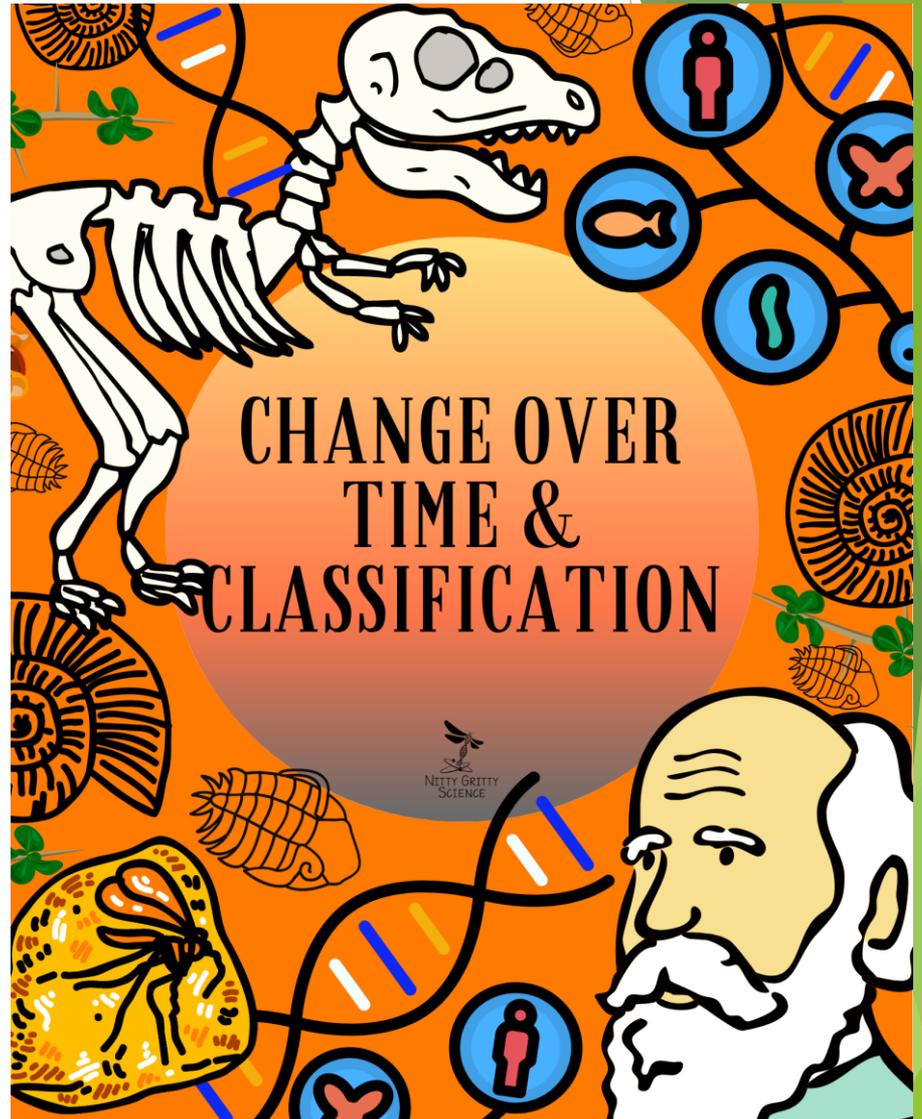


Change Over Time & Classification



Change Over Time & Classification Unit includes:

- Print and digital Interactive Notebooks
- Editable Resources including notes, PowerPoints, and test
- Instructional Videos
- Teacher-led Demos & Guided Inquiry Labs
- Task Cards & Digital Task Cards
- Study Guides





Suggested Pacing Guide



The following is a **suggested pacing guide** for my COMPLETE COURSES (Earth, Life or Physical Science) which are based on 50-minute class periods. There are three variations below. Each variation is based on the **number of sections in your SCIENCE INTERACTIVE NOTEBOOK chapter**.

