DEPARTMENT OF EDUCATION
SCHOOLS DIVISION OF NEGROS ORIENTAL
REGION VII
Kagawasan Ave., Daro, Dumaguete City, Negros Oriental

DESCENT WITH MODIFICATION AND THE DEVELOPMENT OF EVOLUTIONARY THOUGHT

for General Biology 2 Grade 11
Quarter 3 / Week 4

SELF-LEARNING KIT

FOREWORD

This self-learning kit (SLK) will serve as a guide for the learners. It will aid them as they learn new ideas and enrich existing knowledge. To study General Biology 2, one requires a sense of discipline.

In this SLK, learners will gain knowledge on descent with modification from common ancestors to produce the organismal diversity and to trace the development of evolutionary thought.

This will be an exciting lesson as learners try to relate their prior knowledge and experiences to the general features of the history of life on Earth.

OBJECTIVES:
At the end of the lesson, the learners shall be able to:
K: discuss the patterns of descent with modification from common ancestors to produce the organismal diversity observed today;
S: trace the development of evolutionary thought; and
A: appreciate the importance of decent with modification by explaining the given example.

LEARNING COMPETENCIES

- Show patterns of descent with modification from common ancestors to produce the organismal diversity observed today. **(STEM_BIO11/12-IIIc-g-10)**

- Trace the development of evolutionary thought **(STEM_BIO11/12-IIIc-g-11)**

I. WHAT HAPPENED

PRE-TEST

Direction: Arrange the following letters to form a correct word. Write your answers in your notebook.

1. IOEVUTNOL

2. HACLERS ARINDW

3. NRAATUL SEONCTIEL

4. CAESOTRN

5. NSMUITRATOATN

II. WHAT I NEED TO KNOW

Descent with modification refers to the passing on of traits from parent organisms to their offspring. This passing on of traits is known as ***heredity,*** and the basic unit of heredity is the gene. ***Genes*** are the blueprints for making an organism and, as such, hold information about its every conceivable aspect: its growth, development, behavior, appearance, physiology, and reproduction (Klappenbach, 2019).

Source: https://www.livescience.com/how-dna-turns-on-off.html

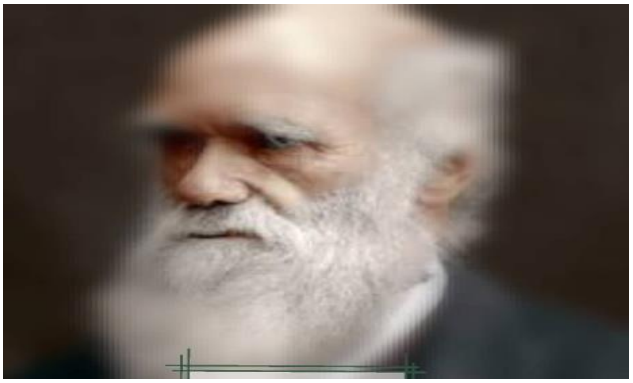
Descent with modification by natural selection explains the adaptations of organisms and the unity and diversity of life.

Evolution described as ***"descent with modification"*** by Charles Darwin refers to the species that changed over time, giving rise to the new species and share a common ancestor. Although Charles Darwin's name is virtually synonymous with the word evolution, he was not the first person to recognize the phenomenon of species change nor did he even use the word "evolution" in the original theory he set forth in On the Origin of Species.

Charles Darwin

Charles Darwin (1809–1882) was born in western England. As a boy, he had a consuming interest in nature. When Darwin was 16, his father sent him to the University of Edinburgh to study medicine, but he dropped out without a degree and enrolled at Cambridge University with the intent of becoming a clergyman. At that time, most naturalists and scientists belonged to the clergy. After graduation, Darwin joined the crew of the survey ship HMS Beagle as ship naturalist and conversation companion to Captain

Robert FitzRoy. FitzRoy chose Darwin because of his education and because his age and social class were like those of the captain.



