1º BACHILLERATO

Secuencias didácticas AICLE

Inglés

Ciencias Mundo Contemporáneo

Guía didáctica para el docente

Título: The Origin of Life
Materia: Ciencias para el Mundo Contemporáneo (1 Bachillerato)
Nivel (MCER): B1
Temporalización: (por determinar, en función de las tareas y actividades que se escoja realizar)

Breve descripción:

La siguiente secuencia didáctica se ha diseñado teniendo en cuenta la normativa vigente y el nivel de los alumnos/as en Lengua Extranjera, así como el hecho de que en la actualidad se indica que la carga lectiva en Lengua Extranjera no debe superar el 50%.
Para esta ejemplificación se ha escogido el tema del origen de la vida por la especial relevancia de Darwin, al cumplirse el bicentenario de su nacimiento. La selección textual y las tareas se centran en un apartado muy concreto: las teorias que explican el origen de la vida, obviándose aquellas otros contenidos que implican un mayor grado de abstracción y, que por tanto, entrañan una mayor dificultad de comprensión para el alumnado aún en su propia lengua.
Con el fin de facilitar su aplicación, se ha dividido en secciones diferentes que abordan un aspecto concreto de los establecidos en el Curriculum de Ciencias para el Mundo Contemporáneo, al final de cada una de ellas se plantea la realización de una tarea específica del ámbito educativo y profesional de las ciencias.

Sección 1: Darwin and his voyages.
- Mapa conceptual acerca de Darwin y sus teorias

Sección 2: Evolution
- Definición de términos y comparación de teorías

Sección 3: Evidences supporting evolution
- Research and presentation of results

Sección 4: Human evolution and Phylogenetic trees
- Scientific poster

Materiales que se aportan
- Guia didáctica de la secuencia
- Material del alumno

Conexiones con otras materias:
- Lengua Extranjera (inglés)

Objetivos específicos

1. Proporcionar cultura científica que le permita comprender los datos existenes en la actualidad.
2. Conocer la distintas teorias que se han dado sobre el origen de la vida citando las fases por las que ha pasado su evolución.
3. Analizar el concepto de evolución, comentar sus pruebas y describir sintéticamente las distintas teorías sobre la evolución de los seres vivos y el origen de las especies, desde el fijismo hasta las modernas corrientes evolutivas.
4. Obtener, analizar y organizar informaciones de contenido científico, utilizar representaciones y modelos, y comunicarlas a los demás con coherencia, precisión y claridad.

Contenidos

Específicos de la materia

- El origen de la vida. Principales teorias que permiten la explicación de los datos existentes.
- Del fijismo al evolucionismo. La selección natural darwiniana y su explicación genética actual.

Lingüísticos

Escuchar, hablar y conversar
- Escucha y comprensión de documentales y entrevistas. Comprensión de la información general y específica
- Participación en situaciones comunicativas propias del aula, dando y pidiendo información
- Exposición de informáciones y datos obtenidos.

Leer y Escribir
- Comprensión de textos académicos, e interpretación de la información. Elaboración de esquemas y resúmenes.
- Búsqueda de información usando recursos en soporte impreso y digital, y extracción de información relevante

Conocimientos de la Lengua
- Estructuras morfosintánticas (comparación y definición)
- Léxico de la secuencia (terminología científica para designar conceptos)
- Estrategias de organización y aprendizaje del vocabulario

Aspectos socioculturales
- Conocimientos históricos, culturales y geográficos (Darwin y sus viajes; la sociedad de la época y el impacto de los descubrimientos y teorias)

Criterios de evaluación

- Valorar la contribución de la ciencia y la tecnología a la resolución de problemas y explicación de la realidad actual.

- Sintetizar y comparar datos y teorias, extrayendo conclusiones.

- Analizar las sucesivas explicaciones científicas dadas a problemas como el origen de la vida o del universo; haciendo hincapié en la importancia del razonamiento hipotético-deductivo, el valor de las pruebas y la influencia del contexto social.

Instrumentos de evaluación

- Observación sistemática del grado de realización de las actividades

- Valoración de las tareas realizadas

- Prueba objetiva, en la que se incluirán tres preguntas en Lengua Extranjera:

1. Definición de términos o asociación de términos y definiciones

2. Completar mapa conceptual

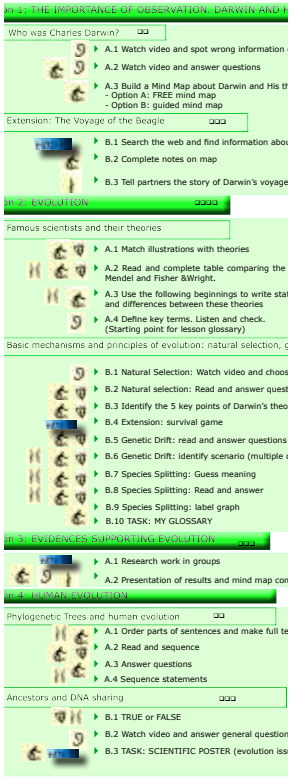
3. Completar enunciados (evidencias, diferencias y similitudes entre teorias)

4. Resolución de problema (explicación de situación actual aplicando conocimientos adquiridos)

Secuenciación de actividades y tareas

Sección 1: Darwin and his voyages
El hilo conductor en esta sección lo constituye la figura de Darwin y sus descubrimientos. Así tras el visionado de un video documental sobre su vida y viajes, se plantean varias actividades para comprobar su comprensión, una de ellas consistente en corregir la transcripción del video y otra en completar una serie de oraciones. Previamente y gracias a un mapa de palabras, se habrá introducido el vocabulario clave para la comprensión del documental.
Tras esta primera toma de contacto con la figura de Darwin, los alumnos habrán de responder a una serie de preguntas de comprensión y construir un mapa conceptual, en este caso combinando los conocimientos previos, con los transmitidos por el video y por un texto sobre sus descubrimientos. Con el fin de "andamiar" el proceso de aprendizaje, se proponen dos versiones del mapa conceptual- las cuales difieren en el grado de guía que ofrecen.

Extensión: partiendo de una mapa en el que aparecen señalados los viajes de Darwin en el Beagle, se pide a los alumnos/as que usen Internet para encontrar información sobre cada uno de los lugares señalados en el mapa y realizar una breve presentación a sus compañeros de sus hallazgos.