Based on a **4-Section Chapter**

Day	Lesson/Activity	Engage	Explain	Explore	Elaborate	Evaluate
1	• Teacher Demo	x				
	• Section 1 Notes – INB input • INB Activity – INB output (homework if not completed in class)		x			
2	• Mini-quiz					x
	• Section 2 Notes – use PowerPoint • INB Activity		x			
3	• Mini-quiz					x
	• Guided Inquiry Lab – Student Led			x		
4	• Section 3 Notes – use PowerPoint • INB Activity		x			
				x		
5	• Mini-quiz					x
	• Section 4 Notes – use PowerPoint • INB Activity		x			
6	• Mini quiz					x
	• Science Stations				x	
7	• Science Stations				x	
8	• Final draft and testing for Creation Station (STEM)				x	x
9	• Task Card Review (game-style, full class, partner)				x	
10	• Chapter Test					x
	• Have students complete notes for next chapter*	x				

* **Note-taking option:** Once students are done with chapter test, they get the next set of notes and work quietly on completing them while other students finish up. All notes are to be completed when they return to class. Have students glue each page of notes into the next few pages of their INB (right side only). This way, when you go over the PowerPoint each day, they have already reviewed topic and are ready for class.

5 E Model

Engage – Teacher-led demos foster wonder and classroom discussion and serve as the hook for the lesson. Videos and images of natural phenomena also foster questioning and communication. NGSS phenomena are aligned to middle school NGSS standards.

Explain – PowerPoints, instructional videos, and guided notes (input side of interactive notebooks) provide definitions, explanations, and information through mini-lecture, text, internet, and other resources which encourages students to explain concepts and definitions in their own words.

Explore – Students investigate problems, events, or situations. As a result of their mental and physical involvement in these activities, students question events, observe patterns, identify and test variables, and communicate results.

Elaborate – It is important to involve students in further experiences that apply, extend, or elaborate the concepts, processes, or skill they are learning. Elaborate activities provide time for students to apply their understanding of concepts and skills. They might apply their understanding to similar phenomena or problems.

Evaluate – Use a variety of assessment to gather evidence of student's understanding and provide opportunities for them to assess their own progress.

Student Interactive Notebook



Each concept shares:

- Actual photos of both the INPUT and OUTPUT pages of Science Interactive Notebook
- Instructions on how to create/use/complete activity for OUTPUT side
- Mini-Quizzes for each concept to check students' understanding
- Answer Keys for all mini-quizzes
- Appendix with Teacher Notes for Interactive Notebook in LARGE print.

Section 1: Darwin's Theory of Evolution

Input page showing a notebook page with handwritten notes and a diagram of a tree of life.

#SurvivaloftheTwitter

Twitter interface showing tweets from @Darwin and @M10nagle.

Name: _____ Date: _____

Quiz: Darwin's Theory of Evolution

Define the following terms:

1. theory _____
2. natural selection _____
3. adaptation _____

Section 2: Evolution of Populations

Input page with a diagram of a population pyramid and handwritten notes.

Butterfly Identification

Butterfly	Scientific Name
	<i>Colias eurytheme</i>
	<i>Stichaethalia bohemica</i>
	<i>Agrius clavata</i>
	<i>Danaus plexippus</i>
	<i>Chlorostiltes emerald</i>
	<i>Danaus eurytheme</i>

Butterfly Classification

Directions: Cut out each butterfly and use the dichotomous key to identify each butterfly. Paste each butterfly in your Science Interactive Notebook, and write the scientific name next to it.

