Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_

**Unit 8 Notes: Evolution**

**Part 1: The History of Life**

**I. How Did Life Come to Be? –Theories**

1. **Dark Ages:** “Life arose from \_\_\_\_\_\_\_\_\_ matter.” This process is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Ex: Rats from dirty clothes, frogs from mud, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

B. **Renaissance**

1. 1668: An Italian doctor named \_\_\_\_\_\_\_\_\_\_\_\_\_\_ proposed the theory of \_\_\_\_\_\_\_\_\_\_ 🡪 “life comes from life”

 Redi’s Hypothesis: maggots come from \_\_\_\_\_, not rotting meat

 **Control Group (Open) Exp. Group #1 (Lid) Exp. Group #2 (Screen)**



 Result: \_\_\_\_\_\_\_\_\_\_\_\_\_ Result: \_\_\_\_\_\_\_\_\_\_\_\_\_ Result: \_\_\_\_\_\_\_\_\_\_\_\_\_

 Redi’s conclusion: \_\_\_\_\_\_\_\_\_\_ (life comes from life) is correct!

1. 1745: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tried to prove that spontaneous generation was correct

Steps to Experiment:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Needham felt this proved that \_\_\_\_\_\_\_\_\_\_\_(living) came from \_\_\_\_\_\_\_\_\_(non-living) after killing all existing bacteria in the broth.

What was wrong with his experiment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3) 1770: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_was an Italian priest who believed Needham did not boil the broth \_\_\_\_\_\_\_\_\_\_\_ to kill all existing bacteria

Steps to Experiment:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4) 1862: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ did another experiment with broth, which led to the concept of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| **Treatment** | **Description** | **Picture** |
| Control | Boiled broth in an\_\_\_\_\_\_neck flask…a year later found \_\_\_\_\_\_\_\_\_\_ in flask |  **Open Flask** |
| Experimental | boiled broth in a \_\_\_\_\_\_\_\_\_neck flask (swan neck keeps bacteria from \_\_\_\_\_\_\_\_\_)… a year later found NO \_\_\_\_\_\_\_\_\_\_\_ |  **Swan-Neck Flask** |

Pasteur’s Conclusion: Spontaneous generation is \_\_\_\_\_\_\_\_\_\_\_\_.

**II. History of Life on Earth**

Age of Earth: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Age of Solar System: \_\_\_\_\_\_\_\_\_\_\_

 Age of Universe: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**III. Earth Before Life**

1. **Formation of the Earth**

-\_\_\_\_\_\_\_ billion years ago

-Early Atmosphere: \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_

1. **Synthesis of Organic Molecules**
2. 1924: Alexander \_\_\_\_\_\_\_\_\_ hypothesized that conditions in early \_\_\_\_\_\_\_\_\_\_\_\_\_\_caused compound to form \_\_\_\_\_\_\_\_\_\_\_ (carbon-containing) molecules (ex: \_\_\_\_\_\_\_\_\_\_\_\_)
3. 1953: Stanley \_\_\_\_\_\_\_\_\_ and Harold Urey set up an experiment to show that the following reaction took place

Label the two missing steps on the picture below:

1. **Polymerization:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_small organic molecules to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



|  |  |  |
| --- | --- | --- |
| **Building Blocks** |  | **Macromolecules** |
|  |  |
|  |  |
|  |  |
|  |  |

1. **First \_\_\_\_\_\_\_\_\_\_\_\_\_ and “protocells” (early cells) called \_\_\_\_\_\_\_\_\_\_\_\_\_**

Membrane made out of phospholipids. Draw a

microsphere with phospholipids in the box to the

right.

