

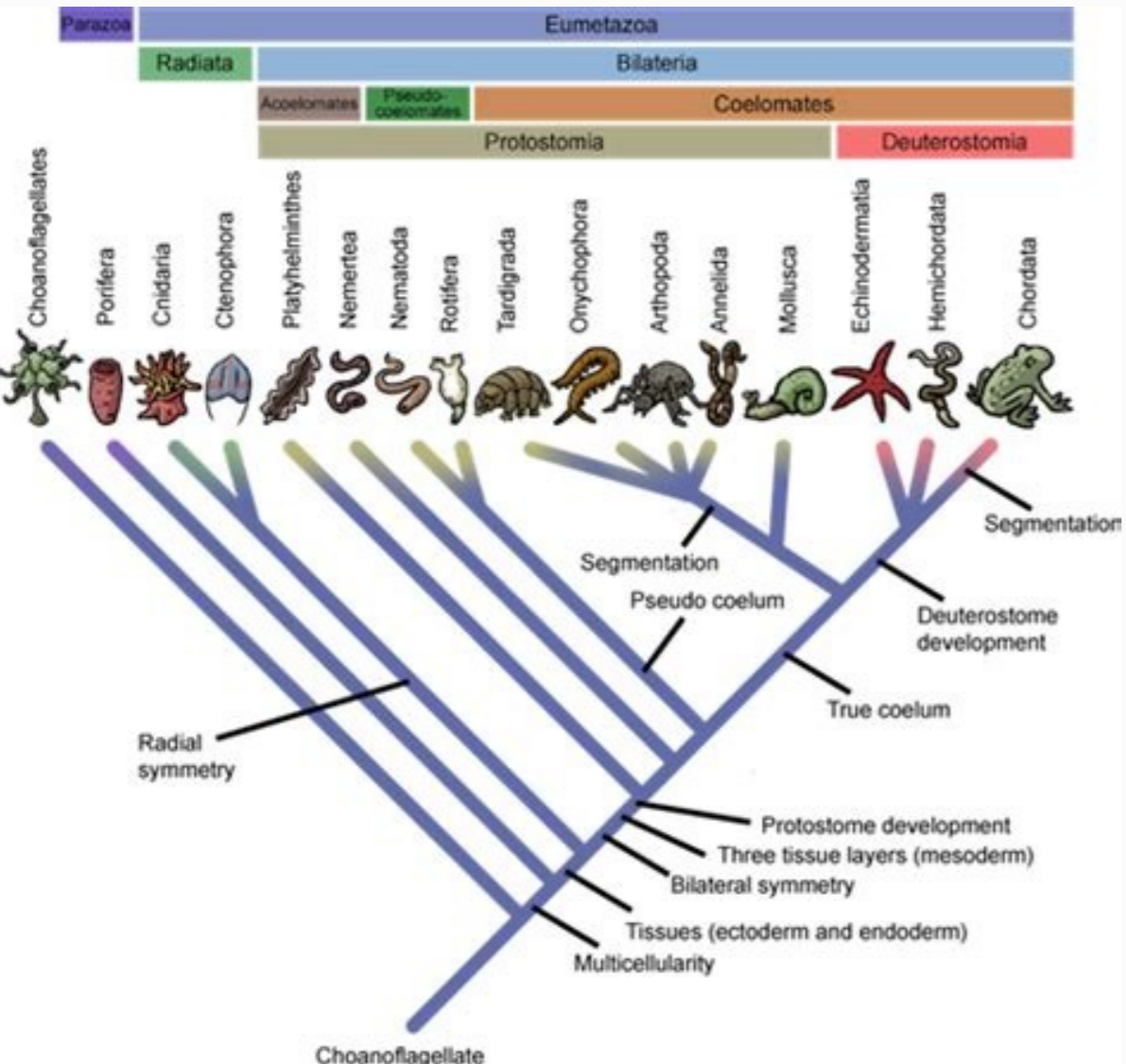
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Biologists use cladograms to study the relationships among certain groups of organisms. Cladograms show how closely two or more groups are related based on ancestral (shared) and derived characters. Branching points on the diagram are made every time a derived character is identified.