1. Wings have a spotted pattern.
2. Wings do not have a dot pattern.
3. Hindwings have smooth edges.
4. Hindwings do not have a smooth edge.
5. Forewings have orange patterns.
6. Forewings have blue patterns.
7. Forewings have a large red and black shape on the forewing.
8. Forewings have a purple, blue, and black shape on the forewing.
9. Forewings have white patterns.
10. Forewings do not have white patterns.
11. Wings are greater than 3 cm.
12. Wings are less than 3 cm.
13. Head wings color is orange.
14. Head wings color is blue.
15. Both hindwings have similar patterns.
16. Both hindwings have similar patterns.
17. Coloration is mostly white color.
18. Coloration has black and white patterns.
19. Hindwings are black from 3 cm wing length.
20. Hindwings are greater than 3 cm wing length.

Name: _____ Date: _____

Quiz: Classification

Indicate the order of classification using numbers 1-8

1. _____ Class
2. _____ Domain
3. _____ Family
4. _____ Kingdom
5. _____ Species
6. _____ Genus
7. _____ Phylum
8. _____ Order

9. What is the two-word naming system?

10. Which scientist developed the classification system?

Section 5: Domains and Kingdoms

Input page with a 'Classification Pizza' diagram and a table of organisms.

Domain	Kingdom	Phylum	Class	Order	Family	Genus	Species
Bacteria	Proteobacteria	Gamma	Proteobacteria	Proteobacteria	Proteobacteria	Proteobacteria	Proteobacteria
Eukarya	Animalia	Mollusca	Gastropoda	Gastropoda	Gastropoda	Gastropoda	Gastropoda
Eukarya	Plantae	Angiosperms	Angiosperms	Angiosperms	Angiosperms	Angiosperms	Angiosperms
Eukarya	Fungi	Basidiomycota	Basidiomycota	Basidiomycota	Basidiomycota	Basidiomycota	Basidiomycota
Eukarya	Protista	Alveolates	Alveolates	Alveolates	Alveolates	Alveolates	Alveolates
Eukarya	Plantae	Gymnosperms	Gymnosperms	Gymnosperms	Gymnosperms	Gymnosperms	Gymnosperms

Instructions:

Students will cut, sort and classify based on domains and kingdoms when completing this Classification Pizza activity. They will first need to identify which kingdom belongs to which domain, then cut out and match an example of an organism to its kingdom. Finally, students will need to describe the organism's cell type, ability to make food and number of cells that make up the organism. The 6 slice pizza foldable, pictures to place on each "slice" and a mini-quiz are included.

Domains and Kingdoms

Directions:

1. Organize the 'Kingdom Pizzas' foldable by the three different DOMAINS by designating a color for each domain and coloring each 'slice' according to its domain color. For example, all 'slices' that belong to Domain Eukarya need to be colored green.
2. Cut out 'Kingdom Pizzas' foldable and cut down the slices in the middle from dotted line to dotted line. Fold back each flap on the dotted line (note, because it's curved not entire flap will be able to fold back).
3. Cut and paste each picture on the top flap of the kingdom 'slice' to which it belongs. Paste wheel (using outer ring) into Science Interactive Notebook.
4. Under each flap, write whether the organisms that belong to that kingdom are prokaryotes or eukaryotes, unicellular or multicellular, autotrophs or heterotrophs.

(Bacteria living in volcano) Salmonella Euglena

Maple tree Hummingbird Button mushrooms

Student Digital Notebook

The student notebook is on Google Drive and ready for you to share with your students. Here's a quick overview of the features:

Set up like a traditional interactive notebook with input and output sides.

Hyperlinked tabs so student can easily move through chapter for review

Students watch video < 6 min to complete notes.

Directions: You will be using a dichotomous key found in the link below to identify a group of butterflies. Use the information below to help understand terms found in dichotomous key.

Band Check None
Spot Vein Dichotomous Key

WINGSPAN
FOREWING
HINDWING

Butterfly Identification	
A	B
C	D
E	F
G	H
I	J
K	

KINGDOM	PHYLUM	CLASS	ORDER	FAMILY	GENUS	SPECIES

CLASSIFICATION

In the 1730's, Carl _____, a Swedish botanist, a two-word naming system called _____ The first part of the name is _____ with the second part referring to the _____

Linnaeus developed a classification system which include seven hierarchical taxa:

Sometimes classification keys are used to identify organism by traits that are visible, however scientist today now look at how closely members of groups are related.