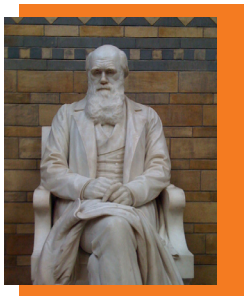
Sección 2: Evolution
En este apartado se abordan las teorias de corte evolucionista de Lamarck, Mendel, Darwin o Fisher y Wright. El objetivo en este caso es que el alumno compare y sea consciente de las diferencias y similitudes existentes en cada caso. De ahí, que el alumno haya de asociar ilustraciones y teorías, completar tablas comparando las cuatro teorias, todo ello tras leer un texto de caracter académico en el que se indican los rasgos fundamentales de cada una de las teorías enunciadas por los científicos anteriormente mencionados.
Finalmente, y antes de dar paso a analizar en mayor profundidad los mecanismos de la evolución, los alumnos habrán de construir definiciones.
Seguidamente se proporcionan una serie de extractos de textos, en los que se desarrollan los diversos mecanismos de la evolución. En este caso la aparente dificultad de los mismos, se solventa con ayudas visuales, glosarios y el planteamiento de actividades guiadas.

Sección 3: Evidences supporting evolution
En este caso, los alumnos habrán de usar Internet y demás recursos a su alcance para buscar información sobre las evidencias o pruebas de la teoria de la evolución, asi como los problemas que se pueden plantear. Una vez recabada la información, cada uno de los grupos procederá a presentar dicha información, mientras el resto completa un esquema o tabla.

Sección 4: Human Evolution and Phylogenetic Trees
En esta sección se introducen cuestiones relacionadas con la filogenética o filogenía y la supuesta evolución del ser humano. La finalidad última será proporcionar al alumno los conocimientos y recursos necesarios para producir un poster científico sobre cualquiera de las aplicaciones actuales de los principios de la evolución.
Pero antes de esto, el alumno/a habrá tenido que responder a preguntas, del tipo "What are phylogenetic trees?", reordenando segmentos de oraciones o secuenciando información tras la lectura de un texto académico. Asimismo, habrá de completar textos con la información proporcionada en un documental por un famoso científico.

Origin and Evolution of Life

Section 1: The importance of observation. Darwin and his voyages.



In this section you will learn about Darwin, a famous scientist who shook the
world with his discoveries and theories. We will try to answer the following questions:
- Who was Darwin?
- What made him famous?
- What impact did his theories have?

At the end, you will be able to build a mind map about this scientist and his discoveries

A. Who was Charles Darwin?

1. Here are some of the key words you will hear through the lesson. Can you try to answer the questions above using the words given.

a. Darwin was a scientist who . . . . . .

b. . . . . made him famous

c. His theories caused great . . . . . .

2. First you will watch a video about his life and voyage on the Beagle and see if your guesses were correct

3. Here is part of the transcript of the video. Can you spot and correct the wrong information provided.

Who was Charles Darwin?
He was an American naturalist who was fascinated with Nature- An ordinary naturalist with an ordinary fascination with nature. In 1731 Charles Darwin was only 22 when he began a five-year voyage on the British HSM Beagle to explore, to observe and to study the natural world.

The Beagle sailed throughout North America and to remote places such as the Falkland Islands off Ecuador. Darwin later wrote that he felt like a blind man being given sight. He returned to England with his mind in notebooks full of fantastic images. Nothing seemed too insignificant for his scrutiny. He kept detailed records of what he saw during his voyage on the Beagle. He collected rocks. He kept ... recordings of minerals and animals. He drew them. He observed them. Little had Darwin realized that his years on the Beagle would begin a lifetime of hard work and controversy

In Darwin's time the prevailing explanation for the great diversity of life was a literal interpretation of the earth's creation as described in Genesis, the first book of the Origin of the Species.

Established naturalists believed that God created each individual species of animals and plants miraculously at the beginning and that these species did not remain fixed.

And yet Darwin also knew that the evidence he had gathered and the tests he had conducted supported the revolutionary idea that living things are related and have changed over millions and millions of years.This new way of thinking was a mark of his genius. It took Darwin 23 years of work to overcome his own doubts and finally present his ideas to the world. His revolutionary book "The Origin of Species" introduced the scientific theory of how life occurs. He called this mechanism of change "physical election"

Understanding Darwin

a. Who was Charles Darwin?

b. What is he famous for?

c. When did he start his voyage on the Beagle? And how long did it take?

d. What did he do during his voyage?

e. Why did his ideas cause so much controversy?

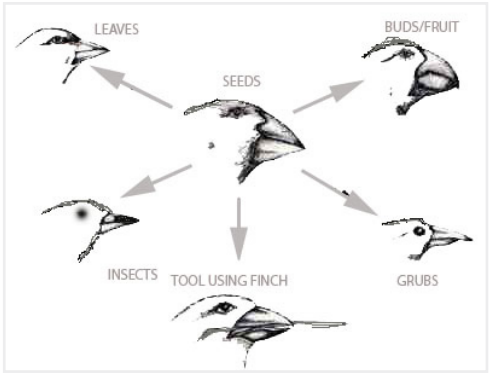
f. Do you agree with Daniel Dennet's opinion about the best idea that anybody's ever had? Why?

"If I ever give a prize to the single best idea that anybody's ever had, I'll give it to Darwin for the idea of natural selection. Ahead of Newton, ahead of Einstein, it was Darwin's great stroke to see how to reunite the facts of the excellence of design of all the different species. He understood that what he was proposing was a truly revolutionary great idea." Philosopher, Daniel Dennet

ACADEMIC SKILLS: MIND MAPS

Watch the video again and use the information given in the following text to build a mind map about Darwin and his theories

Charles Darwin was an English naturalist. He studied variation in plants and animals during a five-year voyage around the world in the 19th century. He explained his ideas about evolution in a book called On the Origin of Species, which was published in 1859. Darwin studied the wildlife on the Galápagos Islands - a group of islands on the equator almost 1,000 kilometres west of Ecuador. He noticed that the finches - songbirds - on the different islands there were fundamentally similar to each other, but showed wide variations in their size, beaks and claws from island to island. For example, their beaks were different depending on the local food source. Darwin concluded that, because the islands are so distant from the mainland, the finches that had arrived there in the past had changed over time.
Darwin studied hundreds more animal and plant species. After nearly 30 years of research, in 1858 he proposed his theory of evolution by natural selection



Adapted from BBC schools GCSE

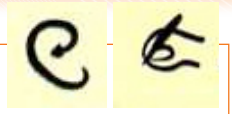
DIDYOU KNOWTHAT . . . . . ?