Cladograms offer a visual that we can use to make comparisons between organisms. We can compare organisms to how close or far apart they are on the cladogram. Organisms that are grouped more closely on a cladogram share more similarities than those further apart. This suggests that the more closely grouped organisms share a more recent common ancestor than those found further apart.

Typically there is an organism found in the cladogram that serves as an out group. The out group is a distantly related organism that serves as a base line for comparisons with all of the other organisms in the cladogram. It usually does not contain any of the derived characters.

1. What is a derived character?
2. Make a list of all the possible derived characters included on this cladogram.
3. What are some derived characters among lizards and eagles?
4. What are some shared characters among rabbits and porch?
5. If mouse were added to this cladogram, where would it be placed?



How Does a Cladogram Reveal Evolutionary Relationships?

What is a cladogram? It is a diagram that depicts evolutionary relationships among groups. It is based on **PHYLOGENY**, which is the study of evolutionary relationships. Sometimes a cladogram is called a phylogenetic tree (though technically, there are minor differences between the two).

In the past, biologists would group organisms based solely on their physical appearance. Today, with the advances in genetics and biochemistry, biologists can look more closely at individuals to discover their pattern of evolution, and group them accordingly - this strategy is called **EVOLUTIONARY CLASSIFICATION**.

CLADISTICS is a form of analysis that looks at features of organisms that are considered "innovations", or newer features that serve some kind of purpose. (Think about what the word "innovation" means in regular language.) These characteristics appear in later organisms but not earlier ones and are called **DERIVED CHARACTERS**.

PART I - Analyze the Cladogram

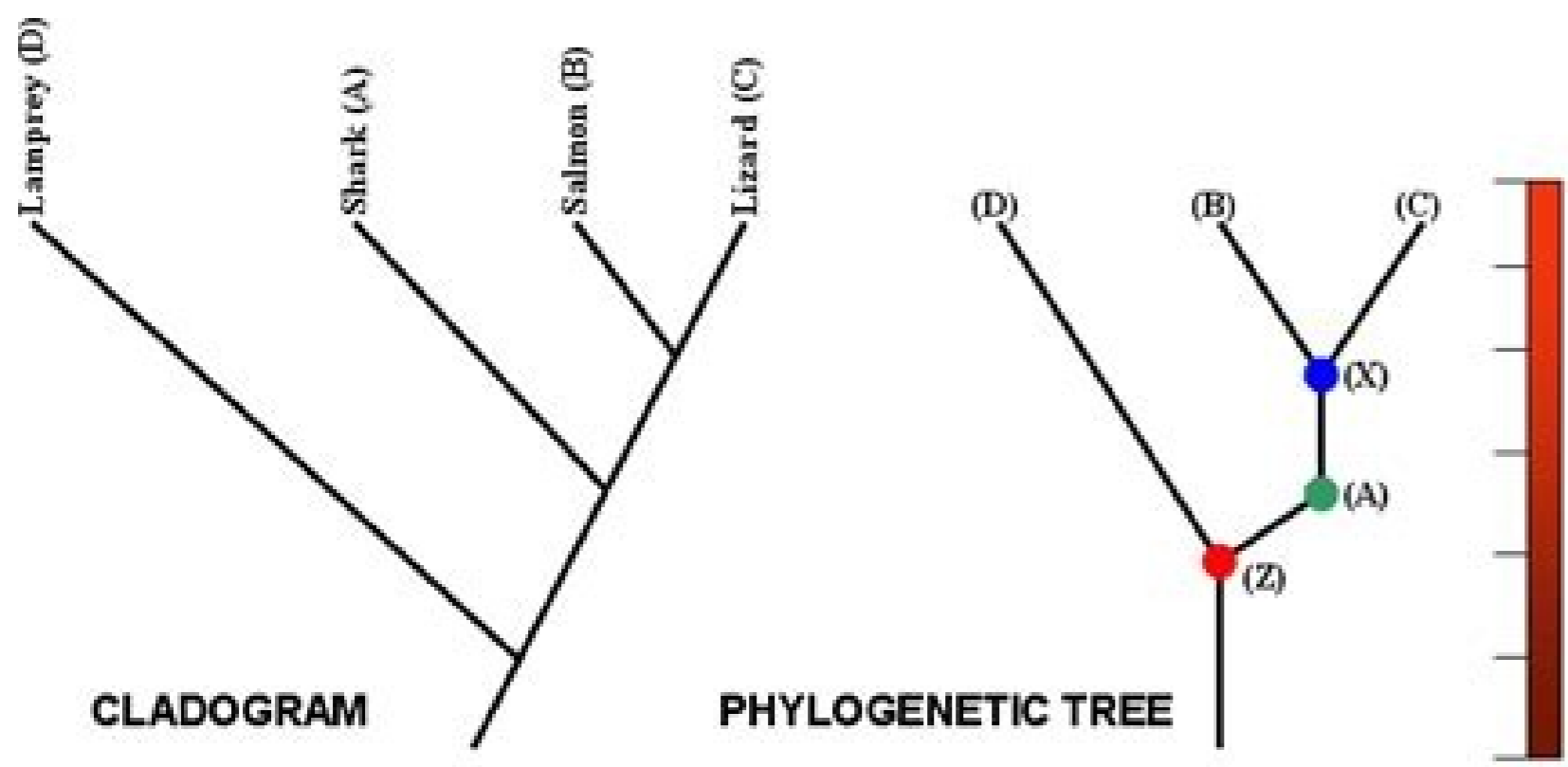
Examine the sample cladogram, each letter on the diagram points to a derived character, or something different (or newer) than what was seen in previous groups. Match the letter to its character. Note: this cladogram was created for simplicity and understanding, it does not represent the established phylogeny for insects and their relatives.