Phylogeny -
Clade -
Cladogram -
Derived character -

Classification of Living Things

Kingdom
Phylum
Class
Order
Family
Genus
Species

Digital Textbook

For further exploration, click button(s) below:

Classification of Living Things

Encouraging independent learners. Directions for output side are here along with what they need to complete the activity.

Notes are chunked into manageable sections with large spaces for textboxes

Some pages have links so students can go deeper into the topic if they need.

Demos, Labs, & Science Stations

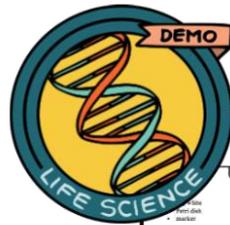
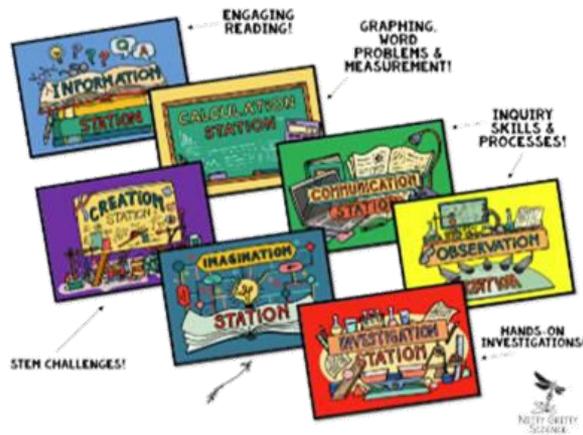


Working in the lab and being engaged in science experiments is the most exciting part of science.

Demo, Labs, and Science Stations Includes:

1. **SCIENCE STATION SIGNAGE** for all 7 stations is provided in color and in black and white (see preview) and all student answer sheets have icons that correspond with each station for ease of use.
2. **DEMONSTRATION** (teacher-led) allows teachers to invite scientific discussions and can help uncover misconceptions and, most importantly, lead to heightened curiosity and interest in the topic being studied.
3. **GUIDED INQUIRY LAB** which is a traditional lab that allows students to perform an investigation in order to solve a problem. Students will hypothesize, collect and analyze data and communicate their results.
4. **TEACHER GUIDES to DEMOS & SCIENCE STATIONS** help get you started and give you background information to make your science lessons engaging.
5. **7 SCIENCE STATIONS** which are designated locations in the classroom with activities that challenge students to extend their knowledge and elaborate on their science skills by working independently of the teacher in small groups or pairs. Stations included are:
 - **INFORMATION STATION** – Group members will read an interesting and relevant science passage then complete a task to help increase science literacy and deepen their understanding of the science concept.
 - **OBSERVATION STATION** – Group members will have images, illustrations, or actual samples at this station that show applications or processes of the science topic. Using what they've learned, they will need to apply their observation skills to complete the questions attached to each.
 - **CALCULATION STATION** – Group members use their math skills to complete the station challenge. Skills may include graphing, analyzing data, using models, measurement, and calculating formulas or word problems.
 - **INVESTIGATION STATION** – Group members will work with one another to explore the concept through hands-on activities so they may practice specific inquiry process skills as they learn.
 - **COMMUNICATION STATION** – There are three different options for this station: interviews, video, group essay. Depending on the option you choose, group members will communicate what they know by answering questions in creative ways.
 - **CREATION STATION** – Group members will work together to solve a STEM (Science, Technology, Engineering, Math) challenge by creating models or designs that demonstrate their understanding of the science topic being taught.
 - **IMAGINATION STATION** – This station makes science concepts relevant for students by asking them to imagine scenarios that will bring about discussion and critical thinking.
6. **INQUIRY PROCESS SKILLS CHECKLIST** is provided with each set to show teachers and administrators the inquiry skills used by students in each activity. These skills include, but are not limited to, communicating, creating models, inferring, classifying, identifying variables, measuring, observing, predicting, gathering and organizing data, comparing and contrasting, interpreting data, and manipulating materials.