Many geniuses used the technique of mind mapping including: Leonardo. Da Vinci, Galileo Galilee, Charles Darwin, Sir Isaac Newton, Albert Einstein. Now it's your turn. In pairs try to build a mind map about Charles Darwin

Option 1:

Level of Difficulty ❑❑❑

OPTION 2



DARWIN

established

His theories caused

who was a

which means

who travelled to the

can result in

and observed

and which occurs through the process of

with different

with different

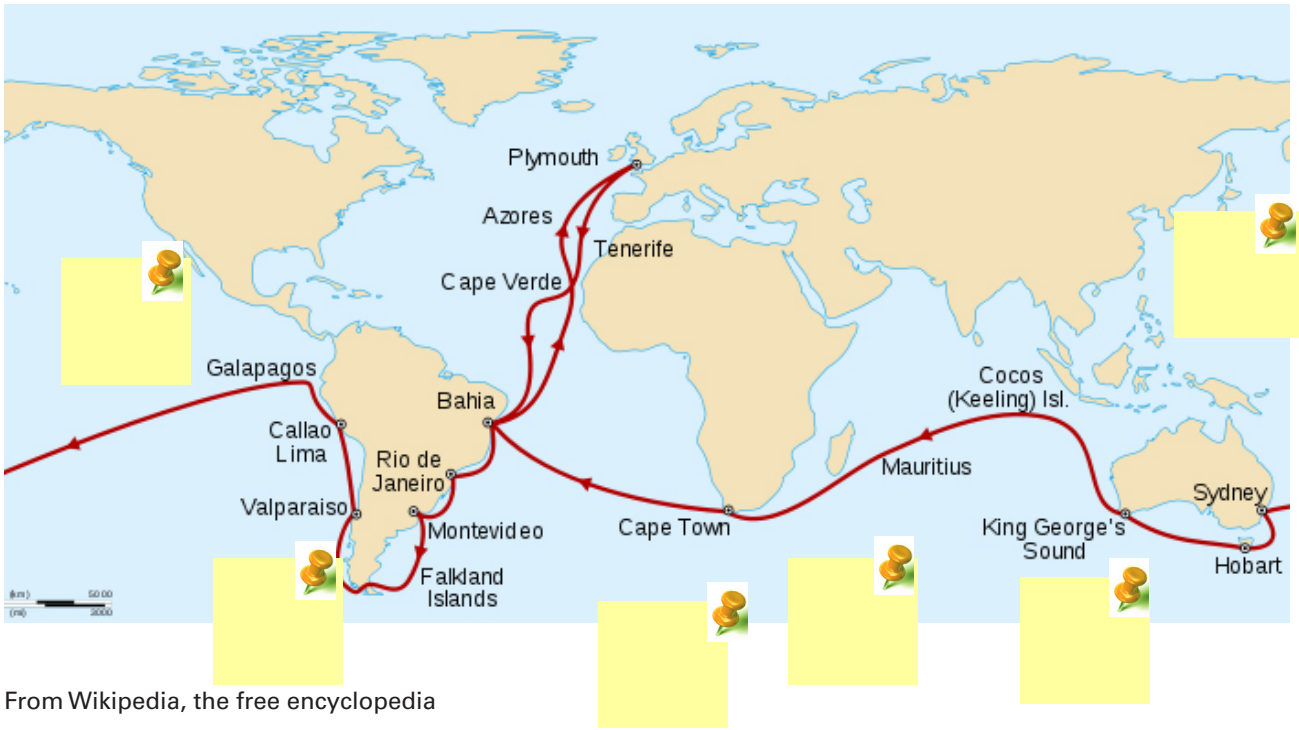
beaks

also known as the

Word Bank: change over time, finches, naturalist, evolution, survival of the fittest, natural selection, Galapagos, turtles, a new species, shaped shells, great controversy

EXTENSION: THE VOYAGE OF THE BEAGLE

Darwin travelled for 5 years on the Beagle. Tell your partners the story of his voyage and his discoveries using this map and searching the Internet.



From Wikipedia, the free encyclopedia

http://www.nhm.ac.uk/resources/nature-online/science-of-natural-history/beagle-journey/beagle-journey.swf
http://en.wikipedia.org/wiki/Charles_Darwin
http://www.pbs.org/wgbh/evolution/educators/teachstuds/pdf/darwins_excerpts.pdf

Here are some questions that can help you to prepare the presentation:

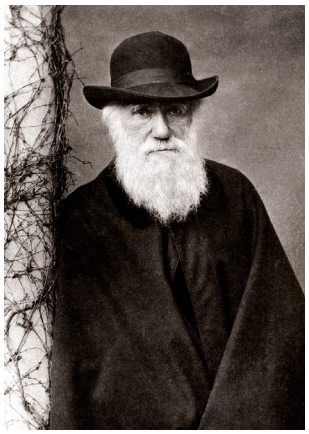
1. What did he find out in each of these places? What did he observe? Use the post-it to write down notes and illustrate the map
2. When did he visit each of these places? Did he visit any other places?
3. What were the three most significant observations made by him?

If you don't have Internet access, here is a text you may find useful.

Darwin spent five years on board a Royal Navy exploring ship, the HMS Beagle. He was the guest naturalist, responsible for making collections and notes about the animals, plants, and the geology of the countries they visited. The ship's crew made charts of all the coastal areas, which could be used by the navy wherever it went in the world. At the time, Britain had by far the largest navy in the world, and an empire which was global.
Darwin collected everywhere the ship weighed anchor. He found huge fossils of recently extinct mammals, experienced an earthquake in Chile, and noticed the land had been raised. Then he saw raised beaches elsewhere, high in the Andes, with fossil seashells and trees which had once grown on a sandy beach. Obviously the earth was constantly changing, with land rising in some places, and sinking in others. He collected birds and insects, and sent shipments back to Cambridge for experts to identify. Darwin was the first dedicated naturalist to visit the Galapagos Islands, off the west coast of Ecuador. He noticed that some of the birds were like mockingbirds on the mainland, but different enough to be placed in separate species. He began to wonder how so many new species came to be on these islands.
When Charles got back to England, he edited a series of scientific reviews of the Voyage, and he wrote a personal journal which we know as the Voyage of the Beagle. It is one of the great natural history travel diaries.