1. _____ Wings
2. _____ 6 Legs
3. _____ Segmented body
4. _____ Double set of wings
5. _____ Cerci (abdominal appendages)
6. _____ Crushing mouthparts
7. _____ Legs
8. _____ Curly Antennae

Phylogenetic Trees and Cladograms

EK1B2: Phylogenetic Trees and Cladograms are graphical representations (models) of evolutionary history that can be tested.

Cladograms show evolutionary relationships based on shared and derived characters. **Phylogenetic Trees** show the evolutionary history of a group of organisms, often including a time scale.



Live worksheets > English Finish!! Please allow access to the microphone Look at the top of your web browser. If you see a message asking for permission to access the microphone, please allow. Close In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation. Cladogramby Multiple Choice Worksheet for Cladogram Practice: Use this resource for reviewing or assessing your students' understanding of cladograms. This resource includes 26 multiple choice questions and KEY. 7 Different CLADOGRAMS was used for this worksheet! Related Products: Cladogram Worksheets Classification Task Cards Cladogram Task Cards Cladogram Practice Vertical Cladograms Cladogram PowerPoint Review Cladogram and Phylogenetic Tree BUNDLE Copyright brainiacteacher & Company, LLC All rights reserved. Biology Christmas Activity. Christmas Tree Cladogram!! Bring a little holiday spirit into your biology lesson! This activity has student trace the "evolution" of Christmas tree decorations and create a cladogram organizing the trees. This activity has three different levels which allows for its use with different levels of students. This could be used as a review or as an activity to fill that tricky day before break. The ability level of your students and the level of difficulty you assign will determine how long this activity takes. It is a Cladogram Practice by This Activity includes: A video link that explains Cladograms. - 1 Practice Cladogram-10 Review Questions - KEY INCLUDED This Cladogram can be done WITH or WITHOUT the Video. Try Related Products Cladogram Worksheets Cladogram Task Cards Cladogram Multiple Choice Practice Cladogram PowerPoint Review Classification: Dichotomous Key, Cladogram, Phylogenetic Trees, and MORE Cladogram and Phylogenetic Tree BUNDLE Cladogram Practice by A scaffolded worksheet that you can do as a class, small group, or individually. Students practice analyzing cladograms, and culminate with creating their own. These cladograms are shown facing two different directions, which is great preparation for the EOY state exams. I would appreciate if you would leave feedback for this item. Thank you! Follow my store to get updates on new items as they are added. The Evolution of Communication: Telephone Cladogram by Have your students make a cladogram using something they definitely know about... cell phones! This set has a cover page that shows a variety of phones ranging from candlestick to iPhone 7 Plus! Then, there are two different activities: a more scaffolded version with the traits filled in, or a blank version for students to create their own. An answer key is provided for the scaffolded version. Enjoy! There are teacher notes on morphology and phylogeny. They are scripted and foolproof! There is a document teaching students on how to create a phylogenetic tree. Before diving into the typical images with branches and nodes, it uses different colored beetles to explain the concept. Then, students are given images of flowers where they now have to create a phylogenetic tree based on the differences and similarities they see in the pictures. Once that foundation is set, students are given a real pTypes: This bundle contains a PowerPoint presentation for Biological Science classes on Taxonomy, Classification and Cladograms/Phylogenetic Trees. Presentation consist slides with transitions and links to videos and images that you may want to add to the PowerPoint. Content includes contributors to classification, Phylogenetic Trees, Cladograms (Cladistics) and patterns of organization based on embryonic germ layers. Presentation shows differentiation in monophyletic, polyphyletic