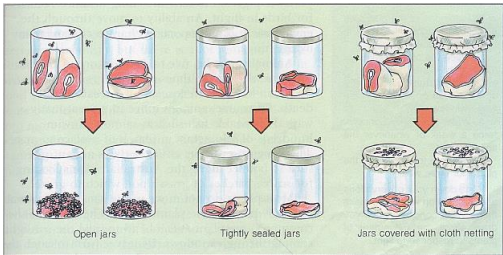
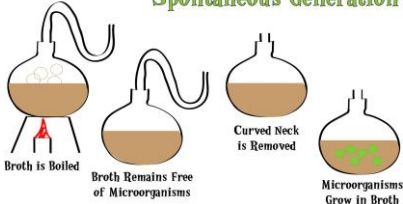


## Unit 8 Review Packet: Evolution and Classification

### History of Life

1) For each scientist listed below, list the steps of their experiments or draw a picture of their experimental set-up. Explain the results of the experiment, and state whether the results supported the theory of **biogenesis** or **spontaneous generation**.

Scientist	Experimental Methods	Results	Supports Biogenesis or Spontaneous Generation?
Redi	<p>Placed Meat into cars</p> <ul style="list-style-type: none"> <li>Control Treatment- No lid</li> <li>Experimental Treatment #1 – Lids</li> <li>Experimental Treatment #2 – Screens</li> </ul>  <p>Open jars      Tightly sealed jars      Jars covered with cloth netting</p>	When Lids and Screens were placed on top, no flies/maggots were seen on the meat.	Biogenesis
Pasteur	<ul style="list-style-type: none"> <li>Control Treatment: boiled broth in an open neck flask...a year later found bacteria in flask</li> <li>Experimental Treatment: boiled broth in a closed neck flask (swan neck keeps bacteria from entering)... a year later found NO bacteria</li> </ul> <p><b>Pasteur's Test of Spontaneous Generation</b></p>  <p>Broth is Boiled      Broth Remains Free of Microorganisms      Curved Neck is Removed      Microorganisms Grow in Broth</p>	No bacteria in closed-neck flask	Spontaneous generation is FALSE!

2) Explain how **Miller and Urey's experiment** helped show the conditions required to create the first organic molecules (amino acids). You may use a picture to aid in your description

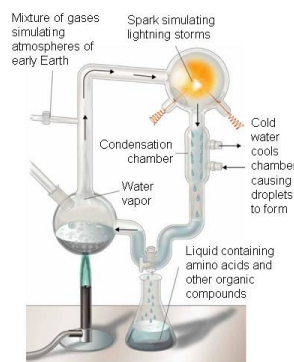
Set up an experiment to show that the following reaction took place



3) The estimated **age** of the Earth is 4.6 Billion years old.

4) Explain how **endosymbiosis** created the first unicellular eukaryotes.

- Endosymbiosis**... when a large prokaryote "swallows" a small prokaryote, which becomes its nucleus, chloroplast, or mitochondrion
- Led to the development of small multicellular life forms with specialized cells for different jobs!



## Evolution

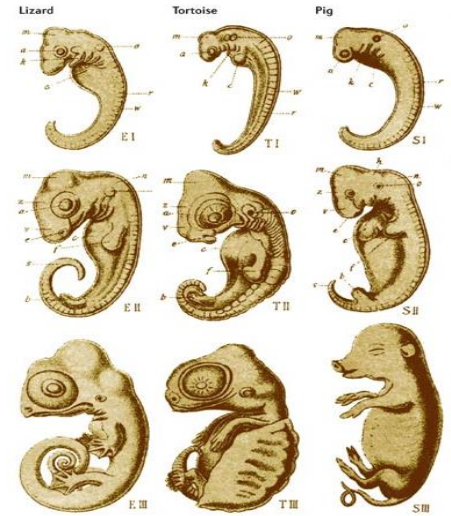
5) Explain the difference between **relative dating** (rock layers) and **absolute dating** (carbon 14 dating).

- **Relative Age** – the approximate age based on position in the layers of sedimentary rocks
- **Absolute Age** – the exact age of a fossil based on **Radioactive Dating (carbon-14)**

7) In **comparative biochemistry**, scientists compare protein or DNA from various organisms to determine how related they are.