From Wikipedia, the free encyclopedia

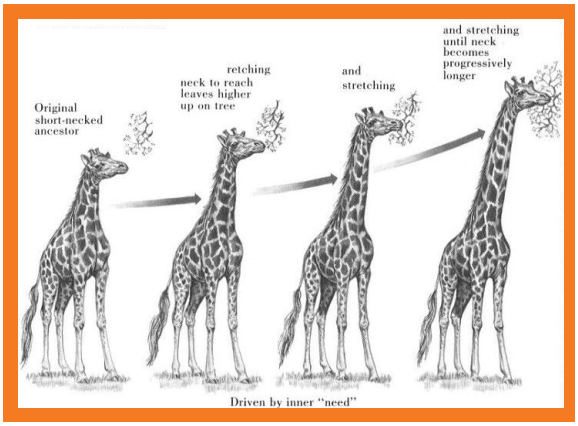
Section 2: Evolution

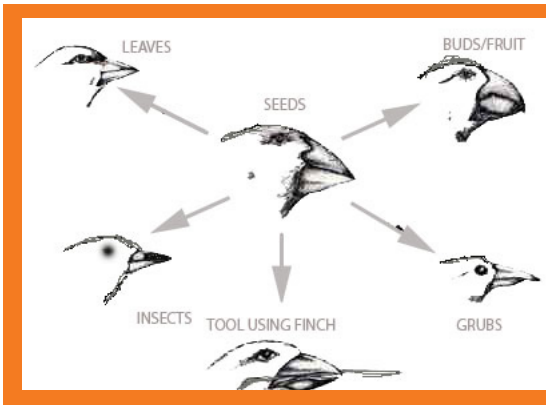


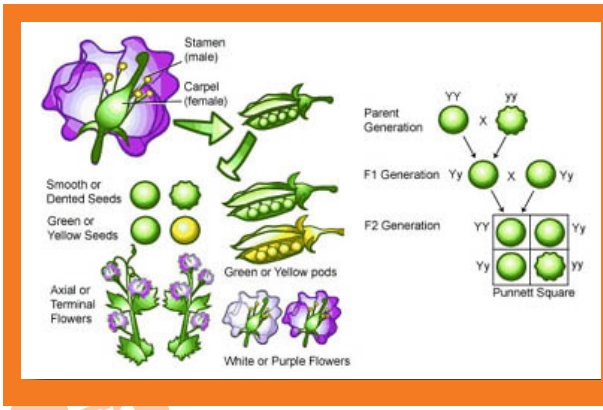
In this part of the lesson, you will learn about several scientists and their theories.
We will also explore the basic mechanisms of Evolution. The basic aim at this point is to understand the principles behind the theory of Evolution, as well as define some key terms related to this theory.
-What is Lamarckism?
-What is natural selection?
-What is genetic drift? and genetic splitting?
- Who was Mendel?
- What were the limitations of Lamarck's and Darwin's theory?

A. FAMOUS SCIENTISTS AND THEIR THEORIES ON EVOLUTION

1. What do these illustrations show? What theory are they related to?







HISTORY OF EVOLUTION

1. Read the texts and match them with the corresponding picture, shown in the previous page.

Jean-Baptiste de Lamarck (1744–1829), a French biologist, claimed that animals changed according to natural laws. He said that animals could pass on **traits** they had acquired during their lifetime to their offspring, using **inheritance**. Today, his theory is known as **Lamarckism**. Its main purpose is to explain adaptations by natural means. He proposed a tendency for organisms to become more complex, moving up a ladder of progress, plus use and disuse.
Lamarck's idea was that a giraffe's neck grew longer because it tried to reach higher up. This idea failed because it cannot be reconciled with heredity (Mendel's work). Mendel made his discoveries about half a century after Lamarck's work.

Key terms:

Charles Darwin (1809–1882) wrote a book called The Origin of Species in 1859. In this book, Darwin put forward much evidence that **evolution** had occurred. He also proposed **natural selection** as the way evolution had taken place. But Darwin did not understand about genetics and how traits were actually passed on. He could not accurately explain what made children look like their parents.
In contrast to Lamarck, Darwin's idea was that the giraffe's neck became longer because those with longer necks survived better. These survivors passed their genes on, and in time the whole race got longer necks.

Key terms:

Mendel
An Austrian monk called Gregor Mendel (1822–1884) bred plants. In the mid- 19th century, he discovered how traits were passed on from one generation to the next. He used peas for his experiments: some peas have white flowers and others have red ones. Some peas have green seeds and others have yellow seeds. Mendel used artificial pollination to breed the peas. Darwin thought that the inheritance from both parents blended together. Mendel proved that the genes from the two parents stay separate, and may be passed on to later generations. But Mendel published his results in a journal that was not well-known, and his discoveries were overlooked. Around 1900, his work was rediscovered.
It turned out that things called **genes** were passed from parent to child. Genes are bits of information that work like a set of instructions. A set of genes are in every living cell. Together, genes organise the way an egg develops into an adult. With mammals and many other living things, a copy of each gene comes from the father and another copy from the mother. Some living organisms, including some plants, only have one parent, so get all their genes from them. These genes produce the **genetic differences** that evolution acts on.

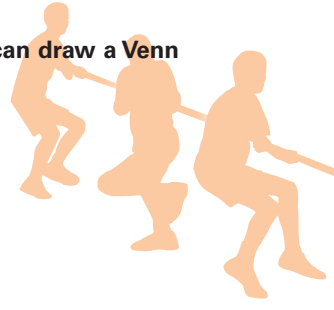
Key terms:

Modern evolutionary synthesis
This explains how the ideas of Charles Darwin fit with the discoveries of Gregor Mendel, who found out how we inherit our genes. The modern synthesis brought Darwin's idea up to date. It bridged the gap between different types of biologists: geneticists, naturalists, and palaeontologists. When the theory of evolution was developed, it was not clear that natural selection and genetics worked together. But Ronald Fisher showed that natural selection would work to change species. Sewall Wright explained genetic drift in 1931.
• Evolution and genetics: evolution consists mainly of changes in the frequencies of alleles between one generation and another.
• Evolution and fossils: the same factors which act today also acted in the past.
• Natural selection: The struggle for existence of animals and plant in the wild causes natural selection. The strength of natural selection in the wild was greater than even Darwin expected.
• Genetic drift can be important in small populations.
• The rate of evolution can vary.

Key terms:

COMPARING: SIMILARITIES AND DIFFERENCES

2. Read the texts again and compare the different theories (e.g. hypothesis and problems). You can draw a Venn diagram or a chart to show similarities and differences.



3. Use the following beginnings to write statements about them and their theories.

1. Both ..... and ..... believed that.....
2. Neither .... nor .....thought that .....
3. .....proved that.....
4. ..... found out how .....
5. Unlike ....., ...showed that.....

4. Extra: What are the closest theories? What theories stand the furthest? Give reasons

DEFINING KEY TERMS

Create a glossary. Include all the key terms which appear through the lesson.

2. Use the notes to define the terms which appear above. Then check, using an online dictionary.

http://biology-online.org/dictionary

	is the transmission and reception by animal or plant generation.
	is the adjustment or change in behavior, physiology, and structure of an organism to become more suited to an environment. According to Charles Darwin's theory of evolution by natural selection, the organisms adapt to their environment to become better fitted to survive and passing their genes on to the next generation.
	is a modification, difference or deviation in structure, form or function in an organism, deviating from other organisms of the same species or group.
	is a group of genetically related organisms which constitutes a single step in the line of descent.
	is an individual living thing that can react to stimuli, reproduce, and grow.

	is the change in genetic composition of a population over successive generations, which may be caused by natural selection, inbreeding, hybridization, or mutation.
	are characteristics or attributes of an organism that are expressed by genes and/or influenced by the environment. They include physical attributes of an organism such as hair color, leaf shape, size, etc., and behavioral characteristics, such as bird nesting.
	is the lowest taxonomic rank, and the most basic unit or category of biological classification.