and paraphyletic groups. Cladogram - Interactive Draggable Science Model by This interactive digital science activity gives students the power to build their own model of a Cladogram. Given a collection of 32 total draggable items, students must place them in their correct position in this diagram by a "drag and drop" modeling activity. Students are provided labels and animals that fit somewhere in the cladogram. Students must drag the parts to their correct location on the triangle. Students will stay super focused and engaged while completing this digital modeling act. Constructing a Chordate Cladogram (KEY) by Students learn how to construct a cladogram with this guided learning activity. I use this as an activity to introduce the unit on chordates and also as a review of evolution. I have similar cladogram activities that can be done on paper, but this one is designed to work on Chromebooks. Students drag and drop labels and answer questions as they proceed through the slides. This activity is available for free at includes the answer key, a link to the Cladogram investigation with 15 different organisms by This cladogram investigation is SECOND part of the cladogram investigation. The first cladogram investigation is having the students arrange cell phones in order of complexity. This cladogram is strictly on organisms. There are 15 various unique organisms included with a summary table where the students can complete while forming their cladogram. Please visit my store to see more of my fun stuff! This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 Students will be able to compare a string of human DNA to gorilla and chimpanzee DNA, collect the DNA that is different, analyze it and then draw a cladogram based on the data. Students will show their knowledge and understanding of the common descent between these organisms, and the process of making a cladogram by answering included questions about their lab activity. KEY is included! Want to earn TpT credits on future purchases? TpT credits are earned for fair feedback left on active, paid Subjects: Types: This is a zip file containing all of my PowerPoints for teaching AP Biology Big Idea 1 Evolution. Each PowerPoint precisely covers what students need to know for the new AP Bio Exam. They are colorful, easy to use and entertaining. They also have embedded videos that link to the Internet to further explain the processes. A total of 7 PPs in all! In addition, I also added several quizzes that I have made and used over the years and test items, flashcard reviews from Quizlet, a cladogram activity Phylogenetic Tree Cladogram Project Worksheet Taxonomy Activity - Thanksgivng: A Thanksgiving science paper lab for taxonomy, cladograms, and phylogeny. This craft is a pumpkin evolutionary tree. Please follow my store by clicking the star by my picture to get updates when more great products are posted! Also, please check out the other great offerings of Dragoner Publishing. This is a family business, so please pin and follow my mom, too! ----- Spooky Speciation: Monster Cladogram Lab by In this cladistics lab, students will create a cladogram by observing and finding similarity in physical traits of 32 species of monsters. This hands-on lab is a great way for students to apply their knowledge of speciation, evolution, phylogenetics and phylogenetic trees/cladograms. Instructions and answer keys are included, as well as 32 pre-made monster cards. I have also included 2 guides to help students with the lab - Guide 1 shows students the physical structure of their tree and Guide 2 This is a great NO PREP review game about genetics for students! The Unfair Game allows students to work in teams to try and answer questions correctly about genetics. The questions cover major genetics vocabulary (genotypes, phenotypes, dominant, recessive, allele, genetics, Punnett squares, probability, etc) and questions about interpreting cladograms. When they get a correct answer, they get to decide if they want to keep or give away the points BEFORE they even see them! That's the most fun! Page 3 Students will work in groups to classify birds in the