

Accelerated Biology**Classification and Evolution Review Sheet**

1. What is the science of grouping organisms based on their evolutionary characteristics called?
Taxonomy
2. Why is classification important to biologists?
It eliminates confusion - All taxonomists will call organisms by the same name (i.e. the cougar, mountain lion, panther, and puma are different names for the same animal. The names varies depending on geographic location)
It helps biologists to determine evolutionary relationships. The more closely organisms are related, the more characteristics they will have in common, and the closer they will be placed taxonomically.
3. Who was the first person to classify organisms? What two groups did he use?
Aristotle
Plants and animals
4. Who invented the binomial nomenclature system of naming organisms?
Carolus Linnaeus; "The Father of Taxonomy"
5. What are the eight taxon levels in order from least specific to most specific?
Domain → Kingdom → Phylum → Class → Order → Family → Genus → Species
Remember: Does King Phillip chew on fat green stems?
6. What is the difference between a prokaryote and a eukaryote? Which one is more primitive?
Prokaryote - Does NOT have nucleus (more primitive)
Eukaryote - Does have nucleus
7. If there was no free oxygen in the early atmosphere, what was the source of the oxygen in today's atmosphere?
Plants added O₂ to the air in the process of photosynthesis!
 $CO_2 + H_2O + \text{light} \rightarrow C_6H_{12}O_6 + O_2$
8. What is a domain? What are the three domains?
It is a larger more comprehensive category than a kingdom.
9. What are the six kingdoms of organisms?
Eubacteria, Archaeobacteria, Protista, Fungi, Plantae, Animalia
10. How would a biologist determine if two organisms belong to the same species?
Only members of the same species can interbreed and produce FERTILE offspring.

11. The African lion belongs to the genus Panthera and species leo. Write its scientific name below.

Panthera leo or *Panthera leo*

12. Fill in the chart below. Include the following characteristics:

- Unicellular/multicellular
- Prokaryotic/eukaryotic
- How they obtain food
- Do they have a cell wall
- Can they photosynthesize
- Example organism

Euacteria	Archaeobacteria	Protista	Fungi	Plantae	Animalia
Unicellular	Unicellular	Mostly Unicellular	Mostly Multicellular	Multicellular	Multicellular
Prokaryotic	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Heterotroph or autotroph	Heterotroph or autotroph	Heterotroph or autotroph	Heterotroph	Autotroph	Heterotroph
Some Photosynthesize	Some photosynthesize	Some photosynthesize	None photosynthesize	All photosynthesize	None photosynthesize
Cell wall present	Cell wall present Live in extreme environments	No cell wall present	Cell wall present (made of chitin, not cellulose like in plants)	Cell wall present (cellulose)	No cell wall present

13. Define the following terms:

Variation – Differences among members of a population (i.e. color, size, speed)

Adaptation – An inherited, beneficial trait

Fitness – The ability of an organism to survive and REPRODUCE!

Mutation – The sudden change in the DNA of one individual

Evolution – Change over time in the characteristics of a population

14. Provide two examples of an adaption for a bird that feeds in the shallow waters of a pond.

Long legs to stand above water

Spoon-like bill to scoop up food from the water

15. What is a species? How would a biologist determine if two organisms belong to the same specie?

Only members of the same species can interbreed and produce FERTILE offspring.

16. Explain natural selection in the four steps we discussed in class.

- 1.) There are variations that exist among the members of a population
- 2.) There is a struggle for existence. Many more individuals are born than will survive
- 3.) Those members who are best adapted to the environment will live longer and reproduce more; survival of the fittest
- 4.) An increasing number of individuals will possess the beneficial trait in each new generation. Darwin called this "Descent with Modification."

= *change over time*

17. Write a concept generalization using the following terms; overpopulation, variation, survival of the fittest, and competition.

18. What is selection pressure? Provide two examples.

Anything that causes a population to change. Only the best adapted organisms will survive.

- 1.) Introduction of a new predator
- 2.) Changes in climate

19. Explain Lamarck's theory of Use and Disuse.

The more an organism uses a structure, the more developed it will become. For example, a giraffe will continually stretch its neck to reach the leaves in the upper canopy of the trees. Over its lifetime, the giraffe will ACQUIRE a longer neck. The giraffe can pass this acquired trait onto its offspring. We now know this is not correct! ACQUIRED TRAITS ARE NOT INHERITED!

20. How was Lamarck's theory disproven?

August Weissman, a German biologist, cut the tails off of hundreds of mice and then breed them. All of the offspring were born with a tail. The ACQUIRED TRAIT of not having a tail, was NOT passed onto the offspring. Lamarck was wrong.

21. Compare and contrast Darwin's and Lamarck's views about the role of the environment in evolution. (Need vs. Variation)

Lamarck - An INDIVIDUAL that ACQUIRES a trait during its lifetime can pass that trait on to its offspring.

Darwin - All members of a population possess variations. Some variations are beneficial, others variations are harmful. Those members that have the beneficial variations and are best adapted to their particular environment, will live longer and reproduce more. Thus, they will pass the beneficial trait onto their offspring. Repeat

this process generation after generation, for thousands of years, and the population will slowly change.

Read the passage below to answer the next three questions.

A population of rabbits live in a meadow. Some of the rabbits can run very fast, some can run at an average speed, and some run very slow. One day, several fox enter the meadow and begin to hunt the rabbits. Only the fastest rabbits survive being hunted by the fox.

22. What variation exists in the mouse population?

Speed

23. What is the environmental pressure in this example?

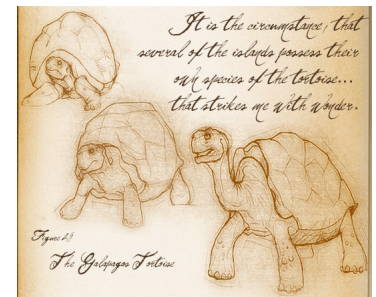
Being hunted by the fox

24. What adaptation will the mouse population have after many generations?

The rabbits in each generation will be slightly faster.

25. The tortoises shown below are three of the species Darwin found on the Galapagos Islands. Explain the process (in detail) that produced the three different species shown below.

These tortoises are each located on a different island, separated from one another. The prominent food source on each island varied. On one island, the main food source was found on the ground, another island contained a small shrub that the tortoise preferred, and on the third island, the food source was located higher up. Over many generations, the tortoises on each island that possessed the favorable variations that allowed them to get more food, survived longer, reproduced more, thus passing on the favorable variations to their offspring.



In times of drought, when food is scarce, only the tortoise with the longest neck and legs will be able to reach the food that is very high. These tortoises will survive. Populations adapt to the environment in which they live.

26. Fix this sentence so that it correctly applies to natural selection. Frogs have evolved a longer tongue so they could catch more flies.

Within a population of frogs, some frogs have a long tongue, some have a short tongue, and some have an average size tongue.

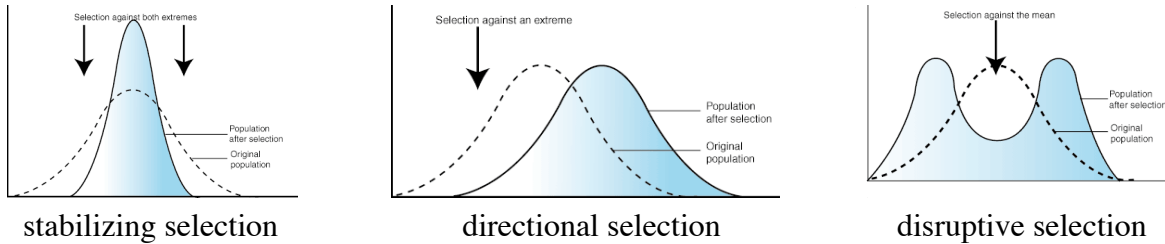
Long tongue → catch more flies → live longer → reproduce more → pass favorable variation onto offspring!

After many generations, the population of frogs will have a slightly longer tongue.

27. Correct the following sentence: Humans evolved from apes.

Humans and apes evolved from a common ancestor.

28. Construct graphs that show the three types of selection and the environments that they occur in.



29. Describe the following evidence for evolution:

fossils – Paleontologists can compare fossils from the past to organisms living today.

homologous structures – Organisms have very similar structures that have been modified for different functions.

vestigial structures – A remnant (left over) structure that no longer serves a purpose but was useful in an ancestral stage.

embryology – Organisms that are very different (i.e. a fish and a human) still have very similar stages of embryonic (pre-birth) stages of development.

