3: Lipids

Chapter 4: Carbohydrates

Alcohols
Aldehydes
Ketones
Ethers
Carboxylic acids
Esters

Unit 29: Acids, Carbohydrates, and Proteins

Chapter 1: What are acids?

Chapter 2: The mathematics of pH

Chapter 3: Carbohydrates

ATP
Carbohydrates as fuel

Chapter 4: Proteins

Unit 30: Nucleic Acids, Energy Production

Chapter 1: RNA

Chapter 2: DNA

RNA polymerase
Messenger RNA
Transfer RNA

Chapter 3: Mitochondria

Kreb's cycle
Electron transport chain

Chapter 4: Chloroplasts

Photosynthesis

Chapter 5: Lipids as energy source

Fats vs. oils
Saturated fats vs. unsaturated fats
Trans vs. cis fatty acids

Unit 31: Electromagnetic Radiation

Chapter 1: The Photon

Electrical and magnetic components

Chapter 2: Spectrum of Electromagnetic Radiation

Color
Why are metals shiny?
Why are objects black?
Why are objects transparent?

Chapter 3: Bending light rays

Passing through water

Unit 32: Electricity

Chapter 1: Movement of electrons

Chapter 2: Static electricity

Chapter 3: Electricity and magnetism

Chapter 4: Making an electric motor

Chapter 5: Making an electrical generator

Unit 33: Nuclear Energy

Chapter 1: Nuclear fusion

Nuclear fusion on the sun

Chapter 2: Mass and energy

Chapter 3: Life and death of stars

Chapter 4: Nuclear fission

Chapter 5: Dangers of radiation

Unit 34: Introductory Math

Chapter 1: Significant Digits

Chapter 2: Rounding Off

Chapter 3: Logs and Decimals

Chapter 4: Fractions

Chapter 5: Converting Units

Unit 35: I Know – Therefore Statements

Chapter 1: Problems

Chapter 2: Converting units

Chapter 3: Terminology

Chapter 4: Metric system

Unit 36: Chemical Reactions

Chapter 1: Definitions

Chapter 2: Catalysts

Chapter 3: Balancing chemical equations

Unit 37: Gases, Equilibrium

Chapter 1: Coulomb's law

Chapter 2: Ideal gas law

Chapter 3: Solving gas problems

Chapter 4: Electrolysis

Chapter 5: Equilibrium of a chemical reaction

- LeChatelier's principle
- Equilibrium constant
- Solubility product constant
- Equilibrium state
- Phase diagrams

Unit 38: Solutions

Chapter 1: Terminology

Chapter 2: Molarity problems

Chapter 3: Mixtures

- Suspensions
- Colloids
- Emulsions

Chapter 4: Colligative properties

Chapter 5: Acids

- Arrhenius acid
- Bronsted acid
- Lowry acid
- Lewis acid

Unit 39: Nuclear Forces

Chapter 1: Nuclear strong force

Chapter 2: Binding energies

Chapter 3: Nuclear decay

Chapter 4: Half lives

Chapter 5: Carbon dating

Unit 40: Electrolytes

Chapter 1: Oxidation state

Chapter 2: Measuring an atom's attraction to electrons

- Electronegativity
- Electron affinity
- Ionization energy
- Reduction potential

Chapter 3: Voltage potential differences

Chapter 4: Voltage and current

Chapter 5: Electroplating

Chapter 6: Oxidation and reduction

Unit 41: Polymers

Chapter 1: Bakelite

Chapter 2: Polyethylene

Chapter 3: Polypeptides

Unit 42: Orbitals

Chapter 1: Orbitals

Chapter 2: Energy levels

Chapter 3: Hund's rule

Chapter 4: Ionizing energies

Chapter 5: Hybrids

Chapter 6: VESPR