SCIENCE STATIONS



Eye Safety

SCIENCE SKILLS AND LAB SAFETY

Name: _____ Date: _____

Procedure:

1. Draw an eye on the underside of the Petri dish and display for class using the projector.
2. Crack open the egg and place the egg white only in the Petri dish.
3. Explain that the proteins in egg whites are similar to those found in the protective layer of the eye.
4. Tell them that someone was not being cautious and has splashed acid into their eye - add drops of acid to the egg white.
5. Ask students to make observations of what is happening to the egg white.
6. Try adding water to reverse the effects. Have students make observations.

What's Happening?

The proteins in the egg white become cloudy when the acid is causing a denaturation of the proteins. This can't be reversed chemically because acid is strong and is permanent that is chemical reactions occur because of their eyes or skin if not used properly. Students must be made aware of the safety procedure associated with such as wearing goggles, gloves and aprons. Make sure they are aware of safety equipment - eye wash station, shower, fire blanket, etc.

Discussion:

Q: What happened to the "eye"?

A: The protective layer became cloudy and damaged the eye.

Q: What type of safety equipment must be worn when doing Lab?

A: goggles, apron, hot fire gloves

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Discussion questions and teacher set-up included!

Teacher guide and answer key offered for every lab!

Easy-to-get materials!



Measure with SI Units

SCIENCE SKILLS AND LAB SAFETY

Name: _____ Date: _____

The standard system of measurement used by scientists around the world is known as the International System of Units, which is abbreviated as SI. SI units are easy to use because they are based on multiples of 10. Each unit is ten times larger than the next smallest unit and one-tenth the size of the next largest unit. The following table lists the prefixes used to name the most common SI units.

Prefix	Symbol	Abbreviation
kilo-	k	1,000
hecto-	h	100
deka-	da	10
deci-	d	0.1
centi-	c	0.01
milli-	m	0.001

Materials:

- scattered seeds
- tape
- balance
- postage scale
- capsaicin (strong) small milk cartons
- fertilizer solution
- metric ruler
- 10-mL graduated cylinder
- colored pencils

Safety:

Wear goggles and gloves.

USER-FRIENDLY PAGES:
Students easily recognize which answer sheet to use at each station by matching station icons located on each page!!

Drip, Drop, Splat!

How does the density of a liquid and drop height affect the size and shape of droplet splatters?

Materials:

- colored water (graduated cylinder A)
- colored syrup (graduated cylinder B)
- eye dropper
- paper
- metric ruler
- meter stick

Procedure:

1. Make a hypothesis of how density of a liquid will affect splatter size on your lab sheet.
2. Place the piece of paper down on the lab table in order to catch splatters.
3. Measure the heights listed in the data table using a meter stick. Place meter stick with end starting at zero on paper and move up stick when increasing height of drop.
4. Use the eye dropper to drop ONE drop of colored water and ONE drop of colored syrup. Make sure to drop on different places on paper.
5. Measure the size of the splatter in MILLIMETERS. Record in data table on answer sheet.
6. Repeat for each height.
7. Use the collected data to graph the splatter size versus drop height for each liquid.

Analyze and Conclude

1. Was your hypothesis correct? Explain.
2. What are two controls in your experiment that helped you collect the most accurate data possible?

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TEACHERS SAVE TIME:
Laminate station pages and reuse for each class and for years to follow!
Inquiry skills used are timeless!

