

Hands-On Science Complete Class Topic List

Scientific Inquiry

SC01	Scientific Inquiry	Think like a scientist: Investigate Observation, Inference, and Opinion through mystery
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Biology

BIO01	Taxonomy & dichotomous keys	classification of organisms activity, use a dichotomous key to identify different beans
BIO02	Animal cell structure	learn about animal cells, make a model of an animal cell in a soda bottle using 3-D materials, examine human cheek cell with a microscope
BIO03	DNA	make a DNA model with marshmallows, red vines, and toothpicks, Isolate DNA from a strawberry
BIO04	Cell division - Mitosis	model the cell cycle and mitosis using yarn, complete a diagram of the cell cycle, observe stages of mitosis in an onion root using a microscope, play mitosis bingo (time
BIO05	Cell division - Meiosis	activities to learn about meiosis (must take mitosis class 1st), sperm and ova are mentioned since they are the products of meiosis - (more appropriate for 7th grade and
BIO06	Genetics and traits	Determine genotype and phenotypes using Easter eggs and beads. Understand how traits are inherited in generations using pom-poms
BIO07	Diffusion, Osmosis, and Tonicity	Set up dialysis tubing to observe osmosis, observed celery in hypotonic/hypertonic/isotonic solutions
BIO08	Bacteria	learn about bacteria cells, exponential growth activity using beans, collect bacteria from everyday items and grow on nutrient agar in Petri dishes, observe results at following class, make bacterial cell model on poster board
BIO09	Yeast	Perfrom yeast growth with different variables, discuss fermentation equation, observe results from bacterial isolation activity (if bacteria class preceeded this one),
BIO10	Mold and mushrooms	observe mold garden, observe mold hyphae with microscope (only if no mold allergies in class), dissect a mushroom, examine various mushrooms (late Fall best for specimen collecting)
BIO11	Plant cell structure	learn about plant cells, make a model of a plant cell, look at onion cells using microscope
BIO12	Plant Vascular System	microscope, create plant vascular system model, look at plant stomata using a microscope, capillary action (adhesion/cohesion of water) demo, discuss plant adaptations, observe transpiration
BIO13	Plant reproduction (flowers)	dissect flowers, learn about differences between dicots and monocots, discuss seed dispersal and look at specimens, observe different fruit/vegetables, roots, leaves
BIO14	Photosynthesis	model the photosynthesis equation using beads and pipe cleaner, observe oxygen production by a leaf(must be a sunny day), perform plant pigment chromatography
BIO15	Seed dissection	dissect lima and kidney beans and learn about structures
BIO16	Non-Vascular plants	Moss dissection and life cycle

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BIO17	Animal Behavior-Earthworms	test the response of earthworms to various stimuli (no animals injured/killed)
BIO18	Microscope use & slide preparation	learn the parts of a microscope and how to use it, prepare a slide with cheek cells and onion cells, bring your microscope if you have one for instruction on how to use it
BIO19	Food Chains/Webs & Energy levels	investigate interactions within a food chain/web, create an energy pyramid and investigate energy transfer within an ecosystem
BIO20	Adaptations and Natural Selection	investigate beak shapes and function, observe natural selection through camouflage
BIO22	Estimating the population in a habitat	Perform a population count using the mark-recapture method using beans
BIO23	Carrying capacity of an area	perform an activity to demonstrate the carrying capacity of an area
BIO24	Frog/worm dissection	2.5 hour class - special fee (frog 1.5 hour, worm 1 hour)
BIO25	Cow eye/crayfish dissection	1.5 hours - special fee
BIO26	Frog dissection	1.5 hour class - Special fee
BIO27	Worm dissection	1 hour class - Special fee
BIO28	Cow eye dissection	1 hour class - Special fee
BIO29	Crayfish dissection	1 hour class - Special fee