1. **Heredity and Replication**

\_\_\_\_\_ was the first \_\_\_\_\_\_\_\_ acid to be used as

genetic material because it could “\_\_\_\_\_\_\_\_\_\_\_”

(make a copy of itself)

Why would RNA need to be able to self-replicate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IV: Early Life**

1. **Unicellular Life**

\_\_\_\_\_\_\_\_ cells, Prokaryotic = no \_\_\_\_\_\_\_\_\_, mostly bacteria

\_\_\_\_\_\_\_\_\_\_ = consumers…can’t make their own food

 B. **Blue-Green Algae Add \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to Atmosphere**

First organisms to be able to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

What type of food do they make? (Hint: It’s a sugar) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What gas do they need to take in to make oxygen? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

C. **Aerobic Respiration**

Organisms use glucose to make \_\_\_\_\_\_, an energy- rich molecule

What gas do they ***take in***, and what gas do they ***release***? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. **Eukaryotic Cells**

Have a \_\_\_\_\_\_\_\_\_ and membrane-bound organelles (ex: \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_) to do specific \_\_\_\_\_\_\_ in the cell.

***Endosymbiosis:*** when a large prokaryote “\_\_\_\_\_\_\_\_\_\_” a small prokaryote, which becomes its \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_.

Draw out the process of endosymbiosis in the box below.

E**. Multicellular Life**

Evolved towards the end of the \_\_\_\_\_\_\_\_\_\_\_\_\_ era in Earth’s \_\_\_\_\_\_\_\_\_\_\_.

Multicellular organisms can \_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells to do different jobs (ex: brain cell, blood cell)

1. **Rapid Diversification of Multi-cellular Life in the Oceans**

A bunch of new \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (no backbone) body forms showed up

For some reason, there was a massive \_\_\_\_\_\_\_\_\_\_\_\_\_\_ at the end of the Precambrian Era, which caused \_\_\_\_\_\_\_\_\_\_\_\_\_ of species to die off

**V. Paleozoic Era**

A. **The First Complex Multicellular Animals to Evolve - \_\_\_\_\_\_\_\_\_\_\_**

Fish are \_\_\_\_\_\_\_\_\_\_\_\_\_, meaning they have a backbone

1. **The first \_\_\_\_\_\_\_\_\_\_\_evolve from seaweed and move to \_\_\_\_\_\_\_\_**
2. **The dominant animal life are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (another vertebrate)**
3. **A new type of plant – \_\_\_\_\_\_\_\_\_\_\_\_\_\_ – evolves**

Conifers are better adapted to \_\_\_\_\_\_\_\_\_ climates

Conifers are also known as \_\_\_\_\_\_\_\_\_\_\_\_

**VI: Mesozoic Era**

1. **Reptiles begin to dominate**

Reptiles are better adapted to land than \_\_\_\_\_\_\_\_\_\_\_\_\_…have \_\_\_\_\_\_skin and \_\_\_\_\_\_\_\_\_\_ eggs

1. **Reptiles called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dominate**
2. **Flowering plants and \_\_\_\_\_\_\_\_\_\_\_\_\_evolve together**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ means that they changed together over time

Insects are needed to pollinate plants…is this cross-pollination or self-pollination? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Another mass (major)\_\_\_\_\_\_\_\_\_\_\_\_\_\_ causes the end of the dinosaurs**

**VII. Cenozoic Era**

 A. **Evolution of special vertebrates with fur and fat – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Fur and fat help keep mammals warm in \_\_\_\_\_\_\_\_\_\_\_\_\_ climates

Nourish young with \_\_\_\_\_\_\_\_\_

B. **Evolution of a special group of mammals – the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Primates are different from other mammals because they live in \_\_\_\_\_\_\_\_\_\_ groups and have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ thumbs

C. **Evolution of a special group of primates – the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Hominids are more advanced than other primates because they can stand \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D. **Modern Man (Homo \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) evolves!**

E. **Modern man masters \_\_\_\_\_\_\_\_\_\_\_\_ use and builds \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

F. **Last Century -- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ advances lead to rapid changes in society**

**Part 2: Evidence for Evolution**

**I. Observable Evidence**

 A. **Early Life Forms: Fossils**

***Fossil =*** a trace of a long-dead organism, found in layers of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_sedimentary rock; hard \_\_\_\_\_\_\_\_\_\_\_\_\_ replace tissues of organism