Two terms are not defined. Try to write a definition for them, using the following model:

Simple three-part definitions

Term	*is/are*	***The Class of object***	***Identifying features or characteristics***

Examples:
Liquid, Mineral, Living being, branch of science, tool, organism, etc.

Biology is	the branch of science	which is concerned with the structure, function, growth, evolution, and distribution of living and non-living organisms.
Term	***The Class of object***	***Identifying features or characteristics***

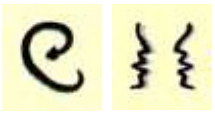
Extra: Defining Race

In pairs, try to write as many definitions as possible for terms related to early theories of evolution. Then check your classmates' knowledge of the topic.

B. The Theory of Evolution and its mechanisms: Natural Selection, Genetic Drift and Species Splitting

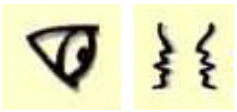
The theory of evolution states that evolution mainly works by natural selection. What does this mean? Animals and plants which are best suited to their environment will, on average, survive better. There is a struggle for existence.
Those who survive will produce the next generation. Their genes will be passed on, and the genes of those who did not reproduce will not. This is the basic mechanism which changes a population and causes evolution.

1. Watch the following video about the mechanism of "natural selection" and then choose the right answer:



1.- Every species exhibits . . .
a) the same traits b) variations c) colour d) none of the above
2.- Natural selection is only one of the processes of evolution. The oher process that can cause change in a species over time is . . . .
a) reproduction b) disease c) mutation d) all of the above
3.- Darwin's theory of natural selection states that life in the wild is competitive and organisms with the most beneficial traits will prosper. This is commonly known as . . .
a) survival of the strongest b) survival of the fittest c) survival of the fattest d) survival of the fastest

2. Now read and answer the following questions

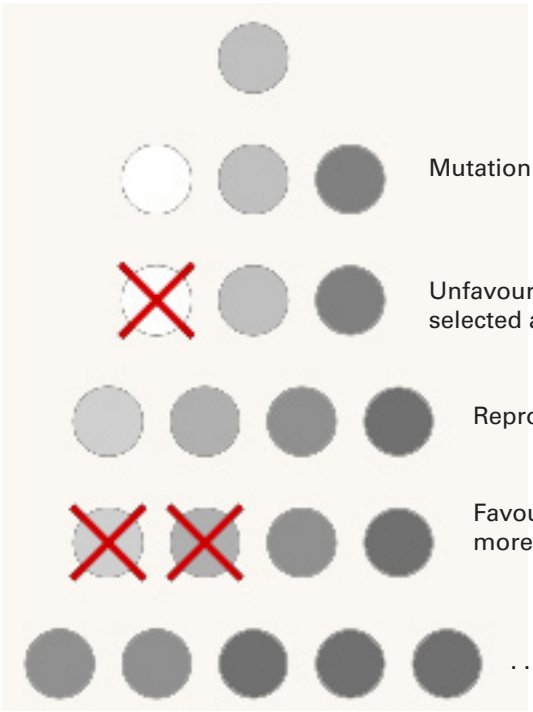


1.- What is the relationship between "evolution" and "natural selection"?
2.- How does natural selection work?
3.- Apart from the wings of birds, can you think of any other good example of evolution?

Natural selection
Natural selection explains why living organisms change over time to have the anatomy, the functions and behaviour that they have. It works like this:
- All living things have such fertility that their population size could increase rapidly for ever.
- We see that the size of populations does not increase to this extent. Mostly, numbers remain about the same.
- The food and other resources are limited. Therefore, there is competition for food and resources.
- No two individuals are alike. Therefore, they will not have the same chances to live and reproduce.
- Much of this variation can be inherited. The parents pass such traits to the children through their genes.
- The next generation can only come from those that survive and reproduce. After many generations of this, the population will have more helpful genetic differences, and fewer harmful ones. Natural selection is really a process of elimination.
The elimination is being caused by the relative fit between the individuals, and the environment they live in. The wings of birds are good examples of evolution that is caused by the creature adapting (changing to fit in) to its environment. Many birds' wings have evolved so that they can fly in different ways, depending on their needs. Forest birds have different needs to desert birds. Vultures live where there is little food. They have to search for it over long distances. Their wings have evolved for soaring so that they do not use much energy when flying for long periods of time. Penguins spend a lot of time in the ocean. Over time their wings evolved into flippers so that penguins now fly through water, but not through air. Other birds, like ostriches, live on the ground, and do not need their wings to fly. These birds can run fast, and also defend themselves. The wings got smaller. Ostriches' wings are now used only for display. The bird fluffs its wings out to make its body look bigger.

Glossary

population: a group of organisms of the same species populating a given area;
alike: having the same characteristics
inherit: receive by genetic transmission
traits:attributes, distinguishing features
wings: movable organ for flying (one of a pair)
evolve: undergo development or evolution
vultures: any of various large diurnal birds of prey having naked heads and weak claws and feeding chiefly on carrion
flippers: fins
fluff:erect
soaring:flying or gliding
an ostrich: fast-running African flightless bird with two-toed feet; largest living bird



3. Read the following situation below and identify the 5 points of Darwin's natural selection

There are 2 types of worms: worms that eat at night (nocturnal) and worms that eat during the day (diurnal).The birds eat during the day and seem to be eating ONLY the diurnal worms. The nocturnal worms are in their burrows during this time. Each spring when the worms reproduce, they have about 500 babies but only 100 of these 500 ever become old enough to reproduce

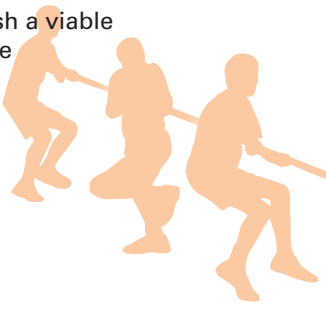
Identify the 5 points in this scenario:

Population has variations. . . . . .
Some variations are favourable. . . . . .
More offspring are produced than survive. . . . . .
Those that survive have favourable traits. . . . . .
A population will change over time. . . . . .

