

## **Biology I (General) Lab / Activity Syllabus**

### **Introduction to Biology:**

#### “Carbon Creation” Demo

- Purpose is to provide a visual of how carbon bonds to oxygen and hydrogen using sugar and sulfuric acid.

#### “Thermite Reaction” Demo

- Purpose is to show what an exothermic (oxidation-reduction) reaction involves and yields using rusty ball bearings and foil.

#### “Identifying Organic Molecules” Lab

- Purpose is to isolate and test for major types of organic molecules (fats, proteins, and sugars) using indicators.

#### “Using a Compound Light Microscope” Lab

- Purpose is to provide information about the functions and purpose of a microscope.

#### “Sewer Lice” Demo

- Purpose is to gain insight to the importance of good research and a develop proper observational skills.

#### “Great Escape” Activity

- Purpose of this exercise is to demonstrate the importance of following the scientific method.

#### “Find My Chip” Activity

- Purpose of this is to review what is required in the result section of the scientific method using a few tools / observations and a cookie.

#### “Chinese Whispering (aka Telephone Game) Simulation” Activity

- Purpose of this activity is to introduce the process of evolution using words/phrases that change or mutate from one person to another (generations).

#### “Evolutionary Phylogenetic Cladograms and Trees” Activity

- Purpose of this assignment is to illustrate how species are related via common ancestry and how characteristics help to determine relationships.

#### “Darwin’s Finches” Lab

- Purpose is to use various tools to simulate different finch beaks and test their beaks on various “islands” containing different kinds of seeds and competition.

### **Ecology:**

#### “Food Chain and Food Web” Activity

- Purpose is to construct and utilize a food chain and food web using materials which include abiotic and biotic examples. Demonstrations on the effect of natural and unnatural disasters are mentioned.

#### “Fungi” Lab

- Purpose is to highlight a major contributor in the food web and in some biogeochemical cycles.

#### “Apple Demo” Activity

- Purpose is to use an apple to represent the Earth and cut away sections to represent resources and populations.

#### “Eco-Column” Lab

- Purpose is for the student to create 2-3 ecosystems and demonstrate how they all work together.

### **Cytology:**

#### “Cell Membrane” Lab

- Purpose is to use bubbles and bubble solutions to simulate cell membranes, fluid mosaic model, channel proteins, etc...

#### “Zinger Bacteria Model” Activity

- Purpose is to review over the main structures of a prokaryotic cell during or after lecture.

#### “Plant vs Animal Cell” Lab

- Purpose of this lab is to prepare, observe and/or record characteristics of different types of cells such as cork, onion, human epithelial, elodea, apple peel, and/or blood cells; also, including protozoa.

#### “Shrink-a-Dink Cells” Activity

- Purpose is to review the organelles and structures found in an animal and/or plant cell.

#### “Hypotonic and Hypertonic Solution” Lab

- Purpose is to observe osmosis across the membranes of a potato; thus, demonstrating various states of solutions.

#### “The Phagocytosis and Pinocytosis: Peanut Problem” Activity

- Purpose of this activity is to allow the student to think about how cells ingest food by means of “bulk transport” by simulating the process using a peanut, string, and a clear plastic bag.

### **Cell Division and Reproduction:**

#### “Basic DNA and Human Chromosome Model” Activities

- Purpose is to introduce the “basic” anatomy of a DNA molecule by using eatable components that represent sugar-phosphate backbones and nitrogenous basis so students understand what DNA looks like during the Interphase stage of the cell cycle. In conjunction, a life-size human model of an X chromosome will be demonstrated to represent the anatomy of what DNA looks like during Mitosis and Meiosis.

#### “Mitosis” Lab

- Purpose of this lab is to observe and identify various stages of mitosis: prophase, metaphase, anaphase, and telophase. The cells that will be used come from a plant root tip and an animal blastula. Along with studying the phases of mitosis, interphase and cytokinesis will also be reviewed.

#### “10-Page Cancer Spread” Project (TBA)

- Purpose is to have students review and research information discussed in class about the different aspects of cancer including: carcinoma, lymphoma, sarcoma, leukemia, carcinogens, treatment/support, benign and malignant tumors, and cancer in general by making a page of each topic based on a theme and putting them all together.

#### “Modeling Meiosis” Lab

- Purpose is to use common food products and crafts to demonstrate the stages of meiosis I and II. Genetic recombination, karyokinesis, and cytokinesis will also be utilized.

