

First Nine Weeks

Laboratory Safety

1. Review appropriate lab safety rules.
2. Review procedures for appropriate use of equipment.

Ch. 1: Scientific Inquiry

Scientific Method;

1. Identify the steps of the scientific method.
2. Develop a hypothesis that can be tested.
3. Differentiate between experimental variables and control.
4. Develop an experimental technique that achieves consistent results.
5. Draw conclusions from experimental data.

Metric System;

1. Identify the SI units of measurement.
2. Use prefixes of metric units to accurately represent measurement.
3. Convert between metric measurements.

Measurement;

1. Differentiate between metric and English units of measurement.
2. Convert between metric and English units of measurement.
3. Make accurate metric measurements using significant figures.

Graphing

1. Identify each axis of a graph.
2. Plot independent and dependent variables.
3. Draw conclusions using data represented on a graph.

Ch. 2: Science and Measurement

1. Make accurate measurements of time and distance.
2. Identify and analyze relationship between time, distance and speed.
3. Calculate speed in various units including inches per second, feet per second and centimeters per second.
4. Review how to solve science problems.

Mathematical Models

1. Review graphical models.
2. Construct and analyze a position vs. time graph.
3. Determine speed from the slope of a position vs. time graph.
4. Differentiate between average and instantaneous speed.
5. Distinguish between speed and acceleration.
6. Calculate acceleration from a formula.
7. Determine acceleration from the slope of a speed vs. time graph.

Ch. 3: Forces (Force, Mass, & Acceleration; Weight, Gravity, & Friction; Equilibrium, Action & Reaction)

1. Explain the meaning of force and how it is required to change the motion of an object.
2. Analyze and discuss Newton's first law of motion and the property of inertia.
3. Analyze and discuss Newton's second law of motion and the relationship between force, mass and acceleration.
4. Calculate force from a formula.
5. Describe how mass affects the acceleration of an object.
6. Differentiate between mass and weight.
7. Calculate weight from a formula.
8. Discuss Newton's law of universal gravitation.
9. Analyze and demonstrate qualitatively how friction affects the motion of an object.
10. Analyze and discuss Newton's third law of motion including identifying action-reaction pairs of forces.
11. Explain momentum and calculate momentum from a formula.

Ch. 4: Machines and Mechanical Systems (Forces in Machines)

1. Describe and explain a simple machine.
2. Apply the concepts of input force and output force to any machine.
3. Determine and calculate the mechanical advantage of a machine.
4. Differentiate between science and engineering.
5. Understand and apply the engineering cycle to the development of an invention or product.
6. Describe the purpose and construction of a prototype.
7. Recognize the three classes of lever.
8. Construct and analyze the various types of simple machines including designs that solve a specific problem.

Ch. 5: Work, Energy and Power (Work; Energy Conservations; Energy Transformations)

1. Explain how work is done.
2. Analyze the relationship between force, distance and work.
3. Calculate work from a formula.
4. Determine the efficiency of a machine.
5. Calculate power performed by a machine and analyze how it is affected by changes in work and time.
6. Explain energy and analyze its relationship to work.
7. Differentiate between kinetic and potential energy.
8. Determine the values of kinetic and potential energy using a formula.
9. Analyze the law of conservation of energy.
10. Identify the various forms of energy and analyze transformations between forms.

Ch. 6: Electricity and Electric Circuits

1. Define electricity and discuss its uses in everyday living.
2. Analyze and build simple electric circuits.
3. Interpret electrical symbols and apply them to an electric circuit diagram.
4. Explain how a switch works and identify its effect on the flow of current.
5. Explore the behavior of an electroscope when positively or negatively charged.
6. Identify electric charges as a fundamental property of matter.
7. List the two forms of electric charge.
8. Describe the forces electric charges exert on each other.
9. Explore the formation of lightning.

Ch. 7: Measuring Electricity (Voltage; Current; Resistance)

1. Identify voltage as a means to measure the potential energy difference of electricity.
2. Describe the role of a battery in a circuit.
3. Describe the transfer of energy in a circuit.
4. Analyze the relationship between voltage and energy in a circuit.
5. Discuss the origin of an electric current.
6. Differentiate between alternating and direct current including their individual uses in society.
7. Use an electrical meter to measure various properties of electricity.
8. Analyze and classify materials as conductors, semiconductors or insulators.
9. Differentiate between electrical conductivity and resistance.
10. Explain how a light bulb produces light energy.

Ch. 8: Electrical Relationships (Ohm's Law; Work, Energy and Power)

1. Analyze the relationship between amps, volts and ohms using Ohm's law.
2. Explore how current changes when voltage or resistance is increased.
3. Use Ohm's law to solve circuit problems.
4. Explain the role of resistors in circuits.
5. Identify power as a means of determining the rate at which energy flows.
6. Explore the relationship between work, energy and power.
7. Calculate power use in a circuit.
8. Rank the amount of power used by various household appliances and estimate their cost of use per month.
9. Discuss how the size of a wire affects resistance and current flow.
10. Explain what factors to consider when choosing a safe extension cord.