The Human Body

HB01	Skeletal System	create a skeletal model with pasta, assemble a life-size paper model of a skeleton
HB02	Build a Bone	label bone diagram, create an edible bone model, examine a cow femur, view bone slide with microscope
HB03	Circulatory System	label diagram of the circulatory system, heart/lung/foot/blood cell demo with chambers of the heart(need large area to do this), look at a dissected cow heart, heart rate activity to determine effect of activity on heart rate, use tennis balls to observe structure/function of heart valve
HB04	All about Blood	perform blood typing using a simulated blood kit,examine blood slide with microscope, demonstrate blood transfusion incompatibility with colored water
HB05	Respiratory System	label diagram of the respiratory system and learn how it works with the circulatory system, activity to measure the effect of exercise on respiration, observe CO2 in exhaled air using limewater
HB06	Build a Lung	Create 3-D model of lung, lung volume activity with balloons (measure and compare sizes of blown-up balloons), observe grape lung model
HB07	Musclar System	label diagram of different types of muscles, muscle fatigue activities, look at muscle slides with microscope
HB08	Nervous System	label diagram of the nervous system, reaction time activity, knee reflexes, pupil contraction, tweezer/receptor cell activity

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HB09	Build a Neuron	label neuron diagram, create model of a neuron using pipe cleaners, demonstrate how a nerve fires using large rope neuron model, play game to demonstrate nerve impulse transmission from neuron to neuron, look at neuron slide with microscope
HB10	Auditory System	Create a model of the ear, spin to demonstrate action of semicircular canals, use spoon and string to experience vibration and sound, observe model/demo of the eardrum
HB11	Digestive System	create 3-D model of the digestive system, peristalsis demonstration, use crackers to demonstrate digestion starts in mouth, baggie/bread activity to demonstrate digestion throughout system
HB12	Smell and Taste	taste PTC, sodium benzoate, and thiourea to test for super tasters, determine how smell and taste work together (apple vs. potato)

Earth Science

Note: Some Earth Science classes include discussion of the Earth's age at approximately 4.5 billion years old and movement of the plates approximately

ES01	Topographic Map	Use clay to create a topographic map, learn how to read a topographic map
ES02	Geologic Dating	Investigate 2 methods geologist use to date rocks, relative and absolute age are examined with superposition and radiometric dating activities.
ES03	Earth's layers	create dough model of Earth's layers and label a diagram, learn facts about different
ES04	Plate Tectonics	Discuss Pangea theory, demonstrate plate boundary types by doing "snack tectonics" activity with graham crackers, frosting, and fruit roll-up
ES05	Faults	create dough fault blocks (hanging wall and foot wall), learn about 3 fault types, compression/tension/shearing forces activities
ES06	Mountains	make mountain-type models with clay
ES07	The Rock Cycle	create diagram of rock cycle, use Starburst candies to demonstrate the rock cycle, examine sedimentary, igneous, metamorphic rock samples
ES08	Minerals	identify minerals based on hardness, streak, luster, crystal, color, examine mineral
ES09	Weathering/erosion	dissovre calcium carbonate, perform Skittles weathering activity, glacier/wind/water action, abrasion activity
ES10	Soil layers	observe layers in soil, create soil horizons using cereal, chemical testing of various soils
ES11	Heating Earth's Surface	perform experiment to demonstrate heating and cooling of different materials and discuss how they affect weather, solar radiation, discuss specific heat
ES12	Core sampling	use a multi-color cupcake and straw to demonstrate how geologists perform core
ES13	Mid-Ocean Ridge	create model of mid-ocean ridge
ES14	Earthquakes	liquefaction activity, build structure on a "fault", build a seismograph

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ES16	Earth's Magnetism	Navigate like a sea turtle using the Earth's magnetic fields, Earth's magnetic core
ES17	Water Cycle & Filters	discussion of the water cycle, create water filter to determine which design will yield the cleanest water (not available at all class locations, must be done outside)