#### “Glitter, the STD of Crafts” Activity

- Using glitter to represent pathogens that can cause STD, students will be asked to begin shaking hands with 2-3 volunteer students in order to demonstrate how STD's can be spread.

### Genetics:

#### “DNA Model and an Introduction to Protein Synthesis” Lab

- Purpose is to create a fairly detailed model of DNA, use the model to understand the structures of the DNA, explain the location/functions of genes, and investigate the basic principles of protein synthesis.

#### “Protein Synthesis” Activity

- Using stencils to mimic genes and the classroom to represent a cell, students are introduced to the general principal of protein synthesis and the steps of transcription and translation.

#### “DNA Extraction from Chicken Liver Cells” Lab

- Purpose of this lab is to extract DNA from chicken liver cells and isolating the DNA in solution for observation; additionally, to reemphasize DNA is found in all organisms.

#### “Brainstorming about Genetics”

- Purpose is to have students discuss and become inspired about genetics by using illustrations (ie unrelated family photo) to introduce terms and genetic related concepts.

#### “Sock Genetics” Demo

- Purpose is to use socks as “paired genes”, along with a Punnett's square constructed from wood/hooks and a whiteboard, to introduce monohybrid crosses and allow the student to develop an awareness of phenotypic and genotypic patterns and fractions/percentages/ratios. Gray socks can be utilized to represent incomplete dominance and black/white socks can be utilized to represent codominance.

#### “Making “Cents” Out of Punnett's Squares”

- The purpose is to use coins and to have students that are class led to follow an activity that demonstrates the meaning of various terms such as genes, genotype, phenotype, dominant and recessive. The activity is also used to review the mechanics of creating monohybrid Punnett's Squares.

#### “Modeling Monohybrid and Dihybrid Crosses and the Law of Probability” Lab and PTC Frequency Demo

- Purpose is to predict the genotypic and phenotypic ratios of offspring resulting from the random paring of gametes and to calculate and graph the genotypic ratio and/or phenotypic ratio among the offspring of a monohybrid and dihybrid cross. Colored shells, beans, and blind folds are used to simulate the various crosses. Note: Sub-activity, PTC Frequency, utilizing the *Hardy-Weinberg* law, may be demonstrated.

#### “Human Karyotype” Activity

- Purpose is to arrange “drawn” chromosomes in declining order of size based on height and gene band patterns in order to determine a patient's gender. A real karyotype will be presented for comparison.

#### “Practice Pedigree” Activity

- Purpose is to become aware of how a pedigree is created and used for clinical and evolutionary studies. Such examples as Huntington's disease and Cystic fibrosis are addressed. A fun side activity will include creating a pedigree from the song, “*I'm my own grandpa*”.

#### “Polygenetic Inheritance” Demo

- Purpose is to line class by height and create a bell curve to demonstrate the fact that polygenetic traits create such graphs.

#### “Hardy-Weinberg Equilibrium” Activity

- Purpose is to make student aware of using an expanded binomial  $(a+b)^n$  to find gene frequencies for a particular trait such as Widow's peak vs straight hairline phenotypes.

### General Anatomy and Physiology:

#### “Mammalian Dissection” Lab (*Note: Alternative Assignment Available*)

- Purpose is to provide laboratory investigations into anatomy and physiology of mammals. The lab will include a dissection of either *Rattus norvegicus* (Norway Rat). External features, muscular systems, throat and oral cavity, abdominal cavity and digestive system, circulatory system, respiratory system, urinary structures, female/male genital structures, and the central nervous system are covered. Throughout the lab comparative anatomy that correlates with mammalian evolution will be made evident.

## Biology II (Anatomy and Physiology) Lab / Activity Syllabus

### Histology:

#### “Anatomical Tissue” Lab(s)

- Purpose is to observe various types of tissues found in the human body including: human connective, muscle, nerve, epithelial, and blood tissue. Also, each tissue section of the lab will include an activity; such as, model building or tissue naming exercises. At some degree, comparative histology with other animals is mentioned to link evolutionary characteristics.

#### “Web Quest: “*Tissue Trek*” Activity

- Purpose is to create a portfolio and video showing crew members encountering five main tissues: connective, bone, muscle, nerve, and epithelial inside of a human body. An outline, description, requirements and research is accessed online via a “web-quest” website. This activity is assigned after the tissues have been discussed.

### Digestive System:

#### “Finding Your Threshold of Taste” Lab

- Purpose of this experiment is to determine the lowest concentration of a substance dissolved in water which can still be tasted; the substances include sugar, salt, and vinegar.

#### “Digestive System Dissection of the Fetal Pig” Lab

- Purpose of the dissection is to expose various tissues for study. The tissues are related to the organs of the digestive system including the oral cavity, esophagus, stomach, small intestine, large intestine, rectum, liver, and pancreases. Throughout the lab comparative anatomy that correlates with human evolution will be made evident.

### Circulatory System:

#### “Observing Circulation” Demo

- Purpose of this investigation is to observe how blood flows in a vertebrate (goldfish). The observer will be able to view blood cells traveling to and from the heart as well as the vessels in which they travel.

#### “Circulatory System Dissection of a Pig Heart” Lab

- Purpose of the dissection is to expose heart tissues for study. Various vessels and chambers of the heart will be observed. Throughout the lab comparative anatomy that correlates with human evolution will be made evident.

#### “Contraction of the Heart” Activity

- Purpose of this lab is to measure pulse rate, blood pressure, and interpret an EKG reading from human test subjects. Target heart rate may also supplement this investigation.

#### “Making Blood” Activity

- Purpose is to model and simulate blood and its components.

#### “Human Blood” Lab

- Purpose of this lab is to observe and record characteristics of different type of human blood cells. Procedures involving preparation and study will be used to identify various cells and/or their components.

### Respiratory System:

#### “Modeling the Breathing Action” Lab

- Purpose is to better understand how breathing works by constructing a working lung model.

#### “Holding Your Breath” Lab

- Purpose of this lab is test whether changes in the levels of oxygen and carbon dioxide in your blood provide the signal to stop holding your breath.

#### “Room to Breathe” Lab

- Purpose is to calculate the amount of air volume in a room and the rate in which those students in the room breath to find out if there is enough air to breath and/or for how long.

### Urinary System:

#### “Catalase: Oxygen and Water Production by Enzymes in Liver (and/or Kidneys)” Lab

- Purpose is to witness the effects of catalase in various temperature and pH environments

#### “Urinary System Dissection of a Sheep Kidney” Lab

- Purpose of the dissection is to expose kidney tissues for study. Various structures and sections of the kidney will be observed. Throughout the lab comparative anatomy that correlates with human evolution will be made evident.

#### “Nephron Model” Lab

- Purpose of this activity is to research and construct a 3-D model of a human nephron using materials from home. A brief oral explanation of the how the nephron works will also be expected.

## **Reproductive System:**

### “Male and Female Gametes” Lab

- Purpose of the microscopic investigation is to outline the structures of the human ovary and anatomy of human sperm cells (gametes). An online search for various topics relating to human reproduction may also be implemented.

## **Nervous System / Senses:**

### “Presentation and Lesson” Activity

- Purpose of this assignment is to present a knowledgeable explanation of the five senses and how they interact with the nervous system (spine and brain).

### “Thinking Cap” Activity

- Students create a simple paper hat that illustrates the different parts of the brain and what those parts do.

### “Nervous System Dissection of a Sheep Brain” Lab

- Purpose of the dissection is to expose brain tissues for study. Various sections and lobes will be observed. Throughout the lab comparative anatomy that correlates with human evolution will be made evident.

## **“Primary Anatomy and Physiology Mammalian Dissection”**

### “Making Anatomical Terminology a...Peeling” Activity

- Purpose is to learn/review biological and anatomical terminology by using and dissecting a banana as a subject of study.

### “*Felis domestica*: Cat Dissection” Lab

- Purpose of this lab is to summarize and investigate the various tissues and systems of a mammal (*Felis domestica*: Cat) that have been discussed throughout the course. External structures, ventral muscles, dorsal muscles, thoracic and anterior systems and veins/arteries, abdominal and posterior systems and veins/arteries, urogenital systems, and related structures will be addressed. Throughout the lab comparative anatomy that correlates with mammalian evolution will be made evident

**Other(s):** (Maybe in conjunction with any of the activities/labs/projects previously mentioned)

### “If My “Organ” Was a Person” Activity

- Purpose is to have students review organs/tissues by mimicking an anatomical structure as a short video.

### “Anatomical Collage: “Biobot” Activity”

- Purpose of this activity is to create a “Biobot” (Anatomical “Collage”) that best resembles the structures and the functions of the organs and systems found in the human body. This activity is assigned after the cat dissection is complete.

## Advanced Biology II: Dual Credit (General) Lab / Activity Syllabus

### Biological Molecules:

“Preparation of Soap and the Study of Biological Fats” Lab

- Purpose is to make a small batch of soap, test the soap’s properties, and relate the soap to biological characteristics.

“Marshmallow Molecular Models” Lab

- Purpose is to use marshmallows to create 3-D structures of hydrocarbons, alcohols, and lipids; carbohydrates and proteins. and may also be included

“Introduction to “Entomophagy” Lab

- Purpose is to investigate, cook, and consume, insects as a good source of protein with little fats and carbohydrates.

“G Protein Coupler Receptor” Participation Lab

- Purpose is to demonstrate how G proteins can influence intracellular messaging with the use of ligands by using Miraculin (sour to sweet stimulator) and Gymnemic acid (sweet reducer); evolutionary advantages or disadvantages will be discussed.

“Organic Breakfast” Lab

- Purpose is to find and test various types of organic molecules including proteins, lipids, and carbohydrates in common food products.

### Cellular Metabolism, Fermentation and Respiration:

“Ghoulish Glycolysis” Project

- Purpose is to review the process of Glycolysis by creating a “music video” to describe the steps of this anaerobic process.

“Fermentation” Lab

- Purpose of this lab is to determine if cultured yogurt can be made by fermentation or if root beer can be made by fermentation; pros and cons of cells using fermentation throughout life’s history discussed.

“Breathless about Cellular Respiration: Krebs Cycle” Lab

- Purpose is to study how exercise affects the disposal of waste (CO<sub>2</sub>) from cellular respiration.

### Photosynthesis:

“Chloroplast in Guard Cells” Mini-Lab

- Purpose is to simply identify the chloroplast organelles, where photosynthesis takes place, and the guard cells that help regulate the materials necessary for photosynthesis.

“Exciting Electron’s that have No-where to Go” Activity

- Purpose is to demonstrate “florescence” when photons of light excite electrons to a higher energy level and not be received by an electron acceptor molecule such as NADP+.

“Plant Pigments for Photosynthesis” Lab

- Purpose is to have pigments extracted from various leaves and then see if the solvent in which the pigments are exposed to will separate those various pigments (i.e. carotenes, xanthophylls, chlorophylls a and b; “paper chromatography” activity.

“Light Dependent Reaction of Photosynthesis” Lab

- Purpose of this investigation is to observe the rate of photosynthesis by infusing carbon dioxide into plant leaves and then exposing the leaf “discs” to light as well as without light. What impact does photosynthesis have on the life changes throughout time?

“Catalase: Oxygen and Water Production by Enzymes in Plants” Lab

- Purpose is to witness the effects of catalase in various temperature and pH environments and define photorespiration.

“Light Independent Reaction of Photosynthesis” Lab

- Purpose is to extract and indicate starch from sugar producing leaves.

### DNA, RNA, and Protein Synthesis:

“DNA Origami” Activity

- Purpose is to create and model a DNA from paper.

“Extracting DNA from Human Cells” Lab

- Purpose of this lab is to extract DNA from human cheek cells and isolating the DNA in solution for observation; additionally, to reemphasize DNA is found in all organisms.

“Modeling a 5+ Meter DNA” (*Optional Extra Credit*)

- Purpose is to create a representation of a DNA molecule in order to review of the DNA anatomy and function.

“Modeling Replication” Activity

- Purpose is to use common household paper products to simulate DNA replication.

“Modeling Transcription” Lab

- Purpose is to not only simulate the production of pre-mRNA but also the end result of the process that being mRNA.

“Modeling Protein Synthesis” Lab

- Purpose is to create an mRNA from a DNA sense strand (via transcription) in order to make a protein (via translation) using crafts.

### “DNA, RNA, and Protein Synthesis Activity and Computer Simulations Online” Activity

- Purpose of this activity is to illustrate how the order of nucleotides in DNA determines the order of amino acids in proteins. It is used to reinforce the concept that any change in the order of nucleotides can change the order of amino acids in proteins; “internet-based activity”.

### **Genetic Expressions:**

#### “The Biology Project Online” Activity

- Purpose is to conduct activities online that address such topics as Mendelian genetics, karyotyping, sex-linked inheritance.

#### “B.L.A.S.T. Online” Activity

- Purpose is to use the website from the National Center for Biotechnology Information (NCBI); [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov), to identify a sequence of bases from a DNA sample. Sequence numbers, official names, gene loci, and phenotypic descriptions and evolutionary correlations are addressed.

#### “Human Karyotype Paper and/or Online” Activity

- Purpose is to arrange chromosomes in declining order of size based on height and gene band patterns in order to determine a patient’s gender and disorder such as Klinefelter’s or Turner’s syndrome.

#### “Pedigree” Activity

- Purpose is to become aware of how a pedigree is created and used for clinical and evolutionary studies. Such examples as Congenital Ptosis, Tay-Sachs, Hypercholesterolemia, and Muscular Dystrophy are addressed.

#### “Stickleback Gene” Activity

- Purpose of the activity is to demonstrate how gene switches (and those that are mutated (i.e. pelvic gene)) are used to turn on genes for various phenotypic characteristics between fresh and salt water stickleback fish for evolutionary benefits (i.e. pelvis, jaw, nose).

#### “RNAi” Activity

- Purpose is to use two analogies in the activity to illustrate how RNAi’s used to “interfere” with specific gene expression and protein production.

#### “Patterns and Gene Expression Presentation using Presentation Software (TBA)

- Purpose is to create a presentation of ideas, diagrams, definitions, information, and/or examples based on genetic expression such as gender linkage, non-disjunction of chromosomes, gene mutations, human genome project, gender determinations, epigenetics, and RNAi.

### **Plant and Animal Diversities:**

#### “Presentation and Lesson” Activity

- Purpose of this assignment is to present a knowledgeable explanation of one of the five main biomes and how plants and animals interact with each other in nature as a teaching assignment to be presented to middle school science students.

#### “Anatomical and Physiological Diversities” Lab

- Purpose is to observe plant (dicot) and animal (chicken) embryos in order to demonstrate diversity among organisms.

#### “Plant and Animal Microhabitat and Ecosystem” Lab (TBA)

- Purpose is to research and create an APA style lab that studies single and multi-cellular plants and animals in their environment.

### **Evolution:**

#### “Presentation and Lesson” Using EVO Activity

- Purpose of this assignment is to present a knowledgeable explanation of evolution. Various lessons and videos will accompany this activity including Hominid skull models.

#### “The Amazing Human Race” Activity

- Purpose of this assignment is to provide students the opportunity to examine models of Hominids from millions of years of evolution by making comparative observations and developing hypothetical conclusions about human ancestry.

## Biology II (Botany) 1<sup>st</sup> Semester Lab / Activity Syllabus

### Introduction to Botany and Plant Diversity:

#### “Chia Sculpture” Lab

- Purpose is to provide a metaphorical “hook” to gain an initial interest in botany by making, sculpturing, and nurturing a self-made chia sculpture.

#### “Anatomy and Function of *Polytrichum* “Moss” and Leafy Liverwort” Lab

- Purpose is to examine moss and liverwort in order to help understand the anatomy/physiology and evolution of Bryophytes.

#### “Anatomy and Function of *Pterophyta* “Ferns” Lab

- Purpose is to examine a fern in order to help understand the anatomy/physiology and evolution of Tracheophytes.

#### “Seed Germination and Plant Development” Lab (Note: Continues into “Stems, Roots, and Leaves”)

- Purpose is to grow and observe plant development from seed to near maturity using a controlled experiment and to make daily observations, records and analysis for the growing plant. An APA research paper based on the results will be formulated.

### Stems, Roots, Leaves:

#### “Dissection of a Dicot Seed” Lab

- Purpose is to examine anatomical structures of a dicot seed and embryo.

#### “Ground Tissue Salad” Demo

- Purpose is to make students aware of various types of ground tissue in common foods.

#### “Plant Tissue, Anatomy, and Physiology: Roots” Lab

- Purpose is to observe and understand the external and internal structures/functions and evolution of roots.

#### “Plant Tissue, Anatomy, and Physiology: Stems” Lab

- Purpose is to observe and understand the external and internal structures/functions and evolution of stems.

#### “Plant Tissue, Anatomy, and Physiology: Leaves” Lab

- Purpose is to observe and understand the external and internal structures/functions and evolution of leaves.

### Reproduction and Development of Seed Plants:

#### “Angiosperm Dissection: Flower” Lab

- Purpose is to identify structures found in a “complete flower”. Evolutionary advantages and the reproductive structures will be primarily targeted during this investigation.

#### “Angiosperm Dissection: Fruit (Fleshy Variety)” Lab

- Purpose is to identify structures and tissues found in “fleshy fruits”

#### “Seed Respiration” Lab

- Purpose is to measure the consumption of oxygen by a germinating seed by creating and using a respirometer.

#### “Reduction of Starches in Banana Cells” Lab

- Purpose of this activity is to compare that amount of starch in unripen vs ripen bananas in order to provide reasoning to why banana tissue softens and become sweeter when they do ripe.

### Other(s): (Maybe in conjunction with any of the activities/labs/projects previously mentioned)

#### “Supermarket Botany Online” Activity

- Purpose is to related common foods found in a grocery store to plants studied. Teaches students about the differences between fruits and vegetables, between roots, stems and leaves and the developmental sequence from flowers to fruits. The online site: <http://www.csu.edu.au/research/grahamcentre/resources>

#### “Dissecting Microwave Popcorn” Activity

- The purpose is to discover the unique design of microwave popcorn packages and to investigate brands, kinds and percent popped.

## **Biology II (Zoology) 2<sup>nd</sup> Semester Lab / Activity Syllabus**

### **Introduction to Zoology:**

#### “Introduction to Animal Symmetry” Activity

- Purpose is to distinguish bilateral and radial symmetry with the use of clay animals created by the students themselves. Why nature has selected animals to have symmetry (pros / cons) discussed.

### **Sponges and Cnidarians:**

#### “Sponge “Cake” Round “Porifera” Activity

- Purpose is to create a model of a typical sponge from sponge cake.

#### “Investigating Hydras (Green and/or Brown)” Lab

- Purpose is to observe the anatomy of Hydras. This investigation will allow one to explain the behavior of hydras as well.

### **Worms and Mollusks:**

#### “Planarian” (Worm) Lab

- Purpose is to observe a flatworm’s anatomy, behavior, and asexual reproductive ability.

#### “Dissection of an Earthworm” (Worm) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

#### “Dissection of a Clam” (Mollusk) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

### **Arthropods and Echinoderms:**

#### “Dissection of a Crayfish” (Arthropod) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

#### “Dissection of a Grasshopper” (Arthropod) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

#### “Dissection of a Starfish” (Echinoderm) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

### **Non-vertebrate Chordates; Vertebrate Chordates: Fishes and Amphibians:**

#### “Dissection of a Perch” (Fish) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

#### “Dissection of a Grass Frog” (Amphibian) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

### **Reptiles and Birds:**

#### “Dissection of a Turtle” (Reptile) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

#### “Dissection of a Pigeon” (Bird) Lab

- Purpose of the dissection is to expose tissues and organs for study. Various characteristics and terms will be observed and addressed; structures/functions have evolved from previous animals will be made aware of.

### **Mammals:**

#### “Blubber for Insulation” Lab

- Purpose is to simulate blubber which helps to explain endothermic characteristics of mammals. What evolutionary advantage does having blubber have for mammals in the arctic?

#### “Hair Follicles and Patterns” Lab

- Purpose is to compare and contrast different hair follicles from various mammals under the microscope. What evolutionary advantage does hair have for mammals?

“Emulsification of Lipids” Demonstration

- Purpose is to provide visual evidence of the emulsification properties of soap and provide evidence that milk contains fat; What evolutionary advantage does milk (ie containing fat) have on developing newborns?

“Using Owl Pellets to Study Mammalian Remains” Lab

- Purpose is to view and hypothesis what type of mammal was regurgitated by a raptor in order to study skeletal and anatomical features of mammals.

“Homemade Scat” Lab

- Purpose is to use baking ingredients to create different types of mammalian defecations using a guide illustrating herbivores, carnivores, and omnivores.

# Earth Space Science Activities Syllabus

## Introduction to Earth Space:

“Determining the Density of Matter” Lab

- Purpose is to determine the density by calculating the mass and volume of an object.

“Mineral Models” Lab

- Purpose is to examine what the basic molecular structure of minerals; such as, silicates, carbonates, sulfates, oxides, and halides look like.

“Introduction to Earth Space Using the Scientific Method” Lab

- Purpose is to review the scientific method and all of its components by creating an activity, lab, or project based on a selected and researchable earth space topic. (to be a student driven activity throughout the term)

## Physical Geology:

“Rock Type Simulations” Lab

- Purpose is to simulate rocks at different stages and get a better understanding of the rock types and cycles.

“Earthquake Simulation” Lab

- Purpose is to discover how buildings withstand an earthquake by creating one and testing it accordingly.

“Convection Currents Modeling” Lab

- Purpose is to discover how convection currents work in order to support continental drift.

“Plate Tectonics Simulation” Lab

- Purpose is to produce a simulation be create and show the process of plate tectonics.

“Volcano Simulation” Lab

- Purpose is the witness how magma can spread and erupt from within volcanoes.

## Historical Geology:

“Creating a Mold and Cast Fossil” Lab

- Purpose is to create and determine the difference between mold and cast fossil types.

“Fossil Finding and Identification” Field Trip

- Purpose is to find and identify marine life about 280-600 million years ago (Paleozoic Era) and to inspire students to understand the geology and evolution of animals found in Indiana millions of years ago.

“Changing Percent Composition of Earth’s Atmosphere” Activity

- Purpose is to use data that shows the changing percentage composition of atmosphere since the formation of the Earth to create a graph of each gas and determine the significance of the data.

“Geological Timeline” Activity

- Purpose is to create a geological timeline of evolutionary events and mass extinctions which can be represented visually.

“Making “Cents” of Radioactivity” Lab

- Purpose is to understand half-life and how it is used to determine the age of fossils by modeling radiometric dating.

“The Decay Curve of Twizzlers” Lab

- Purpose is to simulate the radioactive decay of an isotope using Twizzlers and graphing the results.

## Earth and Moon:

“Lunar Birthdays” Lab

- Purpose of this lab will put to the test to see if moon phases effect a person’s birthday using statistical calculations and graphs.

“Phases of the Moon with Oreos” Activity

- Purpose of this activity is to provide a visual of the moon phases using a manipulative such as Oreo cookies.

“Eccentricity” Lab

- Purpose is to discover if the ellipse of a planet can be found using Kepler’s 1<sup>st</sup> Law.

“Earth, Moon, and Sun” Activity

- Purpose is to devise a model that can show the positions of the sun, the moon, and Earth during various phases and eclipses.

“Moonscape” Activity

- Purpose is to create a model of the lunar surface and various features in order to help understand the moon’s topography.

## Solar System:

“Solar System Model” Activity

- Purpose is to build a model of the solar to give a perceptive of distance between the planets.

## **Stars, Galaxies, and the Universe:**

### “Sun’s Surface” Activity

- Purpose is to model the Sun’s outer atmospheres in order to get a better understanding of the Sun’s surface.

### “Modeling the Main Sequence” Lab

- Purpose is to model the various classifications of stars in order to help visualize the scope and diversity of Main Sequence stars in our galaxy.

### “Modeling the Milky Way Galaxy” Lab

- Purpose is to construct a model of the Milky Way galaxy to help show the location of our own solar system.

### “Modeling the Corner of Our Universe” Lab

- Purpose is to create a scale model of our corner of the universe to allow students to put our universe into perspective regarding its immenseness.

## **Weather:**

### “Hygrometer” Lab

- Purpose is to create a hygrometer to help understand how it is used to measure relative humidity.

### “High Water Capacity of Clouds” Lab

- Purpose is to use cotton balls to demonstrate water capacity in clouds.

### “Modeling Precipitation” Lab

- Purpose is to show how water vapor causes precipitation.

### “Making a Cloud in a Bottle” Lab

- Purpose is to see if a cloud can be made artificially if the conditions are right inside a controlled environment.

### “Convection Current of Air” Lab

- Purpose is to support the fact that convection can be modeled by using smoke as an indicator as warm air rises and cool air sinks in a cycle.

### “Surface Weather Station Plots” Activity

- Purpose is to review surface weather station plots and being able to understand the symbols used to create such plots.

### “Weather Presentation” Project

- Purpose is to create a model and/or demonstration that includes at least one manipulative and use it/them to present on one of any various weather-related topics.

## **Oceanography:**

### “Presentation and Lesson” Activity

- Purpose of this assignment is to present a knowledgeable explanation of one of the five main topics of oceanography including: Ocean Floor, Ocean Water, Ocean Life, Ocean Dynamics, and Ocean Shorelines as a teaching assignment to be presented to middle school science students.