Name: _____ Date: _____

Hypothesis

Drop Height (cm)

	3	25	50	75	100
Colored Water					
Colored Syrup					

Height of Drop vs. Splatter Size

Number of Drops (mm)

Size of Splatter (mm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Water																					
Syrup																					

Legend:

- Water
- Syrup

Analyze and Conclude:

1. _____
2. _____

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Instructional Videos



The Intro to Life Science Instructional Videos and Digital Assessments are designed to help teachers move instruction from the group learning space to the individual learning space. Not only does this give students independence in their learning, but it also allows more time for dynamic and interactive learning when teachers meet with students in a group setting.

This resource is perfect for:

- Flipped Classroom
- Absent students
- 1:1 Classrooms
- Sub Plans
- Hybrid Schedules
- Teachers who want more time to guide students as they apply concepts and engage creatively in the subject matter

Features of this resource include:

- Instructional videos which are six minutes or less to keep students focus
- Videos and assessments can be completed independently
- Auto grading and reporting in Google Forms
- Share link with students through educational platforms or email
- Quizzes are editable with 5 – 8 questions per quiz
- Information in video pairs with Nitty Gritty Science Interactive Notebooks

Task Cards & Digital Task Cards

Task cards are a great tool for concept review that can be used in a variety of ways - pairs, small groups, team games, or individually. The reason they are so effective is there is only ONE task per card, allowing students to focus on that single task until they have successfully completed it. Answers sheet and answer key for teachers are included.

The digital, self-checking task cards are hosted at Boom Learning™ and are compatible with Google Classroom. These are perfect for displaying on your interactive whiteboard and leading class games or review sessions.

Print Task Cards

The print task cards are arranged in a 4x4 grid. Each card has a 'Change Over Time' icon with a number. The tasks are as follows:

- Card 1 (DECIDE):** ___ designed a system to classify organisms based on similarities in body structures.
 - a. Linnaeus c. taxonomy
 - b. classification d. Darwin
- Card 2 (EXPLAIN):** The branch of biology concerned with the grouping and naming of organisms is called ___.
 - a. Linnaeus c. taxonomy
 - b. classification d. ecology
- Card 3 (COMPLETE):** An ___ is a diagram that links groups of organisms by showing lines branched off from common ancestors.
- Card 4 (EXPLAIN):** The grouping of objects or information based on similarities is ___.
- Card 5 (DECIDE):** A(n) ___ consists of a group of closely related species.
 - a. genus c. taxonomy
 - b. kingdom d. ecology
- Card 6 (DETERMINE):** What are three factors that will affect the process of natural selection?
- Card 7 (COMPLETE):** An exact copy of an original organism is called a ___ fossil.
- Card 8 (EXPLAIN):** The abundance of coyotes has led to the killing of several cows and sheep. This is an example of which of the following?
- Card 9 (DECIDE):** The grouping of objects or information based on similarities is ___.
- Card 10 (EXPLAIN):** The grouping of objects or information based on similarities is ___.
- Card 11 (COMPLETE):** Organisms belonging to the same ___ can usually mate and produce fertile offspring.
- Card 12 (EXPLAIN):** The grouping of objects or information based on similarities is ___.
- Card 13 (DECIDE):** A(n) ___ consists of a group of closely related species.
- Card 14 (COMPLETE):** An exact copy of an original organism is called a ___ fossil.
- Card 15 (COMPLETE):** In the process of natural selection, the organisms that are best suited to their environments are most likely to survive and ___.
- Card 16 (DECIDE):** A ___ is a group of related phyla.
 - a. class c. genus
 - b. family d. kingdom

Digital Task Cards

The digital task cards feature a butterfly border and interactive buttons for answers. The tasks are as follows:

- Card 1:** ___ designed a system to classify organisms based on similarities in body structures.
 - Buttons: classification, taxonomy
- Card 2:** A ___ is a diagram that links groups of organisms by showing lines branched off from common ancestors.
 - Button: linky table
- Card 3:** The abundance of coyotes has led to the killing of several cows and sheep. This is an example of which of the following?
 - Buttons: camouflage, competition, variation, imprinting

Study Guides: Includes **print** or **digital** options

Nitty Gritty Science Study Guides are directly aligned to the notes and assessments offered by Nitty Gritty Science and include a variety of review strategies which meet the needs of your learners for independent study and indirect instruction.