Chemistry

CHEM01	The Atom	create an atom model with beads, wire, and clay, activity to demonstrate atom size and movement
CHEM02	Subatomic Particles (SAPs)	learn about subatomic particles, determining # of protons, electrons, neutrons, learn about atomic shells using pony beads, simulate atoms using students and ropes,
CHEM03	The Periodic Table	learn about the organization of the periodic table, activity to demonstrate similarities between elements in the same family (group)
CHEM04	Molecules	create molecule models with candy and toothpicks, model covalent bonding with poker chips and rope
CHEM05	Balancing Chemical Equations	Use legos to create balanced chemical reactions, tarnished silver demo
CHEM06	Endothermic/Exothermic Reactions	perform endothermic and exothermic chemical reactions
CHEM07	Mixtures, Compounds, and Elements	elements
CHEM08	Polymers	perform diaper polymer experiment, make bouncy balls (1.5 hr. class only)
CHEM09	Acids, bases, and the pH scale	test various solutions with cabbage indicator and litmus paper to determine pH
CHEM10	Acids, bases, and antacids	perform experiment to test antacid effectiveness (prerequisite: CHEM09)
CHEM11	Mystery Powders	perform various chemical and physical properties tests on powders to determine identity
CHEM12	Crime scene chemistry	identify mystery powders based on chemical properties, and identify the pen used to write a ransom note using chromatography
CHEM13	Fingerprinting and other crime scene activities	Examine fingerprints and other forensic evidence
CHEM14	Salt, Ice, and Variables (and Ice Cream)	perform experiment to determine effect of salt on ice water, identify dependent and independent variables, make ice cream in bags
CHEM15	Radioactive decay	Model radioactive decay using puzzle pieces, analyze and graph data
CHEM16	Slime Science	investigate viscosity and make slime

Physical Science

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PH01	States of Matter	learn about liquid, solid, gas, condensation, observe ice melting to liquid and turning to gas, observe condensation on glass exterior, perform ice melting experiment, record and graph data, create carbon dioxide and use it to put out a flame, discuss and observe chemical vs. physical changes (match vs. ice cube)
PH02	Levers 1st & 2nd - simple machine	activities to demonstrate 1st & 2nd class levers using ruler, weights, and spring scale
PH03	Levers 3rd - simple machine	activities to demonstrate 3rd class levers using ruler, weights, and spring scale
PH04	Inclined Planes - simple machine	book/ramp/spring scale activity, observe effect of friction on an inclined plane
PH05	Create a catapult - simple machine	make a catapult using popsicle sticks and rubber bands, compare action on different lever lengths, potential and kinetic energy
PH06	Screws - simple machine	wrapped paper and pencil activity, compare screws with different threads
PH07	Pulleys - simple machine	perform 3 pulley activities
PH08	Wedges - simple machine	nail and wood block/wedge activities
PH09	Wheel and Axle- simple machine	build wheel and axle and clothespin cars
PH10	Speed of Falling Objects	investigate the effect of gravity on objects
PH11	Flight and Aerodynamics	learn about Bernouli's effect and flight
PH12	Swinging Pendulums	investigate affect of pendulum length
PH13	Air pressure and the pressure of the atmosphere	activities to demonstrate air pressure (flame/candle/ jar/water, balloon, straw/water)
PH14	Heat, Expansion, and the Movement of Molecules	activities to show effect of heat on volume (water movement, air movement)
PH15	Heat Transfer	Conduction, radiation, convection activities
PH16	Insulation and heat flow	Compare effectiveness of different materials as insulators
PH17	Force, Movement, Work, Systems, and Weight	concepts of force, work, and system, gravity
PH18	Potential and Kinetic Energy	build marble roller coaster to investigate potential and kinetic energy
PH19	Density of Solids	determine density of density cubes using triple beam balance, determine density of irregular shaped objects
PH20	Density of Liquids	observe behavior of liquids with different densities
PH21	Flinkers	Create an object that will neither float or sink in water
PH22	Newton's 1st law	activities to demonstrate Newton's 1st law
PH23	Newton's 2nd Law	activities to demonstrate Newton's 2nd law
PH24	Newton's 3rd Law	activities to demonstrate Newton's 3rd law
PH25	Rockets	Build and launch bottle rockets (indoor or outdoor activity depending on
PH26	Three laws of Thermodynamics	
PH27	Electricity	create simple and parallel circuits, test circuit cards
PH28	Light	observe reflection and refraction, play with prisms (spectrum)
PH29	Sound	observe behavior of sound
PH30	Magnetism	observe and document magnetic field using a compass, test magnetic shielding

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Astronomy

AST01	The Sun	create diagram of sun, view sun with docent from observatory (if available)
AST02	The Planets (2 classes)	Various planet demonstratons and activities (need dark room or area)
AST03	Asteriods & Meteroids	Create asteroid and meteroid model, scale model of small object sizes
AST04	Comets	Create comet model and simulate a comets orbit around the sun
AST05	The Solar System's Size	Create a scale model of the solar system (inside or outside activity depending on
AST06	Lifecycle of a Star (2 classes)	Study the life cycle of a star, create nebula and galaxy model, investigate a supernova, perform black hole activity