Seventh 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 use deductive and inductive reasoning to come to sound logical conclusions. Concepts have more to do with how and why rather than what something is. Rather than simply learning the names of the parts of a plant or animal and what those parts do, we will investigate why the given parts of a plant or animal have the shapes they have and why those shapes determine their functions.

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

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 take your notes, you should copy your notes to the opposite side of the same page (the left-facing page). When you copy over your notes you should use books, internet, or any reliable science resource 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.

CROSSROADS ACADEMY
SCIENTIA VIRTUSQUE

95 Dartmouth College Highway, Lyme, NH 03768
www.crossroadsacademy.org • 603.795.3111

MAJOR CONCEPTS

Scientific Reasoning

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. Broad theories are accepted after much verification from different perspectives.*

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 observation and 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 operates. As we gain more knowledge of nature, theories are often modified. Darwin's theory of evolution, Newton's laws of motion and Bohr's model of the atom have all undergone modifications as new information was discovered.*

Concept: The parallelogram law and synergy. If two forces act in the same direction, the resultant is the additive of them. When operating in opposite directions they subtract. *This is how vectors work. This general notion applies in some respects to a wide variety of events. In some circumstance, two causes when given simultaneously will produce not an additive a much higher than expected effect. This synergy is often found in life systems such as in the hormonal systems of animals and plants where the combined effect of two hormones is orders of magnitude over the two added separately.*

The Physical Universe

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.*

Life in the Universe

Concept: All life on Earth (and probably the universe) shares basic characteristics. *All life on earth contain DNA and all DNA has the same 4 base nucleotides. All organisms on Earth contain hydrogen, carbon, oxygen, nitrogen and phosphorus.*

Concept: Defining "life" is difficult. *A combination of the ability to metabolize, evolve, and co-evolve deeply depend on other life forms; the need for a constant input of energy.*

CONTENT

EXPERIMENTATION
Inductive and deductive reasoning
Design and execution of some short and a single long-term experiment (groups of 2-4)
Listening to the reading of scientific papers and helping in the deciphering of their meanings
Writing a scientific research report based on original research
Scientific instrumentation: safe and proper use of scientific instruments
Metric measurements in science

PALEONTOLOGY/GEOLOGY
Geologic time
How and why Life Forms evolved through geological time with the changing Earth
Types of fossils and how they form
K-T extinction
Planetary life cycle
Gaia hypothesis
Milankovitch Cycle
Glacial cycles, glaciation, glaciers

EVOLUTION
Origin of life
Requirements of life
Natural selection
Extinction and speciation
Nature vs. nurture
Animals and animal reproduction
Plants and plant reproduction

CHEMISTRY AND CELL BIOLOGY
Chemistry of life systems
Cell cycle (somatic and germ), cell division, cell differentiation
Heredity, Mendelian Genetics
Central Dogma
DNA→ RNA→ Protein
Molecular biology
Photosynthesis and energy transfer in life systems
GENERAL LIFE SCIENCE
Animal biology:
- **Basic embryonic tissues: endoderm, mesoderm, ectoderm)**
- **Mammalian development from embryonic tissues into adult tissues**

Animal and plant metabolism
- **Bone and muscle growth and function**
- **Endocrine system**
- **Immune system**
- **Diseases and world health**

SCIENCE BIOGRAPHIES
Emmanuel Kant
Barbara McClintock
Charles Darwin (scientist known for theory of natural selection)
Lise Meitner (physicist who helped discover nuclear fission)
Dmitri Mendeleev (scientist who devised the periodic table)
Martha Chase
Rosalind Franklin
Calvin
Rachael Carson
Frank Asaro
Luis Alvarez
Zea maize

BENCHMARKS

Students will be able to:

- recognize specific inductive fallacies, such as 'ad hominem' and 'appeal to the audience'
- illustrate and recognize sound deductive reasoning
- read and write scientific papers
- exhibit safe and proper use of basic scientific instruments and measuring systems
- verbally present a clear and logical argument
- recognize poor experimental design and be able to correct it
- describe and/or illustrate the general Geological Time Scale
- describe some of the major events in the evolution of the planet
- identify different fossils and describe how they formed
- describe the major elements of the Gaia hypothesis and Milankovitch cycle
- identify different glacial formations
- describe the major aspects of Darwinian evolution: natural selection, the roles mutations play, genetic drift, bottle neck effect, speciation, etc.
- describe the debate of nature vs. nurture
- list the major elements of life, including what molecules include them
- match the form of given bio-molecules with their functions
- draw and describe the cell cycle
- differentiate between multiplication and differentiation
- construct pedigree diagrams and Punnett squares
- explain the need for apoptosis
- describe the central dogma
- draw and detail the processes of replication, transcription, and translation
- explain how chloroplasts capture photons of a given range of wavelengths and converts them into sugars
- identify the three basic embryonic tissues in early vertebrates
- identify basic adult tissues of mammals
- diagram basic metabolic pathways and explain possibly why they evolved as they did
- identify the forms and functions of the skeletal system, endocrine system and immune system of humans
- describe some of the major infectious diseases of humans and their impacts

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.