4. Finished? play the survival game and experiment with theoretical species.

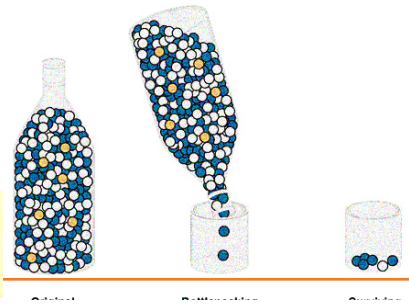
http://science.discovery.com/interactives/literacy/darwin/media/darwin.swf

Aim: to establish a viable lineage



1. Read the text and and then complete the following statement

1.-What does the picture show?
2.-What does genetic drift explain?
3.-How does it work?
Genetic drift is the change brought about in . . . . .



Genetic drift and its effect

Genetic drift explains how random chance can affect evolution in surprisingly big ways, but only when populations are quite small. What 'small' means would depend on the organism. 50 individuals is small, 5000 is not, 500 is maybe.

The basic mechanism of drift is that genetic variety is reduced by chance, making the individuals more similar to each other, and hence more vulnerable.

❑ Drift reduces genetic variation in populations, potentially reducing a population's ability to survive new selective pressures.

❑ Genetic drift acts faster and has more drastic results in smaller populations. Small populations usually become extinct.

❑ Genetic drift may contribute to speciation, if the small group does survive.

❑ Bottleneck events: when a large population is suddenly and drastically reduced in size by some event, the genetic variety will be very much reduced. Infections and extreme climate events are frequent causes. Occasionally, invasions by more competitive species can be devastating.

❑ In the 1880/90s, hunting reduced the Northern elephant seal to only about 20 individuals. Although the population has rebounded, its genetic variability is much less than that of the Southern elephant seal.

❑ Cheetahs have very little variation. We think the species was reduced to a small number at some recent time. Because it lacks genetic variation, it is in danger from infectious diseases.

❑ Founder events: these occur when a small group buds off from a larger population. The small group then lives separately from the main population. The human species is often quoted as having been through such stages. For example, when groups left Africa to set up elsewhere. Apparently, we have less variation than would be expected from our worldwide distribution.

Groups that arrive on islands far from the mainland are also good examples. These groups, by virtue of their small size, cannot carry the full range of alleles to be found in the parent population.

2. Read again and answer the following questions

1.-What does the picture show?

2.-What does genetic drift explain?

3.-How does it work?

Word Help
to bud: start to grow or develop
cheetah:

Learning and applying knowledge

3. What population would be more likely to evolve by genetic drift ? and why?
a) A bird population with 500 breeding pairs
b) A bird population with 5 breeding pairs
c) The population of China

4. What scenario below is an example of genetic drift? and Why?

a) In a population of 20 individuals, 15 individuals are fast enough to elude predators, but the other 5 are too slow and get eaten. All of the individuals in the next genaration are fast.

b) A small forest consists of a species of trees that differs in the colour of its leaves. half of the trees have dark green leaves and the other have light gree. During a terrible storm, a lightning struck the forest and causes a big fire, burning many trees. The next generation of individuals born from the surviving trees are made up of 35 % trees with dark green leaves and 65% of trees with light green leaves

Glossary

Write definitions for each word, using the phrases provided. Add any other word you don't know.

At random:

By chance:

Speciation:

Alleles:

GLOSSARY

an unknown and unpredictable phenomenon

governed by or depending on chance

the evolution of a biological species

one of two alternate forms of a gene

a b c d e f g h i

1.- What does "splitting" mean? Read the text below and find out what "species splitting" mean

Species splitting

Two groups that start the same can also become very different if they live in different places. When a species gets split into two geographical regions, a process starts. Each adapts to its own situation. After a while, individuals from one group can no longer reproduce with the other group. Two good species have evolved from one.
A German explorer, Moritz Wagner, during his three years in Algeria in the 1830s, studied flightless beetles. Each species is confined to a stretch of the north coast between rivers which descend from the Atlas mountains to the Mediterranean.
As soon as one crosses a river, a different but closely related species appears. He wrote later:
"... a [new] species will only [arise] when a few individuals [cross] the limiting borders of their range... the formation of a new race will never succeed... without a long continued separation of the colonists from the other members of their species". (Wagner M. Reisen in der Regentschaft Algier in den Jahren 1836, 1837 & 1838. Voss, Leipzig. p199-200)
This was an early account of the importance of geographical separation. Wagner's ideas were actually based in Lamarckian thinking (regarding the ability of individuals to generate species-level changes) and didn't attract much support- -except among some ethnographers (for example, Friedrich Ratzel), who found them somewhat more applicable in aiding an understanding of human cultural evolution. In fact, the leading evolutionists (Darwin, Wallace, Weismann) attacked Wagner's idea of geographic speciation, and it suffered a long decline until 1942 when it was reintroduced by Mayr. The importance of geographic speciation became one of the core ideas of the evolutionary synthesis.

One example of natural speciation is the three-spined stickleback, a sea fish that, after the last ice age, invaded freshwater, and set up colonies in isolated lakes and streams. Over about 10,000 generations, the sticklebacks show great differences, including variations in fins, changes in the number or size of their bony plates, variable jaw structure, and colour differences.
The wombats of Australia fall into two main groups, Common wombats and Hairy-nosed wombats. The two types look very similar, apart from the hairiness of their noses. However, they are adapted to different environments. Common wombats live in forested areas and eat mostly green food with lots of moisture. They often feed in the daytime. Hairynosed wombats live on hot dry plains where they eat dry grass with very little water or goodness in it. Their metabolic system is slow and they sleep most of the day underground. When two groups that started the same become different enough, then they become two different species. Part of the theory of evolution is that all living things started off the same, but then split off into different groups over billions of years

2. Read the text again and then complete the sentences

1.- Species splitting is the process by which .....

2.- At first, Moritz Wagner's idea about ..... attracted little support, but then, geographic speciation .....

3.- Both the wombats of Australia and the three- spined sticklebacks are examples of how .....

TASK: My glossary file
(Possible variation: wiki glossary)

Section 3: Evidences supporting evolution

RESEARCH

In groups, you will be assigned a specific evidence which supports evolution and you will have to find information, and inform your classmates by means of a presentation. Use the links provided, your textbook or any other resources available.