Each study guide provides a combination of strategies which may include:

- Graphic organizers
- Vocabulary building
- Compare and contrast
- Problem solving
- Concept mapping
- Interpreting data
- Critical thinking
- Theme connection
- Matching
- Fill-in-the-blank
- Short answer
- Real world application
- QR videos with accompanying questions

SECTION 2
 Directions: Pretend you are a scientist who is traveling around the world observing species for a book you're writing. Use some excerpts from your notes. For each set of notes, determine if what's being described is over production, competition or competition and write it on the line.

Notes: Sea turtles lay an enormous number of eggs each year.
 Notes: Lions and tigers both eat the same prey.
 Notes: The peppered moth has two forms, light and dark.
 Notes: Rat snakes can be striped, orange, blue or green depending on environment they live in.

SECTION 3
 Directions: Answer the questions below about the evolution of populations.
 1. Fill in the graphic organizer below.
 3 Sources of Genetic Variation
 2. What is a gene pool?

SECTION 4
 Directions: Answer the questions below about fossils.

 1. What is a paleontologist?
 2. What is the fossil record?
 3. What is the difference between relative and radioactive dating?

SECTION 5
 Directions: Complete the table below by filling in the era and the event that occurred during that era.

Era	Time Period	Event
	46 billion- 600 million years ago	
	600 million-248 million years ago	
	248 million- 65 million years ago	
	65 million years ago-present	

SECTION 7
 Directions: Fill in the classification chart below in the correct order:
 genus, family, order, phylum, class, species

SECTION 8
 Directions: Fill in the chart below with a characteristic and example of each living thing.

Kingdom	Characteristic	Example
Eubacteria		
Archoeobacteria		
Protists		
Plantae		
Fungi		
Animalia		

Directions: Draw a line to match each term with the definition that best describes it.

derived character	Study of how living and extinct organisms are related to one another
clade	A trait that evolved from lineage
cladogram	A diagram that links groups of organisms
phylogeny	A group of organisms that have derived from a common ancestor



Assessments:

Teachers can use a variety of assessments to evaluate student progress throughout the unit. The curriculum provides mini-quizzes for each Interactive Notebook chapter and an online assessments that goes with the instructional videos. The chapter test includes multiple choice, short answer, interpreting diagrams, and an essay.

The image displays two sample assessment pages for the chapter 'Evolution of Populations'. Each page includes a header for 'Name' and 'Date', followed by the title 'Quiz: Evolution of Populations'. The instructions state: 'Indicate the order in which the following events occurred in the speciation of the Galapagos Finches. Use letters A-F.' Below this, there are six numbered blanks for students to write in: 1. _____ Reproductive isolation, 2. _____ Changes in gene pool, 3. _____ Ecological competition, 4. _____ Continued, 5. _____ Founders of, and 6. _____ Separation. The second page also includes the instruction 'Answer the following questions.' and two numbered questions: 7. 'When are two species said to be reproductively isolated?' and 8. 'List the three causes of reproductive isolation.' A large red-bordered box in the center of the assessment pages contains the text: 'EDITABLE CHAPTER TEST INCLUDES MULTIPLE CHOICE, FILL IN THE BLANK, INTERPRETING DIAGRAMS, & SHORT ANSWERS QUESTIONS'. At the bottom of the assessment pages, another red-bordered box states: 'ANSWER KEY INCLUDED — IMAGES ARE BLURRED FOR COPYRIGHT REASONS'. The background of the entire image features a green and white geometric pattern.

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