Ch. 9: Circuits (Series Circuits; Parallel circuits)

1. Differentiate between a series and parallel circuit.
2. Discuss how parallel circuits are used in the wiring of homes.

3. Discuss and demonstrate the current flow, voltage and resistance in a series circuit.
4. Discuss and demonstrate the current flow, voltage and resistance in a parallel circuit.
5. Calculate total resistance in a series circuit.
6. Construct circuits with fixed and variable resistors.
7. Analyze series circuits using Ohm's Law.
8. Use Kirchoff's Voltage Law to find the voltage drop across a circuit component.
9. Identify and explore the origin and effects of a short circuit.

Second Nine Weeks Outline

Ch. 10: Magnets and Motors

1. Describe a magnet.
2. Describe the properties of a permanent magnet.
3. Explore magnetic forces.
4. Explore the use of magnetism including its role in how a compass works.
5. Describe and demonstrate an electromagnet.
6. Analyze how electric current affects the strength of the magnetic field in an electromagnet.
7. List three ways that the strength of an electromagnet can be increased.
8. Analyze the relationship between permanent magnets and electromagnets.
9. List several applications of electromagnets.
10. Explain electromagnetic induction.
11. Describe how electric motors and generators work.

Ch. 11: Harmonic Motion

1. Identify and analyze harmonic motion and its relationship to understanding natural processes.
2. Use harmonic motion to keep accurate time using a pendulum.
3. Interpret and make graphs of harmonic motion.
4. Identify and construct simple oscillators.
5. Adjust frequency and period of simple oscillators.

Ch. 12: Waves (Waves in Motion; Natural Frequency; Resonance)

1. Identify the role waves play in our daily lives including communication.
2. Identify the parts and shapes of waves.
3. Differentiate between transverse and longitudinal waves.
4. Model transverse and longitudinal waves.
5. Explore the properties of waves.
6. Determine the speed of a wave.

7. Explore wave interactions.
8. Investigate natural frequency and resonance.
9. Explore wave interference.

Ch. 13: Sound and Music

1. Analyze how we hear sound.
2. Explore the human range of hearing.
3. Identify and analyze the properties of sound including how they are measured.
4. Explore sound and how it travels.
5. Investigate the basics of acoustics.
6. Interpret a sonogram.
7. Investigate the speed of a sound.
8. Analyze how sound waves are affected by surfaces.
9. Investigate how sound combines to form music and analyze the properties of musical sound.
10. Investigate the relationship between harmonics and the “color” of sound.

Ch. 14: Light and Color (Electromagnetic Spectrum)

1. Describe the atomic origin of light.
2. Differentiate between incandescent and fluorescent light.
3. Explore the components of the electromagnetic spectrum.
4. Compare the speed of light to the speed of sound.
5. Describe polarization.
6. Discuss the origin of color and analyze how the human eye sees it.
7. Identify and explain the RGB and CYMK color models.
8. Understand the mixing of light and pigment.
9. Understand how various devices make color.

Ch. 15: Optics

1. Describe the function of the human eye.
2. Describe the difference between objects and images.
3. Describe and demonstrate the formation of an image.
4. Draw a ray diagram for a lens.
5. Calculate the magnification of a lens.
6. Describe the index of refraction and explain how it is applied in the making of lenses.
7. Identify the characteristics of reflection.
8. Draw a reflected ray.
9. Predict how light bends when the speed of the wave changes.
10. Explore internal reflection.
11. Identify uses of fiber optics.

Third Nine Weeks Outline

Ch. 16: Classification of Matter

1. Describe matter and its properties.
2. Differentiate between substances and mixtures and explore their identifying characteristics.
3. Classify samples of matter as homogeneous mixtures, heterogeneous mixtures, elements or compounds.
4. Measure mass and volume.
5. Use an indirect technique to infer mass from density measurements.
6. Identify the states of matter and explore their characteristics.
7. Classify the states of matter in order of energy.
8. Recognize changes in state as a physical change of matter.
9. Explain the states of matter in terms of molecular motion.
10. Explore changes of state.
11. Identify and investigate the law of conservation of mass.

Ch. 17: Properties of Matter (Density; Buoyancy; Viscosity)

1. Describe the properties of a solid.
2. Calculate density of solids using a formula.
3. Use techniques to determine the density of fluids.
4. Use a liquid density column to predict the density of a solid.
5. Explore the buoyancy of fluids.
6. Investigate how physical properties of matter determine whether an object will sink or float.
7. Explore Archimedes' Principle.
8. Discuss the buoyancy of gases.
9. Use Boyle's Law to analyze the relationship between pressure and volume.
10. Explain why certain fluids are more viscous than others.
11. Measure the viscosity of fluids using a viscometer.
12. Compare the properties of viscosity and the density of fluids.

Ch. 18: Atoms and Elements (Atomic Structure; Periodic Table of Elements)

1. Describe / model the structure of the atom including the subatomic particles.
2. Research the historical evolution of the atomic model.
3. Compare and contrast atoms of different elements.
4. Determine atomic number, mass number and atomic mass.
5. Identify and distinguish isotopes from other elements.
6. Describe the forces that hold an atom together.
7. Use the concept of electron shells to arrange electrons in atomic models.
8. Explore the organization of the periodic table.
9. Use the periodic table to identify the atomic number and mass numbers of each element.