***Types of Fossils***

1) \_\_\_\_\_\_\_\_\_\_\_ = imprint in rock

2) \_\_\_\_\_\_\_\_\_\_\_ = a mold filled with hard minerals

3) \_\_\_\_\_\_\_\_\_\_\_ = signs of life (footprints, burrowing)

 4) \_\_\_\_\_\_\_\_\_\_\_= organisms that have been preserved nearly perfectly in plant resin (amber)

 5) \_\_\_\_\_\_\_\_\_\_ = any living species that is nearly identical to species previously known only from fossils

***How do we determine the age of fossils?***

1) \_\_\_\_\_\_\_\_\_\_\_\_\_ age – the approximate age based on the position in \_\_\_\_\_\_\_\_\_\_\_ of sedimentary rock

2) \_\_\_\_\_\_\_\_\_\_\_\_\_ age – the exact age of a fossil based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dating (ex: Carbon – 14)

***Relative Age – Rock Layers:*** Which is older, a fossil found in layer 2 or 4? How do you know? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Absolute Age – Radioactive Dating***

1) when “isotopes” of atoms in fossils \_\_\_\_\_\_\_\_ into other “isotopes”

2) Remember: isotopes are the same atom with different numbers of \_\_\_\_\_\_\_

3) \_\_\_\_\_\_\_ = how long it takes for one-half of a sample of an isotope to decay

Ex: Carbon Dating (C14 🡪 C12)

4) ***Practice Problem*:** Suppose you have found a fossil containing exactly ¼

Of its original amount of C-14 (the rest has decayed into C-12). How old is the

fossil if the half life of C-14 is 5,730 years? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B. **Comparative Anatomy**

compare structures found in modern organisms with those from \_\_\_\_\_\_\_\_\_\_\_times

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Structures: inherited from a common \_\_\_\_\_\_\_\_\_\_\_\_, changed due to different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Ex: Limb bones of whale, bat, human, etc.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Structures: similar in \_\_\_\_\_\_\_\_\_\_\_\_\_, but not inherited from a common \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Ex: Wings of insects vs. bird

C. **Vestigial Structures**

Features/structures that were useful to an ancestor but are no longer useful

Ex: \_\_\_\_\_\_\_\_\_\_ pelvis, human \_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_

D. **Comparative Embryology**

Finding similarities in \_\_\_\_\_\_\_\_\_\_ ; organisms sharing a recent ancestor have more similar embryos (discovered by Ernst \_\_\_\_\_\_\_\_\_\_\_\_)

E. **Comparative Biochemistry**

Finding similarities in \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_ sequences to look for relatedness

Below is a DNA sequence in several different organisms…which two organisms are the most related? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Human | CCA   TAG   CAC   CTA |
| Pig | CCA   TGG   AAA   CGA |
| Chimpanzee | CCA   TAA   CAC   CTA |
| Cricket | CCT   AAA   GGG   ACG |

**II. Evolutionary Biologists**

 There are several scientists who observed and predicted the causes behind \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 ***Evolution* =** change in a \_\_\_\_\_\_\_\_\_\_\_\_\_ of organisms over a period of time

 A population is a group of members of a single \_\_\_\_\_\_\_ living in a particular area

 A. **Jean Baptiste Lamarck**

***Theory of Use and \_\_\_\_\_\_\_\_\_\_***: “Acquired traits are passed on to the next generation” (AKA Theory of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Characteristics)

 1) Organisms constantly try to \_\_\_\_\_\_\_\_\_\_\_

 2) This effort causes changes in body parts

 3) Once a structure is modified, it is passed on to future \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Example: \_\_\_\_\_\_\_\_\_ neck hypothesis 🡪 giraffe necks are long because \_\_\_\_\_\_\_\_\_\_\_\_giraffes had to stretch to reach their food

 B. **Charles Darwin**

 Geologist and \_\_\_\_\_\_\_\_\_\_\_\_

 Sailed to South America and the Galapagos Islands on the H.M.S. \_\_\_\_\_\_\_\_\_\_\_

 Recorded observations of exotic plants and animals for the Queen

 Studied \_\_\_\_\_\_\_\_\_\_\_ and their beaks

 Concluded that beak shape is related to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 ***Darwin’s Theory of Natural Selection***

1. There is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in every population
2. Some variations are \_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. More young are produced in each generation than can \_\_\_\_\_\_\_\_\_\_\_\_
4. There is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ for resources
5. Those that are successful go on to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Overtime, small changes accumulate in a population because the \_\_\_\_\_\_ \_\_\_\_\_\_\_\_continue to be passed on

 ***Is this survival of the fittest?***

No! To be fit means more than just to survive…you have to be able to \_\_\_\_\_\_\_\_

***Fitness*** = a single organism’s \_\_\_\_\_\_\_\_\_\_\_contribution to the next generation Over time, a population \_\_\_\_\_\_\_\_\_\_\_\_as the number of favorable traits \_\_\_\_\_\_\_

***How do we get variation in a population?***

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in the DNA create different gene forms

 Natural selection “chooses” individuals with favorable mutations to \_\_\_\_\_\_\_\_

 Individuals can’t evolve but populations can. Why is this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**III. Examples of Natural Selection**

A. **Peppered Moths**

 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. Why was this the case? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 B. **Darwin’s Finches:** 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. Why do the different species have different beak shapes? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IV. Types of Natural Selection**

A. **Stabilizing Selection** = individuals with the \_\_\_\_\_\_\_\_\_\_\_\_\_ form of a trait have the highest fitness

B. **Directional Selection** = one \_\_\_\_\_\_\_\_\_\_\_\_\_\_ form of trait is more successful

C. **Disruptive Selection** = \_\_\_\_\_\_\_\_\_ extreme forms are more successful than the average

 The graphs below show the three types of natural selection given on the previous page. The dotted line in each graph represents the color distribution of the original mouse population. Label each type of selection.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 D. **Sexual Selection:** Females choose mates based on certain traits

 Males with these traits have higher \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (reproductive success)

E.  **Artificial Selection**: humans “select” certain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in plants, dogs, etc., that they find \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Note: These organisms may not necessarily survive and reproduce better in nature

**V. When does evolution create new species? - Speciation**

 A. **Morphological Species Concept:** internal and external \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are used to group organisms into species

 B. **Biological Species Concept**– defines a species as a population of organisms that can successfully \_\_\_\_\_\_\_\_\_\_\_\_\_

 C. **Speciation:** formation of a new \_\_\_\_\_\_\_\_\_\_\_\_

 D. **Reasons for Speciation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_ isolation.

 E. **Models of Speciation** (How populations change over time)

**Model #1:** **Gradualism** (change happens \_\_\_\_\_\_\_\_\_\_\_\_, and new species are made at a \_\_\_\_\_\_\_\_\_\_\_\_\_rate)

**Model #2:** **Punctuated Equilibrium** (there are times of \_\_\_\_\_\_\_\_\_ or no change followed by times of \_\_\_\_\_\_\_\_ change – often due to major changes in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) …. This model was designed by Stephen \_\_\_\_\_\_\_\_\_\_

 Draw pictures of gradualism and punctuated equilibrium using the GRAPH METHOD and the TREE METHOD

 **Graph Method Tree Method**

**VI. Patterns of Evolution**

 A. **Coevolution:** change of two or more species in \_\_\_\_\_\_\_\_\_\_\_\_ to one another

 Provide TWO examples of coevolution:

 1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 B. **Convergent Evolution:** organisms with \_\_\_\_\_\_\_\_\_\_\_\_\_\_ ancestors become very similar due to \_\_\_\_\_\_\_\_\_\_\_\_ (Ex: sharks and dolphins)

 C. **Divergent Evolution:** two or more \_\_\_\_\_\_\_\_\_\_\_populations/species become \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Ex: Darwin’s finches)

Label each graph to the right as CONVERGENT or DIVERGENT evolution.

 D. **Adaptive Radiation:** an extreme form of \_\_\_\_\_\_\_\_\_\_\_\_\_evolution where \_\_\_\_\_\_\_\_\_ related species evolve from a \_\_\_\_\_\_\_\_\_\_ ancestor species