

Sixth Grade Science

Overview for Parents

Teacher: Peter Faletra

This year you will have a chance to learn what science is and how scientists go about their work. Most of what we will learn is the concepts of science and how scientists solve the puzzles of nature. Concepts have more to do with how and why rather than what something is. For example, rather than memorizing why we call a certain bird a raptor we will be more interested in how raptors came to be what they are and why they behave as they do.

Quizzes & notes 25%
Exams 25% (about 1/month)
Experimental reports 25% (about 2/month)
Lab Practicals 25% (about 2/month)
There are limited chances for extra credit

Quizzes

Expect short quizzes about once per week.

Notes (the Cornell Method):

You are required to bring your lined spiral-bound notebook to class every day. Your notes will be done in what is sometimes called the Cornell Method. You will be given detailed instructions in class on this method of taking and using notes.

Any notes taken in class will be written on the right-facing page. The same night of the day you took your notes, you should copy your notes to the opposite side of the same page (the left page). When you copy over your notes you should use books, internet, or any science expert to add information to your notes to make sure you thoroughly understand what you are copying. This method of note-taking has been shown to be a very dependable approach to remembering and understanding science (and non-science) information. Your notes will be checked periodically and along with quizzes account for 25% of your grade. **YOUR NOTEBOOK IS POSSIBLY THE MOST IMPORTANT THING IN THIS CLASS...DO NOT LOSE IT!**

Experiments & Experimental Reports:

Experimental reports will follow a standard format that will be explained to you in detail in class. The experimental report is composed of 4 main sections: 1) Introduction, 2) Materials And Methods, 3) Results, and 4) Discussion

Experimental reports account for 25% of your grade. The grade you receive has little to do with the outcome of your experiment. Many experiments yield uncertain results. Your grade will depend mostly on how you adhere to sound scientific reasoning and the format of standard scientific report. Some of the grade will derive from your skill and proper use of the lab equipment and working safely in the lab. This is probably the hardest part of science and will be your biggest challenge. It will require you to be logical, meticulous in your record keeping, and highly critical of your own work. Some portion of the experimental reports will be done at home.

We will be doing many short experiments and 1 long-term investigation. The short experiments are intended for you to understand certain scientific concepts and become accustomed to how scientists think and act in a laboratory setting. The long-term experiment is a long-term investigation made of numerous experiments of your design. The long-term investigation is intended to allow you to do authentic science. It could take up to 4 years (assuming you began in the 5th grade and continued into the 8th grade). You will work in groups of about 4 students and take some time to choose and design a long-term investigation. I hope that some of you will succeed in publishing your long-term investigation.

Exams

You will have about 1 exam per month. Some of the exam questions will be multiple choice, and some will be short explanations where you can use a variety of ways on paper to get your point across, such as words, tables and drawings. Some exams will be oral. In this case, I will read questions to the class.



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Practicals

A lab practical allows you to use your skill at doing science. Practical exams often ask you to observe something and interpret what is going on or identify something. Sometimes it will require you to actually perform a technique.

Help

If you are struggling with something and class time is not enough to solve your struggle, I am available, Monday, Tuesday and Thursday from 3:00 PM to 3:30 PM. I am also available during some study halls.

MAJOR CONCEPTS

Scientific Reasoning

Concept: Experimentation. Modern science verifies its hypotheses and theories through experimentation.

Concept: Science operates on a set of logical intellectual processes with an ordered and systematic approach.

Scientists collect data and make inferences on that data, by inductive logic. They form conclusions on groups of data by deductive reasoning.

Concept: Cause and effect...the notion of some event (or effect) being a consequence of another event (or cause). The caveat being correlation is not causation.

Concept: Complex systems evolve. Species, environments, planets, solar systems, galaxies and the universe are all evolving.

Concept: Science operates on a set of logical intellectual processes with an ordered and systematic approach. One of the first steps in science is the observation and the recording of the observations. Typically, after many observations, hypotheses and theories are formed. Experimentation is the most common approach in modern science to verify whether either an hypothesis or a theory is supported by the facts. Facts are simply those things that make statements true.

Concept: Scientific knowledge Evolves. Scientific knowledge is subject to change. Theories are views of how nature works and as we gain more knowledge of nature theories are always subject to modification. Newton's Laws of gravity and motion were considered "true" until Einstein showed that in some cases they were inaccurate.

The Physical Universe

Concept: There are only 4 fundamental forces of the universe. All manifestations of matter and energy are through these 4 forces.

