

Regents Biology

Homework Packet

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Crossword Puzzle =

Name: _____

North Salem High School

MISSION: *Engage students to continuously learn, question, define and solve problems through critical and creative thinking.*

Evolution

The theory of evolution by natural selection, first formulated in Darwin's book "On the Origin of Species" in 1859, is the process by which organisms change over time as a result of changes in heritable physical or behavioral traits. Changes that allow an organism to better adapt to its environment will help it survive and have more offspring. Evolution by natural selection is one of the best substantiated theories in the history of science, supported by evidence from a wide variety of scientific disciplines, including paleontology, geology, genetics and embryology. We will also review how Gel Electrophoresis / DNA Fingerprinting can be used to determine how related different species are and whether they share a *recent common ancestor*.

Let's get to work!

If you have any problems – please sign up for extra help after school.

**Mr. Collea
Room W-19**

ASSIGNMENT #1

DIRECTIONS: Please use *complete sentences* to answer each of the questions that follow. Please place all answers in the space provided.

1. In its most general sense, what does the term *evolution* mean? (p. 571)

In its most general sense, evolution means a gradual change over time.

2. About how long ago did the earth form? (p. 571)

The earth formed 4.5 billion years ago.

3. The study of fossils provides the strongest evidence of evolution. Define *fossil* (p. 571)

A fossil is an trace or remains of an organism that has been preserved by natural processes.

4. In what kind of rock are most fossils found? (p. 573)

Most fossils are found in sedimentary rock.

(Relative dating)

5. Within the sedimentary rock, where are the oldest fossils found? (p. 574)

The oldest fossils are found at the bottom of sedimentary rock deposits.

6. Define *relative dating* and describe how it applies to the age of fossils? (p. 575)

Relative dating is a method of determining the order in which events occurred.

This applies to fossils because fossils found in the lower layers of sedimentary rock represent organisms that lived at an earlier time than those fossils in the upper layers.

7. Define *absolute dating* and state the method of *absolute dating* scientists consider the most accurate and reliable? (p. 575)

Absolute dating determines how long ago an event occurred and scientists consider radioactive dating to be the most accurate and reliable.

8. What is the *geologic time scale*? (p. 578)

The geologic time scale is a timetable of the earth's history.

9. When does a species become *extinct* and give an example? (p. 580 - 581)

A species becomes extinct when the last individual of the species dies. The best known example of extinction is the dinosaurs.

ASSIGNMENT #2

DIRECTIONS: Please use *complete sentences* to answer each of the questions that follow. Please place all answers in the space provided.

1. What is *comparative anatomy*? (p. 581)

Comparative anatomy is the study of structural similarities and differences among living things.

2. What are *homologous structures* and provide examples of homologous structures? (p. 582)

Homologous structures are parts of different organisms that have similar structure and embryological development, but have different form and function.

Examples of homologous structures include the arm of a human, flipper of a whale, leg of a cats, wing of a bat and the wing of a bird.

3. What are *analogous structures* and provide examples of analogous structures? (p. 582)

Analogous structures are structures that have similar form and function but different internal structures. Examples of analogous are bird wings and insect wings.

4. What are *"useless"* *vestigial structures* and give 3 examples of vestigial structures in humans?

Vestigial structures are remnants of structures that were functional in an ancestral form. Examples include our tailbone, appendix and wisdom teeth.

ASSIGNMENT #3

DIRECTIONS: Please use *complete sentences* to answer each of the questions that follow. Please place all answers in the space provided.

1. Briefly describe Darwin's process of *natural selection*? (p. 602)

Darwin's process of natural selection states that organisms with favorable variations would be better able to survive and to reproduce than organisms with unfavorable variations.

2. List, and briefly describe the six main points to *Darwin's Theory of Evolution*? (p. 602 - 603)

- **OVERPRODUCTION** - Most species produce far more offspring than are needed to maintain a population. Species populations remain more or less constant because only a small fraction of offspring live long enough to reproduce.

- **COMPETITION** - Since living space and food are limited, offspring in each generation must compete among themselves and with other species for the necessities of life. Only a small fraction can possibly survive long enough to reproduce.

- **VARIATION** - Due to sexual reproduction (*meiosis and fertilization*) and **MUTATIONS**, the characteristics of individuals in any species are not exactly the same (except identical twins). Some of these variations **MAY** allow the individual to be better adapted and survive.

• **ADAPTATIONS** - Any kind of inherited trait that improves an organism's chances of survival and reproduction in a given environment.

• **NATURAL SELECTION** - The environment selects the plants and animals with optimum (best) traits to be the parents of the next generation.

• **SPECIATION** - Over MANY generations, favorable adaptations gradually accumulate in the species and unfavorable ones disappear resulting in the formation of an entirely new species.

Assignment #4

Go to Collea's Corner to watch the video *the Stated Clearly* video "What is Evolution?" and then answers the questions that follow.

What is Evolution?

1. What 2 things does the Theory of Evolution help us to understand? (0:22)

(a) **How life, once it came into existence - diversified into the many incredible forms we see now and in the fossil record.**

(b) **It also helps us makes sense of the way in which modern creatures continue to adapt and change today.**

2. In biology, how can Evolution be defined? (0:47)

Any change in the heritable traits within a population across generations.

3. What is DNA? (1:33) **Makes Proteins!**

DNA is a chain-like chemical stored inside each one of your cells (nucleus) which tells them how to grow (mitosis) and function.

4. How do single-celled animals like an amoeba reproduce? (1:59)

By copying their DNA - inside their (guts) - moving both copies to either side of their body, splitting in two right down the middle and then growing back to full size.

(Genetically Identical)

5. How do amoebas reproduce? **ASEXUALLY** or **SEXUALLY**

6. What is a mutation? (2:27)

Changes in DNA - errors or mistakes that occur which modify the DNA code.

7. What can mutation in DNA produce? (2:34)

Mutations can produce variation in body shape and function of the creature who inherits the modified or changed DNA.

8. How is reproduction for dolphins, badgers and humans a little more complicated? (3:10)

They have to find a partner, (*fall in love*), have sex so that a sperm cell from the father which contains half of his DNA combines with the egg cell of the mother, which contains half a copy of her DNA, resulting in a brand new cell with a complete, UNIQUE set of DNA instructions to grow up into a brand new organism.

9. How do badgers reproduce? **ASEXUALLY** or **SEXUALLY**

(Meiosis + Fertilization)

10. How can the baby badger develop some new traits of her own? (4:10)

The baby badger can develop some new traits of her own due to DNA mutations.

11. Who is the most recent common ancestor to dogs? (4:50) gray wolves

Artificial Selection

12. How did humans affect the evolution of dogs from wolves? (5:00)

Humans were selecting wolves with the traits they liked, letting them breed and only keeping the puppies with the most desirable traits.

13. All living things, if you go back far enough, share a common ancestor. (5:50)

14. We don't know what the first life form was or exactly how it came to be, but the simple process of reproduction with variation over billions of years looks to be responsible for all the diversity of life we see today. (6:05)

15. In the mid-1800s two men, Charles Darwin and Alfred Russel Wallace independently discovered, that a breeder is not necessarily needed. There is another force capable of guiding random evolution to produce order and complex function. They called it Natural Selection. (6:45)

Assignment #5

Go to Collea's Corner to watch the video *the Stated Clearly* video "What Exactly is Evolution?" and then fill-in-the-blanks that follow.

What is Natural Selection?

1. **Decent with Modification** is the observable fact that when parents have children, those children often look slightly **different** than their parents and slightly different than **each other**. (0:45)
2. **Common Descent** is the idea that all living things on earth are related, they descended from a **common ancestor**. Through the **gradual** process of descent with modification over many many generations, a **single** original species is thought to have given rise to all the life we see we today. (1:05)
3. The common descent of all life on earth is not a directly **observable** fact. We have **NO** way of going back in time to watch it happen. Instead, common descent is a conclusion based on a massive collection of facts. Facts found independently in the study of: **fossils**, **genetics** (DNA), **comparative anatomy** mathematics, **biochemistry**, and **species** distribution. (1:20)
4. All through history, no one could explain how complex life arose from simple life through random variation, until **Charles Darwin** discovered natural selection. (2:15)
5. Charles Darwin who lived from 1809-1882 was a naturalist - someone who studies nature. At the start of his career he traveled the world by **ship**, collecting and documenting plants and animals. (2:27)

6. During his travels, Darwin became very interested in the idea of common descent. He noticed that Islands contain species of plants and animals unique to those islands, they can't be found anywhere else on earth - but they often look and behave surprisingly similar to creatures found on nearby continents. (2:40)
7. The Galapagos is a collection of 18 main islands; many of which are home to tortoises. (3:55)
8. Darwin drew upon his knowledge of selective breeding to answer this question. For thousands of years, farmers have been taking wild plants and animals, and through the process of selective breeding, have sculpted the original wild forms into new domestic forms much better suited for human use and consumption. (4:45)
9. Darwin proposed that nature itself is also capable of selection. It may not have an intelligent brain like a farmer, but nature is an extremely dangerous place in which to live. (6:22)
10. When parents produce a variety of offspring, nature, simply by being difficult to survive in, decides which of those variations get to live and reproduce, and which do not. Over multiple generations, creatures become more and more fit for survival and reproduction within their specific environments. Darwin called this process: Natural Selection. (6:45)
11. Natural selection is the process by which random evolutionary changes are selected for by nature in a consistent, orderly, non-random way. Through the process of descent with modification, new traits are randomly produced. Nature then carefully decides which of those new traits to keep. (7:45)

Assignment #6

Go to Collea's Corner to watch the video *the Stated Clearly* video "What is the Evidence for Evolution?" and then fill-in-the-blanks that follow.

What is the Evidence for Evolution?

1. The theory of Evolution makes two very bold claims about living creatures: (0:10)

First: All living things on earth are related.

They evolved from a common ancestor.

Second: The evolution of living things is powered by natural processes.

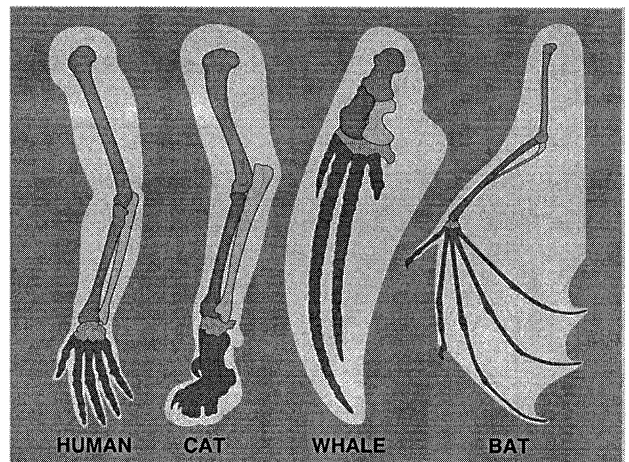
2. The field of comparative anatomy is the study of differences and similarities between living things. (1:30)

3. Whales, just like land mammals but unlike fish: (1:45)

- (a) have placentas (give birth to live young)
- (b) they feed milk to their young
- (c) are warm-blooded
- (d) have lungs - do NOT have gills

4. Many whales have hair, just like land mammals. (2:40)

5. Strangely, whales have arm, wrist, hand, and finger bones inside their front flippers. (2:50)



6. **Embryology** is the study of how creatures develop before being born or hatching from an egg. (3:53)
7. In humans, the leg buds grow to become **legs**. In whales, they grow for a while, but then **stop**, effectively fading away as the rest of the whale continues to grow. (4:10)
8. We have multiple facts from two lines of evidence, comparative **anatomy**, and **embryology**, both telling us the exact **same** story: the **ancestor** of whales were once 4 legged land creatures! (4:40)
9. Scientists have found the **fossils** of many ancient whale-like mammals have and continue to find more. Together, these fossils blur the line between 4 legged land mammals and fully aquatic whales, solidifying the idea that whales indeed, evolved **from** land creatures. (7:00)
10. **DNA** molecules contain chemical codes which act like recipes for living things. (7:20)
11. Without ever looking at bones, embryos, or anatomy, researchers can compare the **DNA** code of different living creatures to find out who is most closely **related** to who. (7:20)
12. If this genetic finding is correct, **whales** and **hippos** both evolved from a **common ancestor** which lived roughly **54** million years ago. (7:50)
13. We know from **fossils**, **DNA**, **embryology** and many other lines of evidence that bird wings are actually modified arms and claws! Birds **evolved** from dinosaur-like ancestors. (9:15)
14. We've found that humans share a fairly **recent common ancestor** with chimpanzees. (9:35)