

IDEAL Science ML Course Scope and Sequence

Note to teachers: The materials for this course were curated and created with a flipped classroom approach. Students are expected to complete reading and practice assignments before attending class so they are prepared to participate in meaningful learning activities with their classmates and their instructor. If you need more information about flipped classrooms, you can read the [flipped classroom resource page from Harvard University](#).

The plans below for each unit are divided into three parts. You can choose to combine all three parts into one 90-minute class, hold three 30-minute classes, or explore other pacing options that best suit your class needs. If you need help adjusting or creating assignments to fit your needs, please use the [IDEAL FAQ page > Atomic Assessments Question #1](#)

HiSET content categories are marked on each lesson/activity with * and 21st Century Skills are marked with †.

Some 21st Century skills apply to course activities depending on how the teacher sets up the class. These are listed below with the conditions of alignment.

†21.9-12.ES.1.a-c: All Weeks

†21.9-12.ES.3.a-d: All Weeks

†21.9-12.ES.4.a,b,e: All Weeks

†21.9-12.ES.4.c: All Week Part 3

†21.9-12.ES.5.a-b: All Weeks

†21.9-12.TL.1.c: All PLIX activities

†21.9-12.TL.2.a,d: All Weeks

†21.9- 12.TL.5.a-c: All Weeks

†21.9-12.TL.6.a,d: All PLIX Activities

Week 1, Unit 1: Science Practices		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Define the goals and advances in science - Examine how scientists think about the natural world - Review experiments, experimental variables and experimental controls - Familiarize yourself with descriptive statistics (mean, median, mode, range) - Review the types of graphs and the usefulness of each	Students complete before class: 1.1 Comprehend Scientific Presentations 1.2 Investigative Design	Students complete before class: 1.3 Variables 1.4 Reason with Scientific Information 1.5 Express Scientific Information	Students complete before class: 1.6 Descriptive Statistics 1.7 Graphing	
	Class time: - Scenario: Asking Questions - Group Practice: Asking Questions - Review: Hypotheses graphic Estimated time: 30 minutes	Class time: - Example: Research Question with Variables - Group Practice: Research Question with Variables Estimated time: 30 minutes	Class Time: - Graphics: Descriptive Statistics and Graphing - Group Practice: Descriptive Statistics and Graphing Estimated time: 30 minutes	
	Unit 1 Quizlet Link	Students complete after class: - PLIX Developing a hypothesis - Week 1: Class Introductions	Students complete after class: Week 1, Unit 1: Individual Practice Question 1	Students complete after class: - Week 1, Unit 1: Individual Practice Question 2 - Week 1, Unit 1: Self-Reflection
Standards *Physical Science	Vocab: Main Idea Details Observations Science Evidence Hypothesis Experiment Conclusion	Vocab: Variable Independent Variable Dependent Variable Controlled Variables + → ⇌ Formulas	Vocab: Mean Median Mode Range Bar graph Circle graph Line graph	

Week 2, Unit 2: Cells		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives: - Review the characteristics of life - Introduce cells, cell theory, and the levels of organization in organisms - Differentiate between eukaryotic and prokaryotic cells - Review features and roles of the plasma membrane and cytosol	Students complete before class: 2.1 Characteristics of Life 2.2 Cell Theory		Students complete before class: 2.3 Prokaryotic and Eukaryotic Cells	Students complete before class: 2.4 Cell Membrane 2.5 Nucleus
	Class Time: - Group Practice: Living and Non-living things - Review: Characteristics of Living Things - Review: Cell Theory - Group Practice: Cell Theory Estimated time: 30 minutes		Class Time: - Group Practice: Eukaryotes vs. Prokaryotes - Review: Eukaryotes vs. Prokaryotes - Discussion Estimated time: 30 minutes	Class Time: Group Practice: Cell Diagnosis Estimated time: 30 minutes
Unit 2 Quizlet Set Link		Students complete after class: PLIX: Characteristics of Life	Students complete after class: Week 2, Unit 2: Individual Practice	Students complete after class: Week 2, Unit 2: Self-Reflection
Standards *Life Science †21.9-12.ES.2.a		Vocab: Organisms Energy Cells Food Animals Fungi Photosynthesis Ribosomes Proteins DNA Nucleus Tissues Organ Organ Systems	Prokaryotic Cells Species Asexual Reproduction Sexual Reproduction Homeostasis Bacteria Microscope Theory Biology	Vocab: Lipids Hydrophilic Hydrophobic Cytoplasm Semipermeable Cytosol Enzymes Nuclear Envelope Nuclear pores Genes Nucleolus

