



monarch

Supply List

Integrated Physics and Chemistry

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UNIT 1: EXPLORATIONS IN PHYSICAL SCIENCE

Assignment	Summary	Video Demo	Supplies
Experiment: Making Observations	In this laboratory exercise, you will choose one peanut from a bowlful and make "identifying observations" about the peanut. Then you will place the peanut back in the bowl and return later to try to find it again by using your observation skills.	Yes	<ul style="list-style-type: none"> • bowl of peanuts in their shells - NOTE: if allergic to peanuts substitute with another nut such as pistachios, walnuts, or almonds. • various measuring tools (metric rulers, string, etc.) • paper and pencil
Experiment: Determining Volume	In this experiment, you will attempt to determine the volume of two objects using the formula method and the water displacement method.	Yes	<ul style="list-style-type: none"> • metric ruler • small block of wood • string • water • small rock • graduated cylinder
Experiment: Determining Density	In this lesson, you will determine the density of various coins.	Yes	<ul style="list-style-type: none"> • a few pennies, nickels, and quarters • metric ruler • metric balance • scissors
*Experiment: Density Column	In this experiment, you will work with several materials to indicate their relative densities.	Yes	<ul style="list-style-type: none"> • items for density column <ul style="list-style-type: none"> ○ Karo syrup or molasses ○ cooking oil ○ red solution ○ blue solution ○ piece of paraffin ○ raisin ○ peanut or cashew ○ paperclip • small plastic cups • eye droppers • laboratory balance • 50-mL graduated cylinder (or larger)
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 2: THE STRUCTURE OF MATTER

Assignment	Summary	Video Demo	Supplies
Experiment: Atomic Structure	In this experiment, you will have a chance to test the hypothesis that Ernest Rutherford used when determining the size of the nucleus.	Yes	<ul style="list-style-type: none"> • large box (at least 40 to 50 cm along all sides) • small block of wood (around 6 to 8 cm along all sides) • 100 marbles or pellets (airsoft pellets work well) • ruler
Experiment: Identifying an Unknown	In this lab, pretend that someone has discovered several old bottles of chemicals whose labels have come off. Your job is to use at least one physical test to try to determine the identity of the one of the elements.	No	<ul style="list-style-type: none"> • metric balance • graduated cylinder • ruler • small paper cup containing one or more metal pieces (Your teacher will supply you with this.)
Experiment: Separating a Mixture	In this laboratory activity, you will be given a mixture containing various substances. Your goal is to use the physical properties of the substances to separate the mixture into its various components.	No	<ul style="list-style-type: none"> • mixture containing salt, iron filings, sand, gravel, and raisins • screens • funnel • filter paper (see diagram below for directions on use) • beakers • ring stand and ring • magnet
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 3: MATTER AND CHANGE

Assignment	Summary	Video Demo	Supplies
Experiment: Graphing Changes of State	In this activity, you will observe the changes in water as it transforms from ice to liquid water and then begins to boil. Part of your task is to determine exactly when it is boiling. In addition, you will gather data to support the idea that, during a change of state, energy put into a substance is used to rearrange the structure of the substance, not change its temperature.	No	<ul style="list-style-type: none"> coarsely crushed ice (about 8 ice cubes or enough to half fill a 500-mL beaker) string or wire Bunsen burner or hot plate (stove on low setting may be used) Pyrex beaker (use a small metal pan if a stove is used) Celsius thermometer ring stand with ring & supports (see diagram) time piece with second hand digital camera (optional)
Experiment: The Cabbage Indicator	In this activity, you will use the pigment from red cabbage leaves. Because this pigment changes color in the presence of acids and bases, it can be used as a pH indicator. You will use vinegar, a known acid, to demonstrate the color change that will occur if a solution is an acid. You will use a known base, such as baking soda or ammonia, to demonstrate the color change that will occur if a solution is a base. Using this information, you will test other household substances for their acid-base character.	No	<ul style="list-style-type: none"> sliced red cabbage stainless steel cooking container food strainer collection beaker coffee filter white vinegar baking soda (or ammonia) distilled water (for control) two pieces of notebook paper several small, clear plastic cups (3-oz [90-mL] bathroom cups work well for this purpose) at least 6 household liquids for testing (suggestions: clear soda-pop, clear shampoos or liquid soap solutions, clear or light-colored fruit or vegetable juices, rain from a recent storm, water with soil fertilizer dissolved in it, etc.)