8) Using **comparative embryology**, we find that organisms with very similar embryos tend to have a very recent common ancestor. To the right, the image displays the embryonic development of a lizard, tortoise, and pig (from left to right). Which two organisms share the most recent common ancestor?

**Tortoise and Lizard**



9) Provide a definition and example (ex: shark fins vs. dolphin fins) for each of the following types of **comparative anatomy**.

Type	Definition	Example
Homologous structures	inherited from a common ancestor, changed due to different environments	Limb bones of whale, bat, human, etc.
Analogous structures	similar in purpose, but not inherited from a common ancestor	Wings of insects vs. bird
Vestigial structures	Features/structures that were useful to an ancestor but are no longer useful	Whale pelvis, Human tailbone + appendix

10) Explain the difference between **Lamarck** and **Darwin's** theories of evolution. Your explanation should include the names of their theories along with examples.

- **Lamarck - Theory of Use and Disuse:** "Acquired traits are passed on to the next generation" (AKA Theory of Acquired Characteristics)
  - Summary of Theory
    - 1) Organisms constantly try to improve
    - 2) This effort causes changes in body parts
    - 3) Once a structure is modified, it is passed on to future generations
  - Example: giraffe necks are long because ancestor giraffes had to stretch to reach their food
- **Darwin – Theory of Natural Selection.** There is variation in every population, Some variations are favorable, More young are produced in each generation than can survive, There is competition for resources, Those that are successful go on to reproduce, Overtime, small changes accumulate in a population because the best traits continue to be passed on
  - Over time, a population adapts as the number of favorable traits increases
  - Example: Rock Pocket Mouse fur color change due to predation

11) What allows for the creation of variation within a population? What does this variation allow for?

- Mutations in the DNA create different gene forms
- Natural selection "chooses" individuals with favorable mutations to reproduce
- Individuals can't evolve...they are born with all the genes they are ever going to have! Populations can evolve as the % of good mutations increases over time

12) Provide two examples (one geographic and one reproductive – you may make them up) demonstrating how **geographic and reproductive isolation** can cause **speciation** (the creation of new species)

Geographic Isolation → one species is separated by a new mountain (or river, or other physical boundary) and this causes the two groups to evolve differently in each location. This may cause speciation over long periods of separate evolution.

Reproductive Isolation → *Drosophila persimilis* breeds in early morning, while closely related *Drosophila pseudoobscura* breeds in the afternoon

13) Explain how Darwin's **Galapagos finches** show the process of natural selection.

Darwin noticed that different species of finches on different Galapagos Islands had differently shaped beaks. There were also different types of seeds found on each island. The finches' beaks had evolved different shapes based upon the type of food they ate. Food served as the selection factor that allowed for the finches' beaks to evolve.

14) Explain how the **peppered moths/rock pocket mice** show the process of natural selection.

There are two forms of peppered moth, light and dark. Before the Industrial Revolution, light moths survived and reproduced more effectively. After the Industrial Revolution, dark moths survived and reproduced more effectively. Over time the dark moths became more prevalent due to predation. Nature has selected for the darker form of the moth.

15) How is **natural selection** different from **artificial selection**?

Artificial Selection = humans "select" certain characteristics in plants, dogs, etc., that they find favorable. These organisms may not necessarily survive and reproduce better in nature, which is what natural selection is.

17) Do a cockroach, daffodil, cow, and mushroom that live in the same area represent a **population**? Why or why not?

No, a population is defined as a single species living in a given area. The organisms listed represent a community because they are a combination from several different species. A better example of a population would be a group of bats that lived in Manassas, VA.

18) Suppose aliens called Dollops can have head spikes ranging from short to tall. Identify which **type of selection** (**Stabilizing, Directional, or Disruptive**) would result from each of the following scenarios and explain which phenotypes (spike length) would be most common in the next generation of Dollops.

A. Powerful sunrays give Dollops with taller head spikes a deadly sunburn

Type of Selection: **Directional**

Next Generation: **More shortened spiked Dollops**

B. Mid-size head spikes are perfect for gathering food, whereas Dollops with short and tall head spikes cannot gather enough food to survive.