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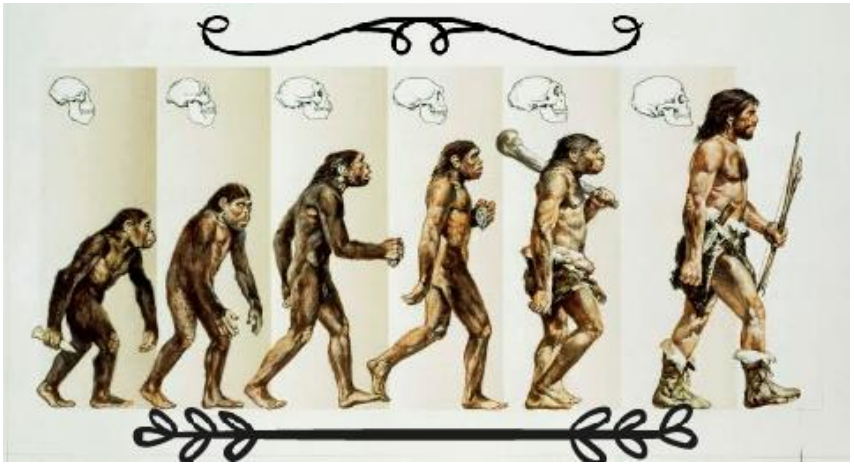


Source: https://www.google.com.ph/search?q=evolution&tbm=isch&ved=2ahUKEwi4lcuF-LXuAhUiNqYKHQRwC-IQ2-cCegQIABAA&oq=evo&gs_lcp=CgNpbWcQARgAMgoIABCxAxCDARBDMgQIABBDMgUIABCxAzIECAAQQzIECAAQQzIECAAQQzIICAAQsQMQgwEyBAgAEEMyBAgAEEMyBwgAELEDEEM6AggAUOXjBlje6gZgsvQGaABwAHgAgAHWAYgBwgOSAQUwLjIuMZgBAKABAaoBC2d3cy13aXotaW1nwAEB&sclient=img&ei=iR8OYPisCqLsmAWE4K2QDg&bih=568&biw=1242&hl=en#imgrc=PoxOmDZPhC7DdM

Heredity and Evolution

According to Charles Darwin, all species descended from only a few life forms that had been modified over time. This "descent with modification," as he called it,

forms the backbone of his Theory of Evolution, which posits that the development of new types of organisms from pre-existing types of organisms over time is how certain species evolve.

How It Works

The passing on of genes is not always exact. Parts of the blueprints may be copied incorrectly, or in the case of organisms that undergo sexual reproduction, genes of one parent are combined with the genes of another parent organism. That is why children are not exact carbon copies of either of their parents.

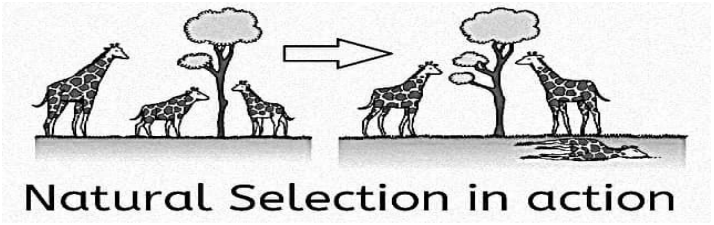
There are three basic concepts that are helpful in clarifying how descent with modification works:

- ✓ Genetic mutation
- ✓ Individual (or natural) selection
- ✓ Evolution of the population (or species as a whole)

It is important to understand that genes and individuals do not evolve; only populations evolve. The process looks like this: Genes mutate, and those mutations have consequences for the individuals within a species. Those individuals either thrive or die out due to their genetics. As a result, populations change (evolve) over time.

Clarifying Natural Selection

Natural selection comes into play, according to Darwin, when a species adapts to its environment, thanks to its specific genetic makeup. Say at some point in time two species of wolves lived in the Arctic: those with short, thin fur and those with long, thick fur. Those wolves with long, thick fur was genetically capable of living in the cold. Those with short, thin fur were not. Therefore, those wolves whose genetics allowed them to live successfully in their environment lived longer, bred more frequently, and passed on their genetics. They were "naturally selected" to thrive. Those wolves that were not genetically adapted to the cold eventually died out.