1. Ch. 19: Molecules and Compounds (Bonding; Chemical Formulas)

1. Describe chemical bonding.
2. Relate the chemical behavior of an element, including bonding, to its placement on the periodic table.
3. Use the periodic table to identify valence electrons.
4. Identify how elements form chemical bonds and the role of valence electrons in bonding.
5. Discuss the role of oxidation numbers in ionic bonding.
6. Predict the chemical formulas of compounds made up of two different elements.
7. Write chemical formulas for ionic and covalent compounds.
8. Naming ionic and covalent compounds.
9. Calculate the formula mass of a compound and compare different compounds based on their formula masses.
10. Identify the environmental and economic impact of recycling plastics.

Fourth Nine Weeks Outline

Ch. 20: Chemical Reactions (Chemical Changes; Chemical Equations; Conservation of Mass)

1. Distinguish between physical and chemical changes in matter.
2. Interpret chemical equations.
3. Write and balance chemical equations with the respect to the law of conservation of mass.
4. Use chemical equations to predict the amount of product that will be produced in a reaction.
5. Design an experiment to prove conservation of mass.
6. Identify the mathematical relationship between the mass in grams of reactants and products, the coefficients in a balanced equation, and the formula masses of the reactants and products.
7. Identify economic and environmental reasons for recycling tires.

Ch. 21: Types of Reactions

1. Distinguish between different types of reactions.
2. Identify the type of reaction that will occur and predict the products formed based on the reactants.
3. Analyze energy changes that accompany chemical reactions and classify them as exothermic or endothermic.
4. Develop a set of rules for precipitate formations and use these rules to make predictions.
5. Demonstrate safe practices during laboratory investigations.

Ch. 22: Chemistry and the Environment (Nuclear Reactions; Carbon Reactions)

1. Describe a nuclear reaction.
2. Compare and contrast nuclear reactions with chemical reactions.
3. Explore radioactivity.
4. Differentiate between nuclear fusion and nuclear fission.
5. Discuss the use of nuclear reactions in medicine and science.
6. Describe the environmental impact of nuclear reactions.
7. Explain carbon reactions and investigate their impact on society.
8. Evaluate the impact of scientific research on society and the environment.
9. Organize data and use it to predict trends.

Ch. 23: Solutions (Dissolving Rate; Solubility)

1. Categorize mixtures as solutions, suspensions, or colloids.
2. Define solubility.
3. Describe saturated, unsaturated and supersaturated solutions.
4. Define and calculate dissolving rate.
5. Evaluate the effectiveness of different methods of influencing dissolving rates.
6. Explain how temperature and pressure influence solubility.
7. Understand solubility values.
8. Interpret temperature-solubility graphs.

Ch. 24: Water Quality (The Water Cycle)

1. Describe the properties of water including its function as a nearly universal solvent.
2. Explore the nature of water and hydrogen bonding.
3. Discuss the solubility of various materials in water.
4. Understand what factors are important to water quality.
5. Use and interpret basic water quality tests.
6. Describe how water moves through the water cycle.
7. Explain why maintaining our water quality is important.

Ch. 25: Acids and Bases (Acids, Bases and pH; Acid Rain)

1. Describe the differing characteristics of an acid and a base.
2. Describe pH as a way to measure the strength of acids and bases.
3. Interpret the pH scale and relate its measurement to the hydrogen ion concentration or hydroxide ion concentration.
4. Discuss the ionization of water.
5. Differentiate between electrolytes and non-electrolytes.
6. Identify pH of common household chemicals.
7. Understand the cause of acid rain.

8. Understand the environmental effects of acid rain.
9. Demonstrate the effect of acid on a natural ecosystem.

Ch. 26: Measuring Heat (Temperature Scales; Specific Heat)

1. Measure temperature.
2. Analyze the relationship between temperature and average kinetic energy of molecules.
3. Convert between Celsius and Fahrenheit temperature scales.
4. Identify and analyze devices used to measure temperature.
5. Develop a mathematical relationship that describes how much the temperature of water increases when heat is added.
6. Discuss the relationship between heat and thermal energy.
7. Identify the various units used to represent heat energy.
8. Predict the final temperature when two containers of water of different temperatures are mixed.
9. Quantify the flow of heat from one container of water to another where there is an initial temperature difference between the two containers.
10. Analyze temperature changes in terms of the flow of heat.
11. Calculate the specific heat of a substance.
12. Predict the equilibrium temperature of a mixture of water and another substance.

Ch. 27: Heat Transfer (Conduction; Convection; Radiation)

1. Describe how thermal energy is transferred by conduction, convection and radiation.
2. Differentiate between conductors and insulators and identify various materials that serve as heat conductors or insulators.
3. Explain the relationship between thermal and electrical conductivity.
4. Describe how the motion of liquids is affected by temperature differences.
5. Describe applications of convection.
6. Identify what properties make a good absorber of heat.
7. Analyze the relationship between color and temperature.