HS AP Biology Summer Assignment 2023-2024
Ms. Musial

Welcome to AP Biology! I look forward to meeting you/seeing you again! My name is Ms. Musial (also known as Ms.M), and I have been teaching at the Science Academy for two years with this upcoming year being my 3rd. My hopes for this class are for you to develop a framework for biology and gain a deeper appreciation of science and of course to pass the AP Exam! The AP biology curriculum centers on the four Big Ideas (listed below) which you will not only learn but understand how they all relate.

The Four Big Ideas
BIG IDEA 1: EVOLUTION (EVO) The process of evolution drives the diversity and unity of life. BIG IDEA 2: ENERGETICS (ENE) Biological systems use energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis. BIG IDEA 3: INFORMATION STORAGE AND TRANSMISSION (IST) Living systems store, retrieve, transmit, and respond to information essential to life processes. BIG IDEA 4: SYSTEMS INTERACTIONS (SYI) Biological systems interact, and these systems and their interactions exhibit complex properties.

Due to the quick pace of the course we will review some concepts over the summer! My goal for this summer assignment is to review some of the scientific practices, explore the biology around you and have fun! Please do not procrastinate! We will be hitting the ground hard from the first day of school so don't get behind before the year even starts!

1. AP Biology Scientific Practices Review

The second part of your summer assignment is to familiarize yourself with the following practices in AP Biology. You will do this by watching the Bozeman Science videos (a great resource for AP science students that we will be using throughout the year) and completing the corresponding video worksheets. Please **PRINT and HAND WRITE** these worksheets! Be ready to turn these in on the first day of school!

Science Practice 1- Models and Representation
Science Practice 2- Using Mathematics
Science Practice 3-Scientific Questioning
Science Practice 4- Data Collection Strategies
Science Practice 5-Analysis & Evaluation of Evidence
Science Practice 6-Scientific Explanation & Theories
Science Practice 7- Scales, concepts & Representations

Worksheets are located in this folder: Bozeman WS Folder

Videos are linked above in blue but can also be found at http://www.bozemanscience.com/ap-biology under the AP Biology Practices category along with the worksheets.

2. Biological Photo Collection

For this assignment, you will "collect" 20 photographic examples of biological terms/concepts and compile them on a google slides presentation. These must be your own pictures and you must have the same unique identifier (such as the Eevee in the example included in each picture you take). Select any 20 of the items from the Biological Collection List to include in your document. This will introduce you not only to the language of biology, but also emphasize that biology is something that's DONE, not just memorized. **This will be due the second day of school!**

- Be creative. If you choose an item that is internal to a plant or animal, like a phloem, you could submit a photograph of the whole organism or a close up of one part, and then explain what a phloem is and specifically where the phloem is in the specimen. However, each photo can only be used for one term/concept. So, if you use a picture of a daisy for the term phloem you must find a completely different kind of plant to explain the term xylem.
- Must use original photos only. Can not take photos from the internet or any other publication. You must take the photo yourself! This will be done by using the unique identifier or Proof Object.
    - **Proof Object** – Your proof must be an object that is inanimate and separate from you. It must be unique – not a yellow #2 pencil or a penny. If you lose your Proof Object before you are able to take a picture with it then you must start over. For that reason, I suggest taking a picture with your Proof Object early on. I will not allow more than two objects used per project--so if you lose it twice, you will need to redo some of your photos! Safeguard your Proof Object carefully.
- You should only use natural items. Take a walk in your neighborhood, go to the park or zoo, go for a hike in the woods, etc. Humans are natural items and may be used, but only for a total of two entries.
- This is an individual project. While brainstorming, discussing, and even going on collecting adventures together is welcome, your items and photos are to be unique.
- Be careful and respectful! Never touch plants or animals you are unfamiliar with. Don't kill or hurt any organisms. Don't remove any organisms from the natural environment. If any pictures deem that you didn't follow this rule then they will not be accepted.

1. Google slides presentation:
    a. Title Slide
        i. Title-Biological Photo Collection
        ii. Picture of you with your Proof Object
        iii. Name
        iv. Grade
    b. Photo Collection Slides (20)
        i. Term/Concept
        ii. Photo with identifier
        iii. Definition of the term/concept IN YOUR OWN WORDS
        iv. Explanation of how your picture represents the term/concept

A short example is provided HERE.

*If you would like to get a head start on unit one or get an idea of the curriculum for AP Biology, Khan Academy has a decent outline for the units. Here is the link for you to explore the units and get some practice.

https://www.khanacademy.org/science/ap-biology

AP Biology Comprehensive vocab list from the CED

(Course and Exam Description)

Unit 1: Chemistry of Life

Polarity Hydrogen bonding in water Cohesion Adhesion Surface tension Macromolecules Atoms Molecules Carbon Nitrogen Carbohydrates Proteins Lipids Nucleic acids Phosphorus Monomers Hydrolysis dehydration synthesis	Polypeptide Primary structure Directionality Amino terminus Carboxyl terminus R group Ionic Secondary structure Tertiary structure Quaternary structure Unsaturated fatty acid Saturated fatty acid Phospholipids Polar region Nonpolar region Polymers Nonpolar Hydrophobic Hydrophilic	Nucleic acids Five-carbon sugar Deoxyribose Ribose Phosphate Nitrogen base (adenine, thymine, guanine, cytosine, uracil) DNA RNA 3’ hydroxyl end 5’ phosphate end Antiparallel Double helix Base pairing rules (DNA) A-T–two hydrogen bonds C-G-three hydrogen bonds Alpha-helices Beta-sheets Carbohydrate polymers –linear or branched

Unit 2: Cell Structure and Function

Subcellular components Organelles Ribosomes Ribosomal RNA (rRNA) mRNA Endoplasmic reticulum (ER) -rough and smooth Golgi complex Mitochondria Lysosomes Hydrolytic enzymes Vacuole Apoptosis Hypotonic Isotonic Hypertonic Passive transport Active transport	Chloroplasts Turgor pressure Thylakoids Stroma Grana Chlorophyll Photosystems Light-dependent reactions Carbon fixation (Calvin cycle) Krebs cycle (citric acid cycle) Electron transport chain ATP synthesis Osmosis Homeostasis Osmoregularity Water potential Solute potential Pressure potential	SA:V ratio Plasma membranes Embedded proteins Steroids Glycoproteins Glycolipids Selective permeability Fluid mosaic model Cell walls Passive transport Active transport Exocytosis Endocytosis Aquaporins Endosymbiosis

Unit 3: Cellular Energetics

Enzymes Active site Substrate molecules Catalysts Activation energy Catalysis Denaturation Environmental temperatures pH Optimal range Competitive inhibitor molecule Noncompetitive inhibitor Allosteric site	<u>Cellular respiration</u> Fermentation -alcohol, lactic acid ETC NADH FADH2 NADP+ Proton gradient Inner mitochondrial membrane Chemiosmosis Oxidative phosphorylation Glycolysis Krebs cycle	<u>Photosynthesis</u> Cyanobacteria Light-dependent reaction ATP NADPH Electron transport chain (ETC) Electrochemical gradient ADP→ATP Inorganic phosphate ATP synthase Photophosphorylation Calvin cycle

Unit 4: Cell Communication and Cell Cycle

Signal transduction Ligand Receptor protein Target cell Protein modification Phosphorylation cascade Cellular response G protein-coupled receptor	Amplification Second messenger Cyclic AMP (cAMP) Gene expression Apoptosis Positive feedback mechanism Negative feedback Homeostasis	Cell cycle Interphase (G0, G1, S, G2) Mitosis Prophase Metaphase Anaphase Telophase Cytokinesis Cyclins cyclin dependent kinases

Unit 5: Heredity

Meiosis Haploid Diploid Gametes Parent cells Daughter cells Homologous chromosomes Crossing over Meiosis I Meiosis II Mendel's law of -segregation -independent assortment	Alleles Zygote Monohybrid punnett square Dihybrid punnett square Sex-linked traits Linked genes -recombinants -parent phenotypes Map distance between genes Phenotypic plasticity Nondisjunction	Phenotype Genotype Dominant Recessive Incomplete dominance Complete dominance Codominance Pedigree Sex chromosomes Non-nuclear inheritance -chloroplast -mitochondria

Unit 6: Gene expression and regulation

Linear chromosomes Circular chromosomes Plasmids Nucleotide base pairing rules Pyrimidines Purines Semiconservative replication Helicase Topoisomerase DNA Polymerase RNA Primers Ligase Leading strand Lagging strand	mRNA tRNA rRNA Codon Anti-codon Ribosome Amino acid Transcription Translation RNA polymerase Template strand of DNA Poly-A tail GTP cap Introns Exons Alternative splicing	Regulatory sequences Regulatory proteins Epigenetics Operon Inducible operon Repressible operon Transcription factors Promoter Transformation Transduction Conjugation Transposition Electrophoresis PCR DNA sequencing

Unit 7: Natural Selection

Natural selection Competition Limited resources Differential survival Evolutionary fitness Biotic Abiotic Genetic variation Phenotypic variation Selective pressure Artificial selection Convergent evolution Genetic drift Bottlenecks Founder effect Migration/gene flow Mutations Hardy-Weinberg Equilibrium Allele frequency Genotypic frequency	Evidence for evolution Geographical Geological Physical Biochemical Morphology Extant Extinct Fossils Decay of isotopes (carbon-14) Homologous structures Vestigial structures Resistance to -antibiotics -pesticides -herbicides -chemotherapy drugs Origin of life Inorganic→ organic (O2) Meteorite RNA World Hypothesis	Phylogenetic tree Cladogram Shared characters Derived characters Common ancestry Out-group Node (on a tree/cladogram) Most recent common ancestor Speciation Punctuated equilibrium Stasis Gradualism Divergent evolution Adaptive radiation Sympatric Allopatric Prezygotic mechanisms Postzygotic mechanisms

Unit 8: Ecology

Response to environment Behavioral mechanisms Physiological mechanisms Communication/signaling Signals -visual -audible -tactile -electrical -chemical Innate behavior Learned behavior Cooperative behavior Abiotic Biotic Adaptation→ trait Invasive species	Endotherms Ectotherms Metabolic rates & body size Net gain in energy Net loss in energy Trophic levels Autotrophs Chemosynthesis Heterotrophs Resource availability Density-dependent factors Density-independent factors Logistic growth Community Ecosystem	Simpson's Diversity Index Population Predator Prey Trophic cascade Niche partitioning Competition Predation Symbiosis Parasitism Mutualism Commensalism Biodiversity Keystone species Producers

Summer Assignment Rubric				
5	**4**	**3**	**2**	**1**
All elements are complete, clearly stated with sufficient understanding and neatly done.	Most elements are complete and clearly stated.	Some elements of the project are incomplete and / or messy.	Few elements of the project are completed per the directions and/or messy.	Little to none of the directions were followed and part of the assignment may be missing