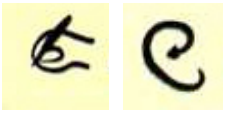
Evidence from paleontology *fossil records* *limitations of fossil evidence*	***Evidence from comparative anatomy*** *homologous and analogous structures- convergent and divergent evolution*	***Evidence from embryology***
Evidence from bio-geography *continental distribution* *- evidence from migration and isolation* *- continental drift* *-oceanic island distribution*	***Evidence from biochemistry and genetics*** *- mutations* *- DNA hybridisation* *- amino acid sequencing* *- bacterial resistance to antibiotics*	***Direct evidence:*** *Examples of artificial selection* *- Domestic dogs* *-Crop seeds*
Biological evidence: *Examples of natural selection* *-peppered moths*		

FACTSHEET

Type of evidence:
Overview:
Examples:
Limitations:

Useful Links:
http://en.wikipedia.org/wiki/Evidence_of_common_descent
http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/evolution/evolutionrev3.shtml
http://evolution.berkeley.edu/evolibrary/article/0_0_0/lines_01
http://anthro.palomar.edu/evolve/evolve_3.htm
http://txtwriter.com/Backgrounders/Evolution/EVcontents.html
http://www.search.com/reference/Evidence_of_evolution
http://evolution.suite101.com/article.cfm/the_evidence_for_evolutio

Option A.
Listen to the presentations and try to complete the following chart with the information provided by your classmates. Add as many branches and boxes as you need.



Evolution

is supported by

fossil evidence

biogeography

such as

which helps us understand the discontinuity of species distribution, by means of

Continental Biogeography

Island Biogeography

like the

like the

which explains

However, there are limitations

which can be seen in

such as

Option B.
Listen to the presentations and try to complete the following chart with the information provided by your classmates.

	Evidence for evolution	
Special Areas of Interest	***Evidence (descriptions or drawings)***	***Limitations***
Anatomy		
Molecular biology		
Paleontology		
Embryology		
Biochemistry and Genetics		
Biological evidence		
Direct evidence		
Others,		

Source: http://www.pbs.org/wgbh/evolution/educators/lessons/lesson3/act2.html

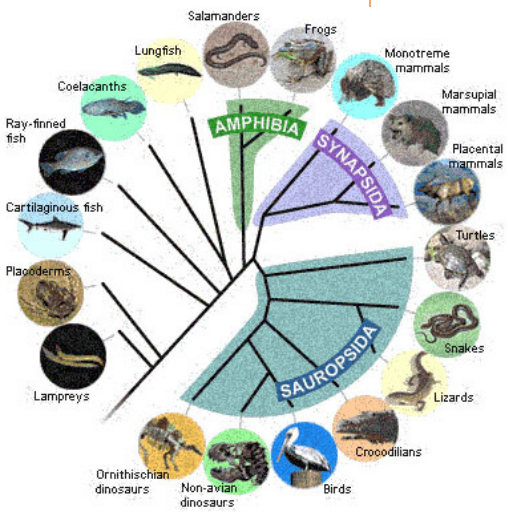
Section 4: Phylogenetic trees and human evolution

What are phylogenetic trees? What are they used for?

1) Order the following sentence parts so the resulting text makes full sense. Check the meaning of the words below, before you start.

☐ a) biologists collect data about the characters	☐ a) a derived character is one that evolved in the lineage	☐ a) and its descendents have inherited that feature
☐ b) to build a phylogenetic tree	☐ b) apart from other individuals	☐ b) so the presence of four limbs is a homology
☐ c) of each organism they are interested in	☐ c)leading up to a clade	☐ c) the ancestor of tetrapods evolved four limbs
	☐ d) and that sets members of that clade	

Copy the text here:

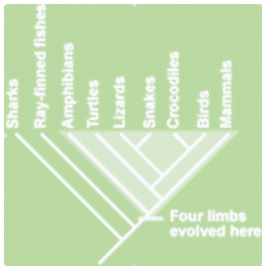


Now read the following text and check if your guesses were correct

Phylogenetic trees are like family trees: both represent patterns of ancestry. However, while families have the opportunity to record their own history, evolutionary lineages do not —.
Species in nature do not show their family histories. Then biologists must reconstruct those histories by collecting and analyzing evidence, which they use to form a hypothesis about how the organisms are related. This is called a phylogeny.
To build a phylogenetic tree such as the one to the right, biologists collect data about the characters of each organism they are interested in. Characters are heritable traits that can be compared from organism to organism, such as physical characteristics (morphology), genetic sequences, and behavioral traits. In order to construct the vertebrate phylogeny, we begin by examining representatives of each lineage to learn about their basic morphology: we look at features like if the lineage has vertebrae, a bony skeleton, four limbs (arms or legs), etc.

Using shared derived characters

Our goal is to find evidence that will help us group organisms into less and less inclusive clades. Specifically, we are interested in shared derived characters. A shared character is one that two lineages have in common, and a derived character is one that evolved in the lineage leading up to a clade and that sets members of that clade apart from other individuals. Shared derived characters can be used to group organisms into clades. For example, amphibians, turtles, lizards, snakes, crocodiles, birds and mammals all have, or historically had, four limbs. If you look at a modern snake you might not see obvious limbs, but fossils show that ancient snakes did have limbs, and some modern snakes actually do retain rudimentary limbs. Four limbs is a shared derived character inherited from a common ancestor that helps set apart this particular clade of vertebrates. However, the presence of four limbs is not useful for determining relationships within the clade in green above, since all lineages in the clade have that character. To determine the relationships in that clade, we would need to examine other characters that vary across the lineages in the clade.



Homologies and analogies

Since a phylogenetic tree is a hypothesis about evolutionary relationships, we want to use characters that are good and reliable indicators of common ancestry. We use homologous characters — characters in different organisms that are similar because they were inherited from a common ancestor that also had that character.

An example of homologous characters is the four limbs of tetrapods. Birds, bats, mice, and crocodiles all have four limbs. Sharks and bony fish do not. The ancestor of tetrapods evolved four limbs, and its descendents have inherited that feature — so the presence of four limbs is a homology. Not all characters are homologies. For example, birds and bats both have wings, while mice and crocodiles do not. That does not mean that birds and bats are more closely related to one another than to mice and crocodiles.

When we examine bird wings and bat wings closely, we see that there are some major differences.

Bat wings consist of flaps of skin stretched between the bones of the fingers and arm. Bird wings consist of feathers extending all along the arm. These structural dissimilarities suggest that bird wings and bat wings were not inherited from a common ancestor with wings. This idea is illustrated by the phylogeny below, which is based on a large number of other characters

Bird and bat wings are analogous — that is, they have separate evolutionary origins, but are superficially similar because they evolved to serve the same function. Analogies are the result of convergent evolution.

Word Help

homologous :
(adj) [From Greek homologos, agreeing : homo-, homo- + logos, word, proportion] Similar in structure and evolutionary origin, though not necessarily in function

tetrapod:
(n) any vertebrate that has four limbs

2) Sequencing. Tell the right order of the following statements as they appear in the text.

a. Birds and bats have different structural similarities.

b. To draw a tree we need to group organisms into less and less inclusive clades.

c. Birds and bats have separate evolutionary origin.

d. We need to examine representatives of each lineage to construct their phylogeny.

e. Birds and bats have wings.