Week 3, Unit 3: Energy		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Review the concept of photosynthesis - Recognize the role of light reactions - Understand the general function and process of cellular respiration - Review the basic function of fermentation and discuss lactic acid and alcohol fermentation		Students complete before class: 3.1 Photosynthesis 3.2 Light Reactions	Students complete before class: 3.3 Cellular Respiration	Students complete before class: 3.4 Fermentation
		Class time: - Group practice: Photosynthesis - Review Photosynthesis graphic - Group practice: chloroplasts Estimated time: 30 minutes	Class time: - Group Practice: Cellular Respiration - Discussion Question - Review Photosynthesis/Cellular Respiration Graphic Estimated time: 30 minutes	Class time: - Group practice: cellular respiration vs. anaerobic respiration venn diagram - Discussion question Estimated time: 30 minutes
	Unit 3 Quizlet Set Link			
Standards *Life Science		Students complete after class: PLIX: Light Reactions	Students complete after class: Week 3, Unit 3: Individual practice Question 1	Students complete after class: - Week 3, Unit 3: Individual Practice Question 2 - Week 3, Unit 3: Self-Reflection
		Vocab: Producers Photosynthesis Glucose Carbohydrate Chloroplasts Chlorophyll Thylakoid Membrane Thylakoids Stroma Stomata	Vocab: Cellular respiration ATP Carbon cycle	Vocab: Anaerobic Anaerobic respiration Lactic acid fermentation Glycolysis Fermentation

Week 4, Unit 4: Human Body and Health		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Recognize the levels of organization and the types of tissue in the human body - Discuss homeostasis and its regulation through feedback - Review the skeletal system and the characteristics of bones - Understand the role of carbohydrates, lipids and proteins in terms of nutrition - Describe the parts of the cardiovascular system and the system's function		Students complete before class: 4.1 Human Body 4.2 Homeostasis	Students complete before class: 4.5 Skeletal System 4.17 Cardiovascular system	Students complete before class: 4.12 Types of Nutrients
		Class Time: - Group practice: Organ Systems - Review Tissues graphic - Group practice: Negative Feedback Estimated time: 30 minutes	Class Time: - Group practice: Skeletal system - Review Skeletal system diagram - Group practice: Cardiovascular system Estimated time: 30 minutes	Class Time: - Group practice: nutrients - Review Nutrients graphic Estimated time: 30 minutes
	Unit 4 Quizlet Link	Students complete after class: PLIX: Homeostasis	Students complete after class: Week 4, Unit 4: Individual Practice Question 1	Students complete after class: - Week 4, Unit 4: Individual Practice Question 2 - Week 4, Unit 4: Self-Reflection
Standards *Life Science †21.9-12.TL.4.c, 21.9-12.TL.6.a,d		Vocab: Tissue, Epithelial tissue, Connective tissue, Muscle tissue, Nervous tissue, Organ, Organ system, Homeostasis, Negative feedback, Positive feedback	Vocab: Cartilage, Ligament, Compact bone, Spongy bone, Blood vessels, Arteries, Veins, Hormones, Endocrine system, Adrenal glands, Kidneys	Vocab: Fructose, Lactose, Starch, Fiber, Gastrointestinal tract, Calories, Amino acids, Antibodies, Muscle fibers, Enzymes, Saturated fat, Unsaturated fat, Trans fat

Week 5, Unit 5: Molecular Basis for Heredity				Virtual Class Part 1		Virtual Class Part 2		Virtual Class Part 3		
Student Objectives - Differentiate between asexual and sexual reproduction - Become familiar with Mendel's study of genetics - Understand the purpose of Punnett squares to predict offspring traits - Review the general composition of DNA - Relate Mendel's laws to modern genetics	Students complete before class: 5.1 Reproduction			Students complete before class: 5.2 Pea plants 5.4 Punnett Squares		Students complete before class: 5.5 DNA 5.9 Molecular Genetics Overview				
	Class time: - Group practice: Asexual reproduction - Review Types of Reproduction graphic - Discussion question Estimated time: 30 minutes			Class time: - Group practice: Cross-breeding pea plants - Review Cross-breeding pea plants graphic - Group practice: Punnett squares Estimated time: 30 minutes		Class time: - Group practice: base pairs - Group practice: Genotypes and Phenotypes Estimated time: 30 minutes				
	Students complete after class: Week 5, Unit 5: Individual practice			Students complete after class: PLIX: Pea Plants Blending Inheritance		Students complete after class: Week 5, Unit 5: Self-Reflection				
Standards *Life Science				Vocab: Asexual reproduction Species Reproduction Sexual reproduction Binary fission Chromosome Cell division Gametes Testes Ovaries Fragmentation	Partheno- genesis Dioecious Sperm Zygote Fertilization Mitosis Embryo Gonads Meiosis Diploid Haploid External fertilization	Internal fertilization Penis Vagina Cloaca Amphibian Self- pollination Cross- pollination Pollinators	Vocab: Inherit Genetics Gregor Mendel Offspring F1 generation F2 generation P generation	Punnett square Mating Dominant trait Recessive trait Homozygous Heterozygou s	Vocab: Deoxyribo- nucleic acid Nucleic acids Nucleotides Double helix James Watson Francis Crick Rosalind Franklin	Maurice Wilkins Base-pair Genes Alleles Dominant allele Recessive allele Genotype Phenotype