Concept: Energy can only manifest itself through its interaction with matter.

Concept: The chemicals that make up living things are the same in all organisms

Concept: Chemical reactions involve the transfer or sharing of electrons. They also involve the loss or gaining of protons.

Concept: There are various parts of compounds that make them act in specific way. For example, the carboxylic acid functional group makes a compound act as a proton donor.

Concept: The universe from the perspective of science only exists of 2 things: matter and energy. The amount of energy and matter in any isolated system is constant.

Concept: Catalysts...Catalysts allow reactions to get over an initial activation energy barrier e.g., a match ignites the fire.

Concept: Organisms breakdown compounds for energy in a stepwise fashion, which allows for a controlled and branched system connected with numerous other metabolic pathways.

Concept: The laws of nature apply everywhere. The laws of physics apply to everything we do...large school systems are harder to change than small school systems...first law of motion...INERTIA.

Concept: Nature can be looked upon as made of two entities: the atomic/subatomic, and the macro-larger-than-atomic. The larger world operates under different parameters than the atomic world.

Concept: Light and sound emission obey an inverse square law

CONTENT

EXPERIMENTATION:

Design and execution of short and a long-term experiment (groups of 2-4)

Introduction to simple notions of logic and reasoning

Scientific instrumentation: Safe and proper use of scientific instruments.

Metric measurements in science

CHEMISTRY:

Elements of life

Major classes of biological molecules and compounds

Functional groups, acids and bases
Chemical and physical changes
Conservation of mass and energy
Catalysts
Chemical equations
Basic chemistry of metabolism

PHYSICS

Introduce the 4 fundamental forces of the universe: gravity, electromagnetism, the strong force, the weak force
Matter and energy (includes review of mass and density)
Energy, heat, and energy transfer
Waves and their characteristics: sign wave, standing waves, interference, etc.
Sound: speed in materials, decibels, log scale, inverse square rule
Light: speed in materials, lumens, inverse square rule

ASTRONOMY

The scale, age, evolution and general structure of the universe
Application of laws of motion to planetary systems
Formation of the solar system
Structure of galaxies

EARTH SCIENCE

Earth as a living planet: Major ecosystems and the effects of elemental cycles...oxygen, nitrogen, carbon limiting factors, etc.
Earth's evolution
Plate tectonics and mountain building
Geological structures
Weathering
Greenhouse effect
Sustainable practices of agriculture and technology

HOW HUMANS AFFECT OUR PLANET

As a Geological force: the impact of humans on the planet can easily be seen from outer space to show how we are now a major geological force
As an Evolutionary force: from plant and animal husbandry, anthropogenic extinction to genetic engineering, humans are a major evolutionary diver

SCIENCE BIOGRAPHIES

Henrietta Leavitt
Georges Lemaitre
John Dalton
Leonardo DaVinci
Edwin Hubble
Annie Jump Cannon
Marie Curie
Isaac Newton
Linus Pauling
Emmanuel Kant
Alfred Wegener

BENCHMARKS

Students will be able to:

- understand and apply basic logical notions of induction and deduction
- design simple experiments and recognize proper experimental design
- observe with care and "see" what escapes the casual observer
- record observations in an orderly manner and represent them in simple graphs
- detail the elements common to all life and in what molecules they are found
- recognize the structure of the major 4 classes of biological molecules
- recognize the differences between a chemical change and a physical change
- predict how elements will behave based on the periodic chart
- explain how acids and bases react and how to determine the pH of a solution

- express and recognize when conservation of matter and energy come into play
- identify and explain how catalysts function
- express simple chemical formulas and reactions in standard form
- express and recognize the basic operations of metabolism
- recognize and demonstrate the relationships among the 4 fundamental forces and what they govern
- express what radioactivity is and what happens in decay
- recognize and describe when and how matter and energy interact
- identify the properties of waves and their behavior
- recognize and express the behavior of sound in different media
- solve simple problems involving sound transmission
- recognize and express the behavior of light in different media
- solve simple problems involving light transmission
- recognize and describe the major celestial bodies
- express the relative size and scale of things in our universe
- illustrate the details of the elemental cycles on Earth
- illustrate how some of the major complexities of Earth's systems interact to regulate the planet's environment and evolution
- provide evidence for humans acting to improve and harm their environment
- model and/or recreate some of the landmark experiments in science

Contacting the Teacher

E-mail: peter.faletra@crossroadsacademy.org or

Call Crossroads Academy: (603) 795-3111 ext. 113 until 4:00 pm or leave a voice mail.