3) Answers the following questions based on the sections above:

a. Why do we need to examine representatives to make a phylogeny?

.....

b. What types of characters are there?

.....

c. Why can you define a phylogenetic tree as a hypotheses on evolution?

.....

Understanding the differences and similarities between 'homology' and 'similarity':
homology: similarity inherited from a common ancestor
analogy: similarity due to convergent evolution
Click here, if you want to know more: http://evolution.berkeley.edu/evolibrary/article/similarity_hs_01

Ancestors and DNA sharing

1) Which of the following statements on human evolution do you think are correct? Read the statements in pairs and discuss if they are true or false.

a) Humans are descendants from chimpanzees.

b) In evolutionary theory, humans are considered African apes.

c) Gorillas and humans are not related in any way.

2) Watch this video with Prof. Richard Dawkins on humans (homo sapiens) and their closest living relatives: chimpanzees. Listen to Prof Dawkins's presentation and learn about the evolution of the human species.

Why are there still chimpanzees?

Did you know that in English we say "DNA" instead of ADN?
DNA stands for DeoxyriboNucleic Acid

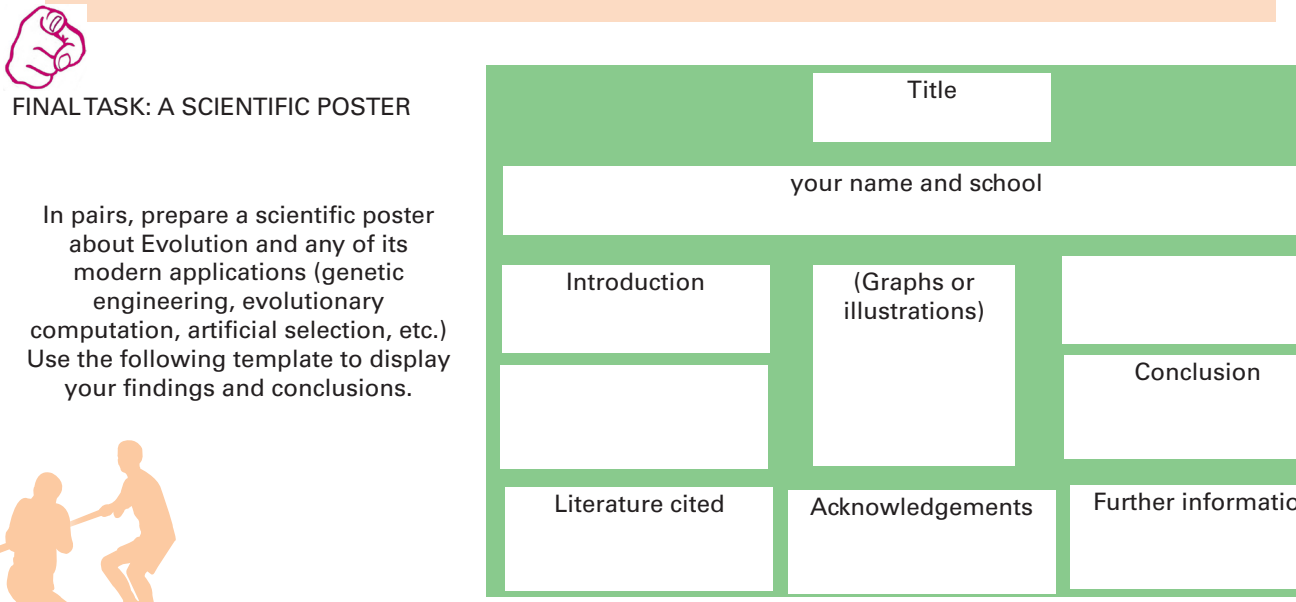
3.- Watch the video again and complete the text below

OUR CLOSEST LIVING RELATIVES

Although many people do not believe it humans are not _____ ____. Chimpanzees and humans are both descendants from a common ancestor who lived ____ _____.
That common ancestor then produced two branches, one of which then went to us humans and one of which went to chimpanzees branching _____ ____.That means that we are all _____. We are not descendants from chimpanzees.
More distantly related are gorillas.
Human and chimps are a natural group related to gorillas, which are all African apes. All the African apes have _____with orangutans.
As a conclusion, we can say that all great apes are cousins. Within the great apes, the African apes are closer cousins. Within the African apes, humans, bonobos and chimpanzees are closer cousins and within them , bonobos and chimpanzees are _____ _____ of all.

FINAL TASK: A SCIENTIFIC POSTER

In pairs, prepare a scientific poster about Evolution and any of its modern applications (genetic engineering, evolutionary computation, artificial selection, etc.) Use the following template to display your findings and conclusions.



Assessment Rubric

Content	4. All sections are well developed. All information included is relevant.	
	3. All sections are quite well developed. Information included is relevant.	
	2. Most sections are present. Most information items are relevant.	
	1. Poster is incomplete. Information included is mostly irrelevant.	
Acquired needed knowledge	4. Student demonstrates knowledge. He/she can accurately answer all questions related to facts in the poster.	
	3. Student demonstrates knowledge. He/she can accurately answer most questions related to facts in the poster.	
	2. Student demonstrates knowledge. He/she can accurately answer 60% questions related to facts in the poster.	
	1. Student demonstrates insufficient knowledge. He/she cannot answer questions accurately	
Information gathering	4.Information is gathered from multiple electronic and non-electronic sources and **cited properly.**	
	3. Information is gathered from multiple electronic and non-electronic sources.	
	2.Information is gathered from limited sources	
	1.Poor gathering of information.	
Title	4. Title can be read from reasonable distance and is quite creative.	
	3. Title can be read from a reasonable distance and describes content well.	
	2. Title can be read and describes content.	
	1. The title is too small and/or does not describe the content of the poster well	
Graphics/ Clarity	4.Graphics are all in focus and the content easily viewed and identified from reasonable distance	
	3. Most graphics are in focus and the content easily viewed and identified	
	2.Most graphics are in focus and the content is easily viewed from close distance	
	1. Many graphics are not clear or are too small	
Mechanics	4. Grammar, punctuation and spelling are correct throughout the poster.	
	3. Only one or two grammar, punctuation or spelling mistakes	
	2. Very few mistakes in grammar, punctuation or spelling	
	1. There are a lot of mistakes	
Design	4.The poster is extremely attractive in terms of design, layout and neatness.	
	3. The poster is attractive in terms of design, layout and neatness.	
	2. The poster is acceptably attractive although a bit messy.	
	1. The poster is very poorly designed.	
		TOTAL: