

FAME Public Charter School A-G Course Template

Course Title: a-g Biology w/ Lab

Brief Course Description - Briefly (in a short paragraph) describe the course focusing on content. This should look like something you would see in a course catalog. Type the information in the text box below. All text boxes will expand as needed.

This course centers on the study of living things. Through investigation and activities, students gain firsthand experience with such learning skills and processes as observing, classifying, identifying, measuring, inferring, hypothesizing, interpreting, and predicting. Students will develop an understanding of the diversity of life and the interdependence of all organisms. Students will complete biology labs relevant to the topics studied and complete lab reports. The labs are designed to promote technical lab competence, utilize the scientific process of research and reporting, and teach and reinforce scientific concepts. Students will also complete a semester term paper on a chosen topic.

Textbooks

Include list of Primary and Secondary Texts. Make sure to note the books that will be read entirely and those that will be as excerpts. Textbook information is not necessary if your course is a Visual and Performing Arts course. Online texts or non-standard text materials should include a link to the online text.

Primary Textbooks

Title: Holt Biology

ISBN: 0030672147

Edition:

Publication Date: 2008

Publisher: Holt, Reinhardt, Winston

Author(s): George B. Johnson, Peter H. Raven

URL Resource(s):

or

Title: Biology: The Dynamics of Life (California Edition)

ISBN:0078665809

Edition:

Publication Date: 2005

Publisher: Glencoe

Author(s): Alton Biggs, Dinah Zike, Peter Rillero, et al

URL Resource(s):

Supplemental Instructional Materials - Please describe. If using online text or non-standard material, please provide the title of the material or webpage and the URL link.

eScience Biology Lab Kit #3

eScience Biology Lab Manual (comes on CD Rom with the kit)

See URL: www.esciencelabs.com for ordering information

Holt Biology Teacher's Edition ISBN: 0030481287

Biology: Dynamics of Life (Ca Edition) Teacher's Edition ISBN: 0078665817

Course Objectives – what the students will know at the end of the course

The course objectives include mastery of and lab work featuring the following topics:

*Cell Biology

- *Genetics
- *Ecology
- *Evolution
- *Physiology
- *Investigation and Experimentation

Course Goals and Major Student Outcomes – what the students will be able to do at the end of the course

Students will work towards mastering the California State Biology/Life Science Content Standards. Student understanding of the standards will be measured by teachers, working collaboratively, to consider a multifaceted view of what constitutes a mature understanding of concepts. Upon completion of this course students will understand that:

1. The fundamental processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells.
2. Mutation and sexual reproduction lead to genetic variation in a population.
3. A multicellular organism develops from a singly zygote, and its phenotype depends on its genotype, which is established at fertilization.
4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of acids in proteins characteristic of that organism.
5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.
6. Stability in an ecosystem is a balance between competing effects.
7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time.
8. Evolution is the result of genetic changes that occur in constantly changing environments.
9. As a result of the coordinated structures and functions of organ systems, the internal environment of the organism remains relatively stable despite changes in the outside environment.
10. Organisms have a variety of mechanisms to combat disease.
11. Scientific progress is made by asking meaningful questions and conducting careful investigations.

Course Outline by Units of Study – the content you will cover arranged in units

- I. The Study of Life
 - A. The Science of Biology
 1. Biology today
 2. Science and the Search for Knowledge
 3. Studying Biology
 - B. Discovering Life
 1. What is Life?
 2. Basic chemistry
 3. Molecules of Life

C. Cells

1. Cell Boundaries
 2. Membrane Structure
 3. Inside the Cell
 4. Eukaryotes and Prokaryotes
 5. Homeostasis
- ## D. The Living Cell
1. Cell communication
 2. Movement of substances in and out of cells
- ## E. Energy and Life
1. Cells and Chemistry
 2. Cells and Energy
 3. Photosynthesis
 4. Cellular Respiration

II. Continuity of Life

A. Cell Reproduction

1. Chromosomes
2. Mitosis and Cell Division
3. Meiosis

B. Genetics and Inheritance

1. Gregor Mendel
2. Patterns of Inheritance
3. Human Genetic Disorders

C. How Genes Work

1. DNA
2. Proteins
3. Gene Expression

D. Gene Technology

1. Revolutions in Genetics
2. Transforming Agriculture
3. Advances in Medicine

E. Evolution and Natural Selection

1. Charles Darwin
2. Evidence for Evolution
3. Natural Selection
4. Origins of Life
5. Early Life in the Sea
6. Transition to Land
7. Early vertebrates
8. Primates
9. The First Humans
10. Evolution of Behavior

III. The Environment

A. Ecosystems

1. Definition of an ecosystem
2. Kinds and cycles of ecosystems
- B. Change within an Ecosystem
- C. Identifying and Solving Environmental Problems

IV. Diversity of Life

- A. Classifying Living Things
 1. Organizing Life
 2. Six Kingdoms
- B. Bacteria and Viruses
- C. Protists
 1. Definition and Diversity of Protists
 2. Diseases Causes by Protists
- D. Fungi and Plants
- E. Plant Form and Function
 1. The Plant Body
 2. How Plants Function
 3. Reproduction in Flowering Plants
 4. Uses of Plants
 5. Growing Plants

V. The Animal Kingdom

- A. Adaptation to Land
- B. Animal Diversity
- C. Arthropods
- D. Fishes and Amphibians
- E. Reptiles, Birds, and Mammals

VI. Human Life

- A. Skin
- B. Bones
- C. Muscles
- D. The Nervous System
- E. The Sense Organs
- F. The Circulatory System
- G. The Respiratory System
- H. The Immune System
- I. Digestion and Excretion
- J. Reproduction and Development

Laboratory Activities

Lab 1: The scientific method
Testable Observations
Hypothesis and Null Hypothesis
Experimental Approach

Variables
Control
Data Collection
Analysis
Lab 2: Writing a lab report
What is a lab report
Parts of a lab report How to write a lab report
Lab 3: Data measurement
The Metric System
Gram
Liter
Meter
Conversion Between the US and Metric Systems
Proper Technique for Measurements
Lab 4: Introduction to the Microscope
Types of Microscopes
Compound Light Microscopes
Parts of a microscope
How to use a Microscope
Preparing a wet mount slide
Depth of Field
Biological Processes:
Lab 5: Diffusion
Diffusion
Rate of diffusion
Direction of diffusion
Concentration gradient
Membrane permeability
Dialysis
Lab 6: Osmosis
Osmosis
Tonicity
Hypertonic
Hypotonic
Isotonic
Osmotic pressure
Lab 7: Respiration
Cellular energy
Respiration
Anaerobic respiration does not require oxygen
Aerobic respiration requires oxygen
Lab 8: Enzymes
Enzymes
Selectivity
“Lock and Key”
Catalysts

Activation Energy
Activation site
Reaction rates
Activators, Inhibitors
The Cell:
Lab 9: Cell structure and function
What is a Cell
Prokaryotes vs. Eukaryotes
Cell Structure
Function of Cellular Structures
Lab 10: Mitosis
Chromosomes
Cell Cycle
Mitosis
Interphase
Metaphase
Anaphase
Telophase
Cytokinesis
Lab 11: Meiosis
Meiosis
Diploid and haploid cells
Chromosomal crossover
Lab 12: DNA and RNA
Structure of DNA
Nucleotides
Amino Acids
Proteins
Genetic Code
Mutation
RNA
Transcription to RNA
Translation to a protein
Lab 13: Mendelian genetics
Gregor Mendel
Law of segregation
Homozygous/Heterozygous
Independent Assortment
Dominant vs. Recessive
Incomplete Dominance vs. Co-Dominance
Genotype vs. Phenotype
Monohybrid and Dihybrid Crosses
Punnett Square
Lab 14: Population genetics
Gene Pool
Gene Frequency

Genetic Variation

Genetic Drift

Founder Effect

Mutation

Natural Selection

Kingdoms of Life:

Lab 15: Taxonomy

Taxonomy

Linnaean System

Binomial nomenclature

Taxonomic vs. phylogenetic classifications

Lab 16: Bacteria and Archaea

Characteristics of Prokaryotes

Heterotrophic, Autotrophic, Chemoautotrophic

Cocci, Bacilli, Spirillia

Plasmid

Bacteriophage

Lab 17: Protista

Complexity and Diversity

Autotrophes, Heterotrophes, Mixotrophes

Unicellular/Multicellular, plasmodial

Filamentous and colony associations

Pseudopodia, Cilia and Flagella

Obtain energy by photosynthesis or engulfment of nutrients (Phagocytic)

Lab 18: Fungi

4 Phylums

Decomposers

Saprophytes

Hyphae, Mycelium

Reproduction

Spores

Dikaryon

Commercial Uses

Lab 19: Photosynthesis

Photosynthesis

Light dependent and light independent reactions

Chloroplasts

Thylakoid

Grana

Lamella

Stroma

Calvin Cycle

Lab 20: Circulation

Vascular vs. non-vascular plants

Xylem

Phloem

Transpiration
Stomata
Circulation
Lab 21: Reproduction
Alternation of generations
Unisexual vs. bisexual plants
Non-seed vs. seed forming plants
Double fertilization
Lab 22: Invertebrates and vertebrates
Characteristics of animals
Heterotrophes
Symmetry
Radial
Bilateral
Asymmetry
Invertebrates
Vertebrates
Endoskeleton
Types and characteristics of invertebrates
Porifera
Cnidaria
Platyhelminthes
Annelida
Arthropoda
Mollusca
Echinodermata
Types and characteristics of vertebrates
Chordata
Lab 23: Structure
Tissue
Epithelial tissue
Connective tissue
Muscle tissue
Nerve tissue
Organs
Organ systems
Integumentary system
Epidermis
Dermis
Subcutaneous
Skeletal system and functions
Hydrostatic Skeleton
Exoskeleton
Endoskeleton
Muscular system
Skeletal muscles

Smooth Muscle
Cardiac Muscle
Isotonic contractions
Isometric contractions
Lab 24: Circulatory and respiratory systems
Circulatory system
Pulmonary
Systemic
Heart
Right atrium
Right Ventricle
Left atrium
Left Ventricle
Blood
Red blood cells
White blood cells
Plasma
Respiration
Alveoli
Respiratory system
Lab 25: Nervous and sensory systems
Nervous system
Sensory system
Neurons
Glial cells
Dendrites
Axons
Synapse
Central nervous system
Peripheral nervous system
Somatic nervous system
Autonomic nervous system
Lab 26: Ecology of Organisms
Ecology of organisms
Range of tolerance
Lab 27: Ecological Interaction
Habitat
Trophic levels

Key Assignments

In addition to chapter readings, assignments, quizzes, and tests, students will complete the following:

1. A total of 27 labs must be completed. The labs indicated above with an (*) will be completed by all students. The remaining may be selected based on interest and teacher assignment. All questions that are presented in the laboratory manuals must be completed and a thorough write up of each of the 27 labs must be submitted and retained

in the student's portfolio.

2. Research Projects: Students will complete one research project each semester on a biology topic of choice related to their units of study. The instructor must approve the topic in advance. Each report must have a least three resources.

Instructional Methods and Strategies

Students will be expected to develop and present work samples described under the key assignments section as well as those required in the textbook/curriculum used. Students will work independently through the text as a primary resource. In order to support this process teachers will provide each student:

- *Opportunities to discuss and define complex issues orally or via email
- *Modeling of activities and expected outcomes
- *A variety of print and non-print resources
- *Modeling of study strategies appropriate for different learning styles
- *Discussions around points of view
- *Opportunities to summarize, analyze, compare/contrast, describe, classify, and persuade
- *Opportunities for practice in preparation for presentations

Assessment Methods and Strategies

A variety of assessment tools will be used. Written work, as described above, will be corrected in collaboration between the student, teacher, and parent. Assessment tools include but are not limited to:

- *Standardized tests, including STAR
- *Criterion based tests
- *Portfolio assessments
- *Student Journals
- *Teacher observation
- *Performance assessments using cameras and recorders
- *Student self-evaluation
- *Surveys and questionnaires
- *Written work, quizzes, and final exams must be completed at 75% accuracy rate to receive credit