Type of Selection: **Stabilizing**

Next Generation: **More Middle-sized Dollops**

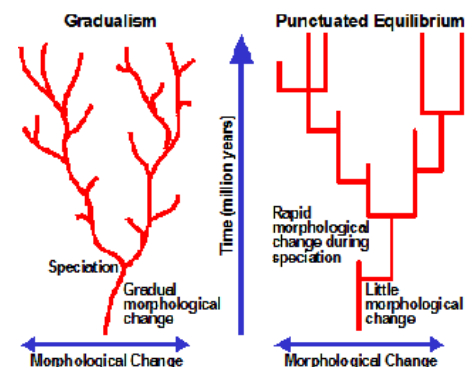
C. Short and tall head spikes attract Goobers, another friendly species of alien, that helps the Dollops build shelters to ensure survival in the cold winter months.

Type of Selection: **Disruptive**

Next Generation: **More Short and Tall spikes, less mid-spikes**

19) Explain the difference between the two models of evolutionary change: **gradualism and punctuated equilibrium**. Please include a picture/diagram to help aid in your explanation

- **Gradualism** (change happens slowly, and new species are made at a constant rate)
- **Punctuated Equilibrium** (there are times of little or no change followed by times of rapid change – often due to major changes in the environment)







20) Explain how the following three types of evolutionary change produce changes in species.

	What Changes?
<b>Convergent Evolution</b>	organisms with different ancestors become very similar due to environment (Ex: sharks and dolphins)
<b>Divergent Evolution</b>	two or more related populations/species become different (Ex: Darwin's finches)
<b>Coevolution</b>	change of two or more species in response to one another (Ex: predator/prey relationships)

21) Explain how **adaptive radiation** relates to divergent evolution, and provide an example of adaptive radiation.

Adaptive Radiation is an extreme form of divergent evolution where many related species evolve from a single ancestor species

**Classification**

Bird W
Bird X
Bird Y
Bird Z

Dichotomous Key to Representative Birds	
1. a. The beak is relatively long and slender.....	<i>Certhidea</i>
b. The beak is relatively stout and heavy .....	go to 2
2. a. The bottom surface of the lower beak is flat and straight .....	<i>Geospiza</i>
b. The bottom surface of the lower beak is curved .....	go to 3
3. a. The lower edge of the upper beak has a distinct bend .....	<i>Camarhynchus</i>
b. The lower edge of the upper beak is mostly flat .....	<i>Platyspiza</i>

22) Use the dichotomous key above to identify Bird W, X, Y, and Z.

**W=Geospiza**  
**X= Platyspiza**

**Y= Certhidea**  
**Z=Camarhynchus**

23) The science of classifying organisms into groups according to their characteristics and evolutionary history is called **taxonomy**.

24) The man who developed the **binomial system** of classification was **Carl Linnaeus**. Why is the term “binomial” used?  
**Bi means two, nomial means name – two naming system**

25) The **scientific name** of the common dog is *Canis familiaris*. Identify the **genus** and **species** of the common dog.

Genus: **Canis**  
Species: **familiaris**

26) Identify Linnaeus's **7 levels of classification** from most broad to most specific.

**Kingdom, Phylum, Class, Order, Family, Genus, Species**

27) List two characteristics for each of the **six kingdoms of life** given below.

**\*See chart from class for extensive list of characteristics\***

28) Be prepared to group an organism into a **kingdom** based on certain characteristics given. For example, to which kingdom does the following organism belong?

Organism: “I am a multicellular heterotroph that eats by ingesting grass. I have eukaryotic cells”

Kingdom: **Animalia**

For Questions 29-31, use the cladogram to the right

29) Name five characters possessed by birds.

Avian endothermy, asymmetrical feather, bidepalism, parental care, amniote egg

30) According to the cladogram, which character evolved first: the amniote egg or hair?

Amniote egg

31) On the cladogram, circle the point (i.e. node) that represents the most recent common ancestor of crocodiles, dinosaurs and birds.