DNA – The more recently two species share a common ancestor, the more similar their DNA will be. Organisms that do not share a recent common ancestor, will have a greater % difference in their DNA

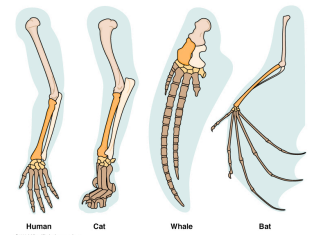
30. Similar structures that are modified for different functions are called **homologous**.

Provide three examples of these structures.

1.) **Human arm**

2.) **Whale fin**

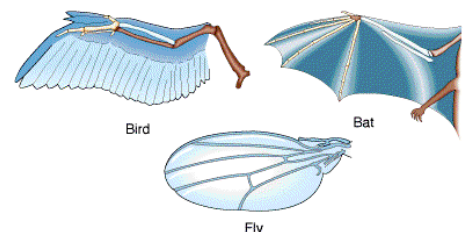
3.) **Bat wing**



31. Structures that are *not similar*, but serve the *same function* are called **analogous**. Provide two examples of these structures.

1.) **Bird wing**

2.) **insect wing**



32. Define vestigial structure. Provide three examples.

- 1.) Human appendix
- 2.) pelvic girdle and leg bones in a whale
- 3.) wings on a flightless bird (i.e. ostrich, emu)

33. Explain how vestigial structures help to prove the theory of evolution.

I will use the above example of leg bones in whales as an example.

Whales evolved from a wolf-like mammal called that lived on land. This mammal began to hunt for its food in the shallow waters. This proved to be a very successful strategy for finding easy prey. As time went on, it spent more and more time in the water. Its fore limbs, which were adapted to walking on land, slowly evolved into fins that were better adapted for swimming. At the same time, the hind limbs, which were not needed for walking anymore, slowly grew smaller and smaller until they disappeared all together. The evidence still remains though. Modern day whales, that do not have legs, still have leg bones and pelvis in their skeleton!

Watch the video clip below!

http://www.pbs.org/wgbh/evolution/library/03/4/l_034_05.html

34. The wing of a bird and the arm of a man are **homologous** structures, while the wing of a bat and the wing of a butterfly are **analogous** structures.

35. Do analogous structures provide evidence for the theory of evolution? Explain your answer.

No. A bat and a butterfly do NOT share a recent common ancestor.

36. What are **two** methods scientists use to determine the age of fossils? What is the difference between them?

Indirect Dating - Fossils further down in the strata are older than fossils near the top.

Direct Dating - Giving the fossils an exact age in years. Atoms, such as C-14, are not stable and begin to break down as soon as the organism dies. It takes 5,730 years for half of the C-14 present to break down into Nitrogen. This is called its half -life. A scientist just needs to look at how much C-14 remains and how much Nitrogen has formed, and they can determine how long ago the organism died!

37. Draw four layers of rock strata (labeled J – M). Place M on the bottom and J on the top. If fossils were found in all four layers, in which layer would they be the youngest? The oldest? What is this method of dating fossils called?

J - youngest
~~~~~  
K  
~~~~~  
L
~~~~~  
M - oldest

38. If a fossil contains 14g of C-14, how many grams of C-14 did it contain 5 half-lives ago? Show all your work!

448 → 224 → 112 → 56 → 28 → 14

448 grams of C-14

You just need to keep doubling the amount of C-14.

39. If it takes 5,730 years for one half-life to occur, how old is the above fossil?

$5,730 \times 5 = 28,650$  years old

40. In what type of rock are fossils most commonly found?

Sedimentary rock. Igneous and Metamorphic rocks form under extreme heat and pressure and would destroy any fossil remains.

41. Explain the significance of how plate tectonics has shaped the face of the Earth and led to evolution.

Watch this video clip.

<http://www.youtube.com/watch?v=xV36ptFUspg>

42. The **greater** the percent of DNA that two organisms have in common, the more **closely** the two organisms are related.