**Bio.3.4 Explain the theory of evolution by natural selection as a mechanism for how species change over time.**

Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.

Bio.3.4.2 Explain how natural selection influences the changes in species over time.

Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection. **Bio.3.5 Analyze how classification systems are developed upon speciation.**

Bio.3.5.1 Explain the historical development and changing nature of classification systems.

Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees).

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| **Early Earth & First Life** | |
| **Biogenesis:**  The theory that all life comes from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ life.  **\*\*Accepted!\*\***  Describe the conditions of Early Earth:  Gases in Early Earth’s atmosphere:  **Oparin’s Theory**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Sun & Lightning)  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(methane, ammonia, Hydrogen)  =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Miller & Urey**  Tested Oparin’s theory with this machine! Oparin was RIGHT!!  **Miller & Urey Experiment.JPG** | **Abiogenesis**  The theory that living things can come from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Things.  **\*\*Disproved!\*\***  Examples:   1. pasteur experiment.jpg Louis Pasteur: 2. Francesco Redi:   redi experiment.jpg |

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| Endosymbiont Theory: Also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  endosymbiosis 1.gif  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ prokaryotes 🡪\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Prokaryotes 🡪 Photosynthetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 Multicellular Organisms | |
| **Evidence of Evolution** | |
| 1. **Fossil Evidence**   3 types of fossils:  1.  2.  3.   1. **Biochemical Evidence**: Comparing common \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ among organisms. The more amino acids in common, the more closely related. 2. **Anatomical Evidence:** 3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Embryos of various organisms appear very similar 4. Homologous Structures: Same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structure: Different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, Same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6. Vestigial Structure: Organs that were useful to an organism’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but no longer serve a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  |  |  |  |  | | --- | --- | --- | --- | | **Embryology**  **embryos.JPG** | **homologous.JPGHomologous Structures** | **analogous.JPGAnalogous Structures** | **Vestigial Structures**  **Examples:**  **1.**  **2.**  **3.**  **4.**  **5.**  **6.** | | |
| **Speciation** | |
| Charles Darwin | |
| * Naturalist * Sailed to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Ship: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Book: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Observations:   1. Finches: 2. Tortoise: 3. Marine Iguanas: |
| These observations lead Darwin to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| **Natural Selection** | |
| A.K.A: Survival \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  The process:   1. Individuals with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ survive 2. Mate & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3. And pass the desirable trait on to their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | Natural Selection Nutshell.JPG |
| Survival Adaptations: | |
| Mimicry  mimicry butterfly.jpeg | Camouflage  camo 1.jpg |

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| Disease Agents: | |
| Antibiotic Resistance:  Antibiotic resistance.gif | |
| Pesticide Resistance 2.gifPesticide resistance.jpgPesticide Resistance: | |
| Vaccines & Antivirals  Vaccine: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form of a virus given to boost one’s immunity to a disease.  Virus: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pathogen that cannot \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ without a host cell. | |
| Virus Structure  virus.JPG | Virus Life Cycles  Lytic Lysogenic  Lytic.JPGlysogenic.JPG |

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| Passive & Active Immunity | |
| Active Immunity  Body makes its own antibodies after becoming infected with a pathogen.  Natural:  Artificial: | Passive Immunity  Body is directly given the antibodies to a pathogen  Natural:  Artificial: |
| Geographic Isolation:  When a species gets separated from each other due to a geographic feature, the species begins to evolve in order to adapt to the new environment, Eventually the birds will evolve into two genetically different species.  geographic isolation.jpeg | |
| **Taxonomy** | |
| The science of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Putting things into meaningful groups according to likeness. | |
| **Aristotle**   * First to classify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * He made 2 groups: Blood Vs. Bloodless   (Plant & Animal)   * Classified based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and less on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ similarities. | **Linnaeus**   * Classified based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ similarities/form. * Developed several \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (groups) for classifying. * Binomial Nomenclature:   + Giving every organism a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Latin name.   + 2 word name - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   + Ex. Humans = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Taxa:** A category used in classification  (Largest) 🡪 (Smallest)  **Kingdom** 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 **Class** 🡪 **order** 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Genus** 🡪 **Species**    “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” | |

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| **Kingdoms of Life** | | | | |
| **Bacteria**   * Prokaryotic * \_\_\_\_\_\_\_\_\_\_\_\_cellular * Some cell walls are   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * Some ancient types can live in extreme   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **Protista**   * Eukaryotic * Auto\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & hetero\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Plant-Like, Animal-Like. & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * “Junk drawer” Kingdom * Kingdom of microscopic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **Fungi**   * Cell walls are made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Heterotrophic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **Plant**   * Eukaryotic * Cell walls are made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * \_\_\_\_\_\_\_\_\_\_\_\_Cellular * \_\_\_\_\_\_\_\_\_\_\_\_trophic | **Animal**   * Eukaryotic * \_\_\_\_\_\_\_\_\_\_\_\_\_\_cellular * Lack a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_trophic |
| Flower Anatomy edit.JPGFlower Anatomy | | | | |
| 4 Types of Plants Chart edit.JPG | | | | |

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| **Dichotomous Key** | |
| Uses \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to identify organisms | |
| Dichotomous Key Clues.JPGdichotomous Key Pics edit.JPG | |
| **Cladograms** | |
| * Also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Shows \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ among organisms (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) * Also shows when particular \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ emerged. | |
| cladogram practice.JPG | cladogram 4.jpg |