US based upon their habitat, range, diet, song, interactions with others, and their behavior. General Directions: Students will cut out all the birds and their descriptions. The task is to organize the birds in a cladogram based on their given traits. In this assignment, students are graded based upon their ability to state their claim, evidence, and reasoning. Great project to demonstrate evolutionary trends, behavioral traits, and physiologiPage 4 DIY Cladogram Student Activity by Includes: Quick overview on what a Cladogram is and how they are used. Instructions for creating your own Cladogram. I'd recommend putting students in small groups for this activity. Animal cutouts for the cladogram activity - 3 different options for animals Use this as formative or summative assessment, or to trigger critical thinking or communication skills in your classroom. This project does not necessarily need to be marked. It could just be an activity meant to get your students in the right mind. Cladogram by Using student's name to teach a difficult strand is AWESOME.... This 10 question worksheet identifies key characteristics, key organisms (students), and interprets CLADOGRAM with a TWIST but with the same goal. Example: Which derived characteristic(s) do Marcus share with Lindsey? Talkative KEY INCLUDED Copyright brainiacteacher & Company, LLC All rights reserved by author. This product is to be used by the original downloader only. Copying for more than one teacher, classroom, department, school, or to make a Cladogram Worksheet by The student will learn how a cladogram illustrates an evolutionary hypothesis and makes predictions about evolutionary events. (i.e. the scientific method). The student will learn how cladograms depict relationships between taxa, and represent a "family tree" of life. The student will learn how to construct a cladogram from morphological data. Evolution, Pedigree, Cladogram End of Course Review by General overview station review for final exam or state test for the following concepts: Natural Selection Survival of the Fittest Common Ancestors with homologous structures and hominids Pedigrees Genetic Drift Gene Flow Cladograms Each station requires students to recollect on old concepts using pictures and stories. This can be used as an introduction review day if you want to dig deeper another day or as a great overview of the concepts for just one day. The file is in PDF so that you can have the Subjects: Types: This is a simpler version of the previous cell phone cladogram investigation. The 1st version of the cell phone cladogram could potentially be a tad challenging for some students. I have simplified it by eliminating talk time and memory in each so that students can focus on building the cladogram. If you are looking for a more challenging one, the 1st version will be better suited. Please visit my store to see more of my fun stuff! Why not download this and all my resources for only \$9. Cladogram Guided Notes by Mr Waggoner Chemistry Biology NGSS Guided notes for the following powerpoint presentation Cladogram Notes The following webquest is great to do before these notes or as a follow up: Phylogenetic Trees and Evolutionary Relationships Webquest LS4-1 Phylogenetic Trees, DNA Evidence, Homology, Evolutionary Tree Virtual Lab Cladogram Task Cards by To get the original without the answers open it in kami and then click print save it as a pdf without annotations and you have the version to give to your students! Cladogram Project for Middle Schoolers: KEY Included!! by Included in this project is an easy way for grades 6 - 8 students to take fun organism cards, place them onto a Venn diagram and then trace over the diagram, turning it into a cladogram! They then label the cladogram nodes for commonalities, and finish a 4 question project analysis. Included is a 17 slide color step by step presentation, a 12 page handout file with everything that you need to copy for the lab AND an included KEY so that you can easily show students where they are going with the Subjects: Types: Page 5 This Google Slides, digital AND printable science lesson includes two warm-ups (Slide 