Week 6, Unit 8: Chemistry		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Review atoms and how they are related to elements, and the particles that make up atoms - Review the nucleus of an atom and what holds it together - Explore protons and how they relate to elements, and what protons are made of - Review neutrons and how they cause different isotopes of an element, and the particles in neutrons - Become familiar with electrons and their place in atoms - Define atomic number and mass number - Explore ions, how they form and their properties	Unit 8 Quizlet Link	Students complete before class: 8.1 Atom 8.2 Nucleus of the Atom	Students complete before class: 8.3 Proton 8.4 Neutron 8.5 Electron	Students complete before class: 8.6 Atomic Mass and Number 8.7 Ion
		Class time: - Group practice: Subatomic particles - Group practice: Atoms Estimated time: 30 minutes	Class time: - Group Practice: Naming atoms - Group practice: Drawing atoms Estimated time: 30 minutes	Class time: - Group practice: isotopes - Group practice: Ions - Discussion Question Estimated time: 30 minutes
		Students complete after class: Week 6, Unit 8: Individual Practice Question 1	Students complete after class: Week 6, Unit 8: Individual Practice Question 2	Students complete after class: - PLIX: Cations and Anions - Week 6, Unit 8: Self-Reflection
Standards *Physical Science		Vocab: Element Protons Atoms Electrons Nucleus Strong nuclear force	Vocab: Fundamental particles Quarks Gluons Isotopes Leptons Atomic model Orbital S orbitals P orbitals Energy level Valence electrons	Vocab: Atomic number Mass number Periodic table Ions Cations Anions Compound

Week 7, Unit 9: Matter and Change		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Define matter and what mass and volume measure - Define physical property and examples of the physical properties of matter - Define density and how to calculate density - Define chemical property and recognize examples of the chemical properties of matter - Review elements and their different properties, the history of elements and how atoms relate to elements	Students complete before class: 9.1 Matter, Mass, and Volume	Students complete before class: 9.2 Physical Properties of Matter 9.3 Density	Students complete before class: 9.4 Chemical Properties of Matter 9.5 Element	
	Class time: - Review Mass, Weight, and Volume graphic - Group Practice: Measuring Mass and Volume Estimated time: 30 minutes	Class time: - Group Practice: Physical Properties - Review Density formula - Group practice: density - Discussion Question Estimated time: 30 minutes	Class time: - Group practice: Chemical and Physical Properties - Group practice: Elements Estimated time: 30 minutes	
Unit 9 Quizlet Link	Students complete after class: Week 7, Unit 9: Individual Practice Question 1	Students complete after class: PLIX: Density	Students complete after class: - Week 7, Unit 9: Individual Practice Question 2 - Week 7, Unit 9: Self-Reflection	
	Standards *Physical Science	Vocab: Matter Mass Kg Weight Volume M^3 Cm^3 L ML Displacement	Vocab: Melting point Physical properties Substance Liquid Solid Gas Odor Boiling point Heat conductivity Electric conductivity Ability to dissolve Ductile Density	Vocab: Chemical properties Reactivity Flammability Ability to rust Element