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The Origin of Species

Darwin never used the word evolution in the first edition of The Origin of Species, although the final word of the book is evolved. Instead, Darwin used the phrase descent with modification.

- All living organisms are related to each other due to their descent from a common ancestor that lived in the distant past.
- Over evolutionary time, the descendants of that common ancestor have accumulated diverse modifications, or adaptations, that allow them to survive and reproduce in specific habitats.
- Over long periods of time, descent with modification has led to the rich diversity of life we see today.

If we try to visualize descent with modification, the history of life resembles a tree, with multiple branches from a common trunk.

- Closely related species, the twigs on a common branch of the tree, shared the same line of descent until their recent divergence from a common ancestor.

Three important points need to be emphasized about evolution through natural selection.

1. Although natural selection occurs through interactions between individual organisms and their environment, individuals do not evolve. A population is the smallest group that can evolve over time.
2. Natural selection can act only on heritable traits, traits that are passed from organisms to their offspring. Characteristics acquired by an organism during its lifetime may enhance its survival and reproductive success, but there is no evidence that such characteristics can be inherited by offspring.
3. Environmental factors vary from place to place and from time to time. A trait that is favorable in one environment may be useless or even harmful in another environment.

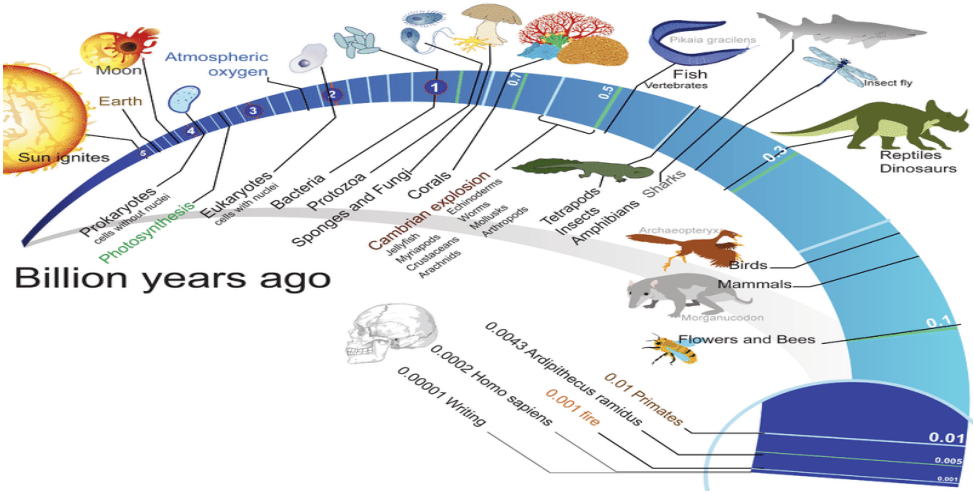
Development of Evolutionary Thought

Many people assume that the theory put forth by Darwin in *Origin of Species* is the final say on evolutionary theory. Biologists, however, know that the theory of evolution has evolved over time. For example, evolutionary theory dramatically changed when Darwin's original ideas were merged with ideas from genetics to become the Modern Synthesis. People will see that evolution makes sense when they realize that the theory of evolution has been updated. The updated and revised theory becomes easier to understand, appreciate, and embrace. This more integrated theory of evolution has even greater power to explain the origins of the great diversity of life on Earth.

	Darwin 1859	Modern Synthesis 1942	Integral Model 2012
Variation	Unknown	• Changes in "genes" • Random mutations due to copy errors and damage	• Changes in DNA • Mobile DNA • Changes in regulation • Dynamic Genome • Endosymbiosis • Hybridization • Random mutations
Inheritance	Vertical	Vertical	•Vertical • Horizontal
Selection	Natural, Artificial, Sexual	Natural, Artificial, Sexual, Drift	Natural, Artificial, Sexual, Drift, Kin. Group
Time	~ 500 million years	~ 2 billion years	~ 3.7 billion years

Evolution of Evolutionary Theory

Three theories of evolution have different facts to support Variation, Inheritance, Selection and Time. Darwin's theory is represented by the color green. Updated information supporting the "Modern Synthesis" is highlighted in blue. Updated information supporting the "Integral Model" is highlighted in purple.
(Source: http://epic ofevolution.com/dialog/evolution-of-evolution.html)



Source (https://www.ck12.org/book/cbse_biology_book_class_xii/section/9.5/)

Although Charles Darwin's name is virtually synonymous with the word evolution, he was not the first person to recognize the phenomenon of species change nor did he even use the word "evolution" in the original theory he set forth in *On the Origin of Species* (1859).

Antiquity

The history of evolution long predates Darwin and his theory. The belief in a changing or dynamic universe can be first seen in ancient Greek philosophy. Heraclitus (c. 500 B.C.E.), also known as the "flux philosopher," believed that change was a fundamental property of the universe. His successor, Empedocles (c. 392–432 B.C.E.), first articulated a crude but

dynamic theory that postulated that the origin of life had taken place in a manner that suggested evolution.

From Aristotle to Linnaeus

However, beginning with the philosophical worldview established by Aristotle (384–322 B.C.E.), the belief in a changing universe fell into disfavor. Aristotle and his numerous medieval and Renaissance translators, commentators, and supporters instead believed in a static universe which held that living organisms were created initially and then remained essentially unchanged. These ideal types or species were arranged hierarchically in what came to be known as the "scala naturae," or the ladder of creation.

Buffon, Lamarck, and Transmutationism

Belief in species change, or transmutationism, slowly began to emerge during the Enlightenment. This period saw the emergence of the belief in a progressive world, both scientific and social. It also saw the beginnings of the new science of geology. Geological theories suggested that fossils were of organic (once-living) origin and that uniform or constant processes rather than catastrophic or one-time events had shaped Earth's history.

The French naturalist Comte de Buffon (Count Buffon, 1707–1788) was one of the first to question the fixity of species and to suggest a transmutationist theory with a startling resemblance to Darwinian evolution. Although he was a respected naturalist, his theoretical explanations for the origin of life and of species change were not accepted during his time. Buffon's transmutationist ideas were also not accepted because they opposed the philosophical teachings of his French colleague Georges Cuvier, the great comparative anatomist and the father of modern paleontology.

The first to suggest a viable theory of species change was Frenchman Jean-Baptiste Lamarck. Lamarck was interested in adaptation or the manner and process by which organisms are able to adapt physiologically and morphologically to their environment. He was especially interested in how well-adapted organs like the neck of the giraffe had originated. According to Lamarck, the use or, in many cases, disuse of such a vital organ could lead to the development of novel but well-adapted traits. The cumulative effect of these adaptations could eventually lead to a new species.

Transmutationism itself became increasingly acceptable by the early nineteenth century. It captured the interest of Darwin's own grandfather, Erasmus Darwin (1731–1802), who suggested that life had originated from "one living filament." Other transmutationists included French anatomist Isidore Geoffroy Sainte Hilaire (1805–1861), who studied birth defects. He suggested that through such "monstrous births" new species might suddenly arise.

Darwin and On the Origin of Species

Charles Darwin was the leading transmutationist of the nineteenth century. Darwin had developed the major features of his theory as early as 1837 after returning from his five-year voyage of the HMS *Beagle* and after reading the famous *Essay on the Principle of Population* by Thomas Malthus (1766–1834). However, Darwin did not make his work public until much later. He felt that he needed to collect solid evidence to his support what he knew would be a contentious theory. He was finally forced into joint publication of an abbreviated version of his theory in 1858, shortly after English naturalist Alfred Russel Wallace (1823–1913) independently formulated his own nearly identical theory.

It took Darwin less than a year to outline in book form his theory of species change that he called "descent with modification" by means of the mechanism of natural selection. The full title of his famous book was *On the Origin of Species or the Preservation of Favored Races in the Struggle for Life*. The book appeared in bookstores on November 24, 1859 and sold out on the first day. It went through six editions as Darwin modified his theory in response to his many critics. It is generally thought that the first edition is a more accurate account of the workings of evolution because subsequent editions included a watered-down version of his original theory.

Darwin thought "descent with modification" took place primarily through the mechanism he termed natural selection. Natural selection occurs when an organism with a favorable variation in some trait reproduces more as a result, thereby increasing the frequency of the variation in the next generation. In addition to this mechanism for driving species change, Darwin included some four of five other mechanisms that he thought could account for species change including the inheritance of acquired characters.

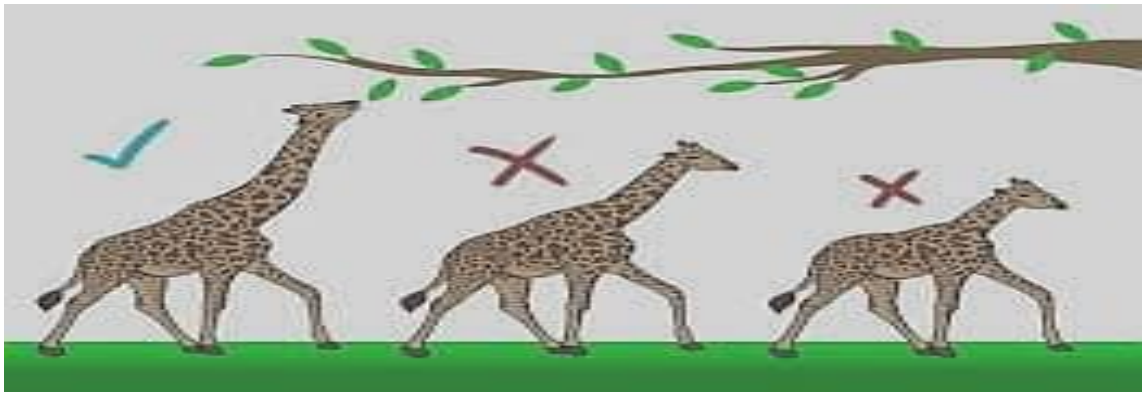
ACTIVITIES

A. Poster Making. Apply your understanding on the development of evolution by making a poster. Use a long bond paper. (36 points)

Rubrics for Poster Making

CATEGORY	4	3	2	1
Graphics -Clarity	Graphics are all in focus and the content easily viewed and identified from 6 ft. away.	Most graphics are in focus and the content easily viewed and identified from 6 ft. away.	Most graphics are in focus and the content is easily viewed and identified from 4 ft. away.	Many graphics are not clear or are too small.
Graphics - Originality	Several of the graphics used on the poster reflect an exceptional degree of student creativity in their creation and/or display.	One or two of the graphics used on the poster reflect student creativity in their creation and/or display.	The graphics are made by the student but are based on the designs or ideas of others.	No graphics made by the student are included.
Graphics - Relevance	All graphics are related to the topic and make it easier to understand. All borrowed graphics have a source citation.	All graphics are related to the topic and most make it easier to understand. All borrowed graphics have a source citation.	All graphics relate to the topic. Most borrowed graphics have a source citation.	Graphics do not relate to the topic or several borrowed graphics do not have a source citation.
Labels	All items of importance on the poster are clearly labeled with labels that can be read from at least 3 ft. away.	Almost all items of importance on the poster are clearly labeled with labels that can be read from at least 3 ft. away.	Several items of importance on the poster are clearly labeled with labels that can be read from at least 3 ft. away.	Labels are too small to view or no important items were labeled.
Required Elements	The poster includes all required elements as well as additional information.	All required elements are included on the poster.	All but 1 of the required elements are included on the poster.	Several required elements were missing.
Knowledge Gained	Student can accurately answer all questions related to facts in the poster and processes used to create the poster.	Student can accurately answer most questions related to facts in the poster and processes used to create the poster.	Student can accurately answer about 75% of questions related to facts in the poster and processes used to create the poster.	Student appears to have insufficient knowledge about the facts or processes used in the poster.
Content - Accuracy	At least 7 accurate facts are displayed on the poster.	5-6 accurate facts are displayed on the poster.	3-4 accurate facts are displayed on the poster.	Less than 3 accurate facts are displayed on the poster.
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed. It is not attractive.
Mechanics	Capitalization and punctuation are correct throughout the poster.	There is 1 error in capitalization or punctuation.	There are 2 errors in capitalization or punctuation.	There are more than 2 errors in capitalization or punctuation.

Activity B.
DIRECTIONS: Appreciate
. Write at least 3-5 sentences and write it in your notebook or paper.(10pts)



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Criteria	
Content	5 points
Cohesiveness	5 points
Total	10 points

III. WHAT I HAVE LEARNED

POST-TEST

DIRECTIONS:

A. Complete the sentence by filling in the blanks with the correct word/words from the word pool. Write the answer in your notebook.

Evolution	Charles Darwin	Genes
	Natural Selection	Descent with modification.

1. According to _____, all species descended from only a few life forms that had been modified over time.
2. _____ refers to the species that changed over time, giving rise to the new species and share a common ancestor.
3. _____ are the blueprints for making an organism and, as such, hold information about its every conceivable aspect.
4. Darwin use the phrase _____ instead of evolution.
5. _____ occurs through interactions between individual organisms and their environment, individuals do not evolve.

B. Multiple Choice. Read and understand each item carefully. Then, write the letter of your answer in your notebook.

1. The force that initiates evolution is _____.
   a. Variation b. Mutation c. Extinction d. Adaptation

2. Which condition can be explained by Lamarckism?
   a. How giraffes got their long neck
   b. How humans lost their tail
   c. How humans became bipedal
   d. All of the above

3. The last common ancestor of humans is _____.
   a. Pan troglodytes
   b. Homo neanderthalensis
   c. Lemuroidea
   d. Dromaeosaurus

4. On the Origin of Species was written by _____.
   a. Charles Darwin
   b. Ludmila Kuprianova
   c. Mikhail A. Fedonkin
   d. None of the above

5. Charles Darwin was best known in the 19th century for _____.
   a. creating the idea of evolution
   b. creating the idea of uniformitarianism
   c. making the idea of evolution acceptable for scientists and the educated general public
   d. all of the above

6. The theory of evolution by natural selection was independently developed by _____.
   a. Charles Lyell and Charles Darwin
   b. Charles Darwin and Alfred Wallace
   c. Erasmus Darwin and Lamarck
   d. Charles Lyell and James Hutton

7. The evolution of one species into two or more species as a result of different populations becoming reproductively isolated from each other is _____.
   a. adaptive radiation
   b. creationism
   c. photosynthesis
   d. transmutation

8. Boucher de Perthes is known for discovering something in northern France during the 1830's. What was it?
   a. a partial Neanderthal skeleton
   b. prehistoric stone tools
   c. the major cause of biological evolution
   d. none of the above

9. These are the blueprints for making an organism and, as such, hold information about its every conceivable aspect.
   a. Genes
   b. Cells
   c. Chromosomes
   d. None of the above

10. It refers to the passing on of traits from parent organisms to their offspring.
   a. Ascent with modification
   b. Descent with modification
   c. Natural Selection
   d. Theory

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SYNOPSIS

This self-learning kit (SLK) focuses on descent with modification from common ancestors. It also explains the Origin of Species through Natural Selection which involved adaptation and survival of the fittest in the environment.

Students will learn that there are many aspects and ideas about evolution prior to Charles Darwin.

ANSWER KEY

Pre-Activity

1. Evolution
2. Charles Darwin
3. Natural Selection
4. Ancestor
5. Transmutation

Activities

A. The grade of making the poster will be based on their understanding on the development of evolution
*Rubrics will be provided
B. The score will be based on the rubrics presented.

Post-test

A.
1. Charles Darwin
2. Evolution
3. Genes
4. descent with modification.
5. Natural Selection

B.
1. A
2. D
3. A
4. A
5. C
6. B
7. A
8. B
9. A
10. B

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Ma. Ofelia I. Buscato, RN,LPT is a Registered Nurse and a Licensed Professional Teacher currently teaching in the Senior High School Department Ong Che Tee Bacong High School, Sacsac, Bacong, Negros Oriental. She completed her Comprehensive Academic Requirements in her Master of Education major in General Science at Foundation University.