1), Cornell notes (Slide 2), a lab activity with directions (Slide 3-5), a slide presentation to follow along with the notes, an evaluation sheet for students and/or teachers to use (Slide 6) and answer key (Slide 7). The slide presentation--included in Slide 1 as a separate link already embedded--follows along with the Cornell notes (perfect for differentiation) and includes the warm-ups, notes, mini quiz, anPage 6 Darwin, his journey, evidence for evolution, cladograms--it's all in here. Use actual locks and boxes, OR use this fun lesson with a simple envelope system! Enough problems for 6 groups of students, or more if you use the problems in duplicate. I actually made different codes and problems for each group. With locks: utilizes 3, 3-digit locks, one MasterLock combination lock, four boxes, some paper, and a lot of fun!! I got the locks and toolboxes at Dollar Tree, or I also bought inexpensive unPage 7 This complete and easy to use Classification Bundle focuses on the following: Classification, Kingdoms of Life, Dichotomous Key, and Cladogram. It includes 5 full lessons, warm-ups, projects, activities, PowerPoint notes and slides, projects, tests, review activities and more! Get this all everything you'll need in my BIOLOGY COMPLETE YEAR BUNDLE! WHAT'S ALL INCLUDED IN THIS BUNDLE? Notebook Set-Up Warm-ups Lesson- Classification Lesson- Kingdoms of Life Lesson- Dichotomous Key Lesson- Cladogram Bingo UnPage 8 Crosswords are a great way to reinforce terminology and vocabulary associated with your unit of study. Terms included: Animalia, Taxonomy, Kingdom, Clade, Unicellular, Plantae, Eubacteria, Domain, Cladogram, Multicellular, Protista, Linnaeus, Species, Archaea, Fungi ----- If you would like to check out or purchase other Crossword products, click the link below to take a look at the entire Crosswords section of BrPage 9 A comprehensive 10 worksheet bundle that covers basic and advanced concepts in taxonomy and classification for an upper middle school or lower high school biology course. Topics include: Linnaean classification, species, cladistics, cladograms, archaea and bacteria, viruses, protists, fungi, plants, invertebrates, vertebrates, and humans. Bundle Contents: Worksheet - Taxonomy - Classification of Living Things Worksheet - Taxonomy - Cladistics and Cladograms Worksheet - Taxonomy - Archaea and BacterPage 10 Here is an UPDATED natural selection bundled unit covering all thirteen topics in the New Curriculum Framework. The bundle includes over twenty activities, including several labs, group projects, Cornell notes, two PowerPoints, Internet activities, a video worksheet, a cladogram, and a case study. Various student handouts can be used for note-taking, homework, or group collaboration. They are easy to follow and clearly labeled. Answer keys are included. The following topics are covered: Page 11 This active reading lesson introduces students to the various forms of evidence used to support the theory of evolution. It covers fossils and how they are dated, the differences between homologous, analogous, and vestigial structures, physiological similarities, comparative embryology, and similarities amongst DNA base pairings. Also included is practice reading a cladogram, comparing embryos, and identifying homologous structures. Students highlight and annotate the reading, answer reading compPage 12 Classification and Taxonomy: Review biological classification and taxonomy with the I Have...Who Has... card game. Play as a class or in small groups. Classification and Taxonomy product includes: - 24 Classification and Taxonomy: "I Have...Who Has..." cards - Directions and answer key - Color and black & white versions - Vocabulary: taxonomy, taxon, domain, kingdom, family, order, phylum, class, species, genus, phylogeny, cladogram, Eubacteria, Archaeobacteria, Plantae, Animalia, Protista, FungiPage 13 Make vocabulary interactive! Cut-and-Paste vocabulary is fun and interactive! Topics in this set include: - Classification (classification, taxonomy, binomial nomenclature, organism, heterotroph, autotroph) - Domains and Kingdoms (prokaryotic, eukaryotic, multicellular, unicellular, heterotroph, autotroph, domain, kingdom) - Ecological Relationships (symbiosis, predation, competition, mutualism, commensalism, parasitism, adaptation, niche) - Ecosystems (organism, habitat, biotic factor, abiotic factor, sPage 14 Evolution Interactive Notebook, 21 pages of information and activities, foldables, questions, quizzes, rubrics, answer keys, evolution, charles darwin, natural selection, whale evolution, adaptations, survival of the fittest, peppered moth, populations, species, speciation, extinction, environment, DNA This resource is an interactive notebook for Evolution. It contains, information, activities, project ideas and quizzes, that can be used to help your students understand the important conceptsPage 15 Classification fundamentals is a 50 slide power point presentation and a 8 pages of student notes that going to help you to teach the topic of classification in secondary grades. This power point is aligned with the common core standards and contains 5 formative assessments. With this product you will engage, teach and assess your students! Main contents: Essential Questions, Key terms, What is classification, breve history of taxonomy, Binomial Nomenclature, prokaryote, eukaryote, autoPage 16 The end of the year is quickly approaching. Now, it is time to review! Use these puzzles as an in class or homework assignment that your students won't mind doing. Help them remember and review key vocabulary and concepts from the year. Bundle and save 30%. Check out the individual resources for a complete view of what is included in the bundle. Keywords: science, biology, life science, RNA, ribose, thymine, hypotonic, hypertonic, solution, solute, concentration, homeostasis, biochemPage 17 NGSS STANDARDS WITHIN THIS UNIT: A. NEXT GENERATION SCIENCE STANDARDS HERE IN DCI's: LS4, LS3. B. Cross Cutting Concepts: Patterns, Cause and Effect, Scale, Proportion, and Quantity, Systems and System Models, Structure and Function, Stability and Change Scientific and Engineering Practices: Engaging in Arguments from Evidence, Analyzing and Interpreting Data, Developing and Using Models, Using Mathematical and Computational Thinking "Evidence for Evolution: Stations Lab" explores six lines of evidencePage 18 This complete teaching unit on "The Plant Kingdom: Introduction, Evolution, and Classification" includes everything you need to teach this unit to your life science or biology students. Resources include an 118-slide PowerPoint presentation packed with colorful and interesting photographs and images, teacher notes, printable and digital student notes, task cards, labs, lab stations, study guides, homework assignments, crossword puzzles, a graphic organizer, quizzes, and a final unit test. InclPage 19 Want to head full steam into S.T.E.A.M., but not sure how to get started? Try our twist on S.T.E.A.M.! With science as the primary background subject, students learn all about life science using Social Studies, Technology, ELA, Art, and Math. These student-led, print and go, low-to-no prep Science Circuit Stations are easy to implement with a few household items. WHAT'S INCLUDED IN THIS LESSON: • Signage in two sizes for eight stations, blank templates to create your own stations, and student staPage 20 Greetings! This Biology Survival Bundle includes over seventy activities at a 30% savings. The lessons supplement the following units - the scientific method, the characteristics and organization of life, cell chemistry, cell structure and function, cell transport and homeostasis, enzymes and the rates of reaction, cell division, cycles and cellular energy, producers and photosynthesis, energy flow in an ecosystem, taxonomy, genetics, genetic engineering, protein synthesis, microbiology, the div

Phylogenetic System 543 Kevin Padian Phylogeny of Dinosaurs 546 Quadrupedality Kevin Padian Physiology Q 552 619 ... The answers to these questions are probably yes, no, yes, and no, perhaps in no particular order. ... FIGURE 2 Cladograms of archosaur relationships. (A) Cladogram combining Gauthier's (1994) arrangement for the Ornithosuchia ...

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