Week 8, Unit 14: Forces		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Define force and how it relates to motion, force as a vector - Explore combining forces: pulling down and pushing up, forces acting in opposite directions, forces acting in the same direction - Define friction, why it occurs and the factors that affect it - Explore the Law of Gravity by demonstrating that Earth's gravity pulls any object on or near Earth toward it even though nothing is touching the object - Review Newton's law of universal gravitation and factors that affect the strength of gravity between two objects - Explore acceleration due to gravity and why falling objects with different masses accelerate at the same rate	Students complete before class: 14.1 Force	Students complete before class: 14.2 Combining Forces 14.3 Friction	Students complete before class: 14.4 Gravity 14.5 Newton's Law of Gravity 14.6 Acceleration Due to Gravity	
	Class Time: - Group practice: Force - Group practice: Applied forces Estimated time: 30 minutes	Class Time: - Group practice: net forces - Group practice: friction - Discussion Question Estimated time: 30 minutes	Class Time: - Group practice: law of gravity - Group practice: Acceleration due to gravity - Discussion Question Estimated time: 30 minutes	
	Students complete after class: Week 8, Unit 14: Individual practice Question 1	Students complete after class: PLIX: Determining the Net Force	Students complete after class: - Week 8, Unit 14: Individual practice Question 2 - Week 8, Unit 14: Self-Reflection	
	Vocab: Force Gravity Friction Applied forces Acceleration Newtons Vector	Vocab: Net force	Vocab: Weight Law of universal gravitation Scientific law Velocity Air resistance	
Unit 14 Quizlet Link				
Standards *Physical Science				

Week 9, Unit 21: Planet Earth		Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives - Examine the Earth's shape - Examine Earth's magnetic field - Explore how scientists use seismic waves to learn about the Earth's interior - Describe the various layers of the Earth - Identify and describe the two internal layers of Earth - Describe the makeup of the Earth's crust - Examine the composition and behavior of the Earth's mantle - Describe the composition of the Earth's core	Students complete before class: 21.1 Earth's Shape 21.2 Earth's Magnetic Field	Students complete before class: 21.3 Earth's Interior 21.4 Earth's Outer Layers 21.5 Earth's Inner Layers	Students complete before class: 21.6 Earth's Crust 21.7 Earth's Mantle 21.8 Earth's Core	
	Class time: - Group practice: the Earth's shape - Discussion question - Review: Earth's magnetic field Estimated time: 30 minutes	Class time: - Group practice: Earth's layers - Discussion question Estimated time: 30 minutes	Class time: - Group practice: Types of Crust - Review Crust Diagram - Group practice: Convection Currents Estimated time: 30 minutes	
Unit 21 Quizlet Link	Students complete after class: Week 9, Unit 21: Individual Practice Question 1	Students complete after class: Week 9, Unit 21: Individual Practice Question 2	Students complete after class: - PLIX: What's That Crust Made Of? - Week 9, Unit 21: Self-Reflection	
Standards *Earth Science	Vocab: Lunar eclipse Hemisphere Equator Northern hemisphere Southern Hemisphere Western Hemisphere Eastern hemisphere Prime Meridian Longitude Latitude Magnetic field Compass	Vocab: Crust Core Inner core Outer core Mantle Earthquake Seismic waves Meteorites Solar system Hydrosphere Lithosphere Atmosphere Biosphere	Vocab: Asthenosphere Oceanic crust Continental crust Gabbro Kimberlite Peridotite Conduction Convection	

Week 10, Unit 32: Space	Virtual Class Part 1	Virtual Class Part 2	Virtual Class Part 3
Student Objectives • Become familiar with the basic properties of the Sun • Recognize surface features on the Sun, such as solar flares and sunspots • Examine the eight planets of our solar system, their orbits, and rotation • Look at the size and shape of planet orbits • Understand the role of gravity • Compares the characteristics of inner and outer planets	Students complete before class: 32.1 Sun 32.2 Surface Features of the Sun	Students complete before class: 32.3 Planets of the Solar System 32.4 Planet Orbits in the Solar System	Students complete before class: 32.5 Gravity in the Solar System 32.6 Inner vs. Outer Planets
	Class time: • Group practice: definitions • Review Surface Features of the Sun Graphic • Discussion Question Estimated time: 30 minutes	Class time: • Group practice: Our Solar System • Review Our Solar System Graphic Estimated time: 30 minutes	Class time: • Group practice: gravitational forces • Review gravitational forces principles • Group practice: Inner and Outer Planets Estimated time: 30 minutes
Unit 32 Quizlet Link	Students complete after class: • Week 10, Unit 32: Individual Practice Question 1	Students complete after class: • Week 10, Unit 32: Individual Practice Question 2	Students complete after class: • PLIX: Venn Diagrams: Planets and Dwarf Planets of the Solar System • Week 10, Unit 32: Self-Reflection
	Vocab: Star Solar system Orbit Sunspots Flares Solar wind Solar prominences	Vocab: Astronomical units Asteroid belt Kuiper belt Dwarf planet Orbital period	Vocab: Satellites Inner planets Outer planets Igneous rock Gas giants Elements Astronomers Nebula Planetary rings
Standards *Physical Science			