CORNELL NOTES
Directions: You must create a minimum of 5 questions in this column per page (average). Use these to study your notes and prepare for tests and quizzes. Notes will be stamped after each assigned sections (if completed) and turned in to your teacher at the end of the Unit for scoring.

UNIT 4: EVOLUTION
Chapter 10: Principles of Evolution

I. Early Ideas about Evolution (10.1)

A. Early scientists proposed ideas about evolution

1. **Evolution**- process of biological ____________ by which descendants come to ____________ from their ancestors

2. Other scientists besides Darwin came up with idea

B. Four scientists important in development of evolution theory

1, **Carolus Linnaeus (**1700's)- developed __________________ system to name living things (grouped by _________________)

2. **Georges Louis Leclerc de Buffon** (1700's)- proposed species shared _______________ instead of arising separately

3. **Erasamus Darwin**- Darwin's grandfather. Proposed that all living things were _______________ from a common _____________

4. **Jean-Baptiste Lamarck** -proposed theory that all organisms evolved toward _____________ and _____________.

a. Proposed changes in environment caused an organism behavior to change, leading to greater use or disuse of a ____________ or __________

b. Organism then passed changes on to ________

C. Theories of geologic change set stage for Darwin's Theory

1. ______ **of the Earth** was key issue in early debates

a. Many thought Earth on _______ years old

b. Discovery of _________ created controversy

2. **James Hutton** (late 1700's)- proposed that Earth very ________. Said **geologic** change occurred gradually (called __________________)

3. **Charles Lyell** (1830)- published "Principles of Geology". Also said Earth must be very old. Said changes in Earth occurred at constant _______ over time

a. Same changes we see happening __________

b. Greatly affected _______________ thinking.

II. Darwin’s Observations (10.2)

A. Darwin observed differences among ___________ species

1. Differences between species studied on ________________ **Islands**

2. Noticed variations well suited to animals environment (_______________- differences in physical traits)

3. Studied birds, tortoises and said somehow adapt to their surroundings (**adaptation**- a feature that allows an organism to better _____________ in _____________________)

B. Darwin observed ______________ and **geologic** evidence supporting ancient Earth

1. Discovered fossil evidence of species ____________ over time

2. Suggested that ____________ organisms have relationship to ___________ forms

3. Earth must be very _____ (supported Lyell’s theory)

4. Darwin said, like the Earth, organisms must change ________________ over time

III. Theory of Natural Selection (10.3)

A. Several key insights led to Darwin’s idea for natural selection

1. **Artificial Selection**- process by which ____________ changes a species by ____________ it for certain traits

a. Darwin compared what he learned about breeding to his idea of _________________

b. Said that in nature, environment creates __________________ pressure instead of humans in _________________ selection

2. **Natural Selection**- mechanism by which _________________ is selective agent

a. Darwin used work of others to develop theory

b. Said adaptations arose over many ________________ (called process "**decent with** ___________________)

B. Natural selection explains how evolution can occur

1. 4 main principles to theory of natural selection

a. **Variation**- variations in _______________ are basis for__________ _____________.

b. **Overproduction**- organisms produce more ___________ than will survive (creates competition)

c. **Adaptation**- Some adaptations allow organism to survive at ___________ rate and individuals are "naturally selected" to survive and produce _____________

d. **Descent with Modification**- Over time, natural selection will result in species with ______________ that are well suited for ____________

2. **Fitness**- measure of ability to ___________ and _______________ more offspring relative to other members of a population

C. Natural selection acts on existing variation

1. **Natural selection acts on** _________________ (not ____________ material itself)

2. As environment changes, different traits will become ___________________.

IV. Evidence of Evolution (10.4)

A. Evidence for evolution in Darwin's time came from several sources

1.____________- supported Darwin's "descent with modification"

2. **Geography**- Darwin realized that ___________ found on Galapagos Islands closely resembled those found on _____________.

a. Over time new ___________ became well established in separate island populations

b. The different __________________ on each island led to specific adaptations in diets, habits, and ________ shapes

3. **Embryology**- Similarities in ____________ showed relationships between organisms and possible common _____________

4. **Anatomy**- Some of Darwin's best evidence came from comparing ________ parts of different species

a. **homologous structures**- features that are similar in ______________ but have different ____________ (**suggested common ancestor**) (i.e. forelimbs of vertebrates)

b. **analogous structures**-structures that perform similar ____________ but are not similar in _________ (i.e. wings of bats and insects)

B. Structural patterns are clues to