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Experiment: Chemical Changes	In this activity, several changes will be made to samples of matter. Your challenge will be to decide if the change is physical or chemical. You will also have to defend your choice.	No	<ul style="list-style-type: none">• small utility candle and holder• matches• metric balance• 3 small sheets of paper• watch glass• 3 test tubes• table salt (NaCl)• calcium chloride (CaCl₂)• baking soda (NaHCO₃)• magnesium ribbon• 1M hydrochloric acid (muriatic acid)
Experiment: Half-Life	In this laboratory activity, you will use candy to simulate the decay of a radioactive isotope. This investigation will demonstrate some of the basic principles of half-lives and radioactive decay.	No	<ul style="list-style-type: none">• 100 small candy pieces with printing or design on one side only (M&M™, Reese's pieces™, etc.)• resealable plastic bag or clean plastic box with lid• sheet of wax paper, approximately 30 cm x 30 cm• plastic knife• plastic cup• graph paper
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 4: STATES OF MATTER

Assignment	Summary	Video Demo	Supplies
Experiment: Comparing Hardness and Density of Solids	In this activity, you will compare several solids to determine if there is a relationship between the hardness of a sample and its density.	No	<ul style="list-style-type: none"> at least six of the following solid samples (some are crystals, others amorphous): aluminum, amber, calcite, chalcophyrite, dolomite, feldspar (orthoclase or anorthite), fluorite, galena, gypsum, hematite, ice, iron, magnetite, mica (muscovite or biotite), pyrite, quartz, ulexite your own fingers (fingernails to be precise!) copper penny (pre-1981) dissection knife (from a biology dissection kit) steel nail or file metric balance graduated cylinder overflow can (optional, may be necessary for some samples) graph paper
Experiment: Viscosity	All liquids display the property of viscosity due to the intermolecular forces between the particles of the liquid. In this laboratory activity, you will compare the viscosity of several liquids. You will also determine the effect of temperature on the viscosity of liquids.	No	<ul style="list-style-type: none"> egg carton scissors or nail several straws cardboard (for ramp) tape stopwatch or watch with second hand 1-inch block, a book, or other support ramp (see images below) several test liquids (e.g., water, ketchup, honey, olive oil, molasses, syrup, heavy cream, vegetable oil) microwave beaker or measuring cup
Experiment: Pressure in Gases	In this project, you will determine the air pressure in the tires of a car using an indirect method.	No	<ul style="list-style-type: none"> a car and licensed driver the car manual (for information) air pressure gauge 4 sheets of tag board or thin cardboard tape
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 5: MOTION AND FORCES

Assignment	Summary	Video Demo	Supplies
Experiment: Motion Graphs	In the first half of this project, your challenge is to design an experiment to determine the speed of a battery-powered toy car. In the second half of the project, you will do an experiment to determine whether a non-powered toy car is accelerating.	No	<ul style="list-style-type: none"> • battery-powered toy car • non-powered toy car • meter stick • stopwatches (one for each timer) or second hand on clock • long board (at least 2 meters) for ramp • books to prop up ramp
Project: Virtual lab – Conservation of Momentum	Write a brief essay on the uses of momentum collisions in curling.	V-Lab	N/A
Project: Virtual Lab – Newton's Laws	Write a brief essay describing how Newton's Laws explain how a rocket in space can move objects.	V-Lab	N/A
Experiment: Propulsion	In this activity, you will experiment with other applications of Newton's third law.	No	<ul style="list-style-type: none"> • balloon • empty soda pop can • sharp nail • hammer • fishing line or strong thread • bowl of water
Project: Virtual Lab – Circular Motion	Many roller coasters today have loops, either as stand-alone loops or as parts of corkscrews. In stand-alone loops, the loops are teardrop shaped and not one complete circle. Write a brief essay as to why you think they are constructed that way.	V-Lab	N/A
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 7: WORK AND ENERGY

Assignment	Summary	Video Demo	Supplies
Experiment: Potential and Kinetic Energy	In this project, you will investigate the principals involved in the conversion of potential to kinetic energy due to the force of gravity. In addition, you will verify that the mechanical energy of one object can be transferred to another object.	No	<ul style="list-style-type: none"> • cardboard tube (from gift wrap or paper towels) • box (cut from lightweight cardboard, such as a gift box, using the pattern below) • four marbles of different masses • meter stick • tape • scissors • book • metric balance
Project: Virtual Lab – Simple Machines	Write a brief essay explaining why the efficiency of a complex machine decreases as more simple machines are used.	V-Lab	N/A
Experiment: Inclined Planes	In this project, you will determine the IMA, AMA, and efficiency for inclined planes with different slopes.	No	<ul style="list-style-type: none"> • smooth board • smooth block or other object to drag up the plane (approximately 200 to 500 grams) • spring scale (calibrated in newtons) • string • books or blocks to support the inclined plane • meter stick
Project: Virtual Lab – Projectiles	Assume you built a really big machine that could launch the projectile a “significant” distance; for instance, several hundred miles. Write a brief essay discussing the issues that would need to be accounted for with a projectile with that type of range.	V-Lab	N/A
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 8: HEAT FLOW

Assignment	Summary	Video Demo	Supplies
Experiment: Insulators	In this activity, you will compare the heat-retaining ability of several insulators.	No	<ul style="list-style-type: none"> • large Styrofoam cup • small Styrofoam cup • flat piece of Styrofoam • thermometer • hot water • heat source for heating water • at least two insulating materials (shredded newspaper, sheets of newspaper, bits of cloth, small Styrofoam peanuts, bubble wrap, feathers, aluminum foil, saw dust, etc.) • clock with second hand
Experiment: Heat and Expansion	In this project, you will investigate the phenomenon of thermal expansion.	No	<ul style="list-style-type: none"> • beaker or pan for heating water • medium test tube • one-holed stopper to fit test tube • glass tube to fit through stopper • grease pencil • food coloring • hot plate for heating water • large round balloon • marker • tape measure • freezer
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 9: ELECTRICITY AND MAGNETISM

Assignment	Summary	Video Demo	Supplies
Experiment: Electrostatic Investigations	In this laboratory activity, you will investigate the principles of electrostatics using adhesive tape.	No	<ul style="list-style-type: none"> • clear adhesive tape • plastic straw
Project: Virtual Lab – Circuits	Write a brief essay describing the minimum requirements for any electric circuit.	V-Lab	N/A
Experiment: Diverting a Magnetic Field	You have learned that a magnetic field can influence the flow of electric current. For this reason, it is important to divert magnetic fields away from sensitive circuits. In this activity, you will explore how this can be accomplished.	No	<ul style="list-style-type: none"> • strong disk magnet • plastic drinking straw • tape • double-stick tape or glue • paperclips • cardboard from cereal or cake mix box • test materials such as pennies, aluminum foil, an iron or steel nail, cardboard, crayons, a table knife, or a popsicle stick • compass • paper
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 10: WAVES

Assignment	Summary	Video Demo	Supplies
Experiment: Changing the Speed of a Wave	In this project, you will learn how waves travel on a rubber band.	No	<ul style="list-style-type: none"> • plastic box • paperclips • 2 sturdy rubber bands, large enough to stretch around the plastic box
Project: Virtual Lab – Sound	From your experience in this lab on building your own musical instrument, write a brief essay on the purpose of these “boxes”. Include a brief description of a xylophone and what it uses for the purpose of the box.	V-Lab	N/A
Experiment: Using Vibrations to Produce Sound	In this project, you will investigate how small changes in the structure of a sound-producing object can affect the pitch of the sound produced.	No	<ul style="list-style-type: none"> • a tuning fork • wooden ruler • plastic bowl (for water) • 3 test tubes (or 3 identical glass bottles with narrow mouths)
Project: Virtual Lab – Doppler Effect	Write a brief essay describing how the Doppler effect explains why some stars are “blue shifted” and others are “red shifted.”	V-Lab	N/A
Experiment: Law of Reflection	This activity will allow you to verify the law of reflection. In addition, you will learn a technique with which to analyze your results scientifically.	No	<ul style="list-style-type: none"> • laser pointer • small rectangular or square plane mirror • block of wood to support mirror • sharp pencil • protractor • unlined paper
Project: Virtual Lab – Light	Write a brief essay describing at least three ways the “Brownie” was made easier to use for the average citizen.	V-Lab	N/A
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

UNIT 11: CHEMISTRY AND PHYSICS IN OUR WORLD

Assignment	Summary	Video Demo	Supplies
Experiment: Carbon Dioxide and Water Acidity	In this project, you will learn how carbon dioxide can affect the pH of water.	No	<ul style="list-style-type: none"> • three 12-inch balloons • measuring tape • twist tie • bicycle tire air pump • CO₂ cartridge bicycle tire pump • one-hole stopper with glass tube inserted • four 100-mL beakers • 100-mL graduated cylinder • pH paper, acid range
Experiment: Water Acidity and the Environment	In this project, you will test how acid affects a variety of materials.	No	<ul style="list-style-type: none"> • sand paper • vinegar • fresh water • small jar with lid • several small paper or plastic cups or small beakers • materials to test: <ul style="list-style-type: none"> Part A: <ul style="list-style-type: none"> • a raw egg Part B (two samples of each item are required): <ul style="list-style-type: none"> • small sea shell • piece of coral • a penny (use sand paper to remove any surface build-up) • an iron or steel nail (use sand paper to remove any surface build-up) • chips of marble, concrete, brick • various rock samples (slate, limestone, quartz) • piece of chalk • small glass bead or other piece of glass • small plastic bead or other piece of plastic

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Experiment: Kepler's Second Law	In this laboratory activity, you will use actual data from observations made of the orbit of Mercury to test Kepler's second law, also known as the law of equal areas.	No	<ul style="list-style-type: none">• centimeter graph paper• scissors• poster board• triple beam balance• centimeter ruler• tape
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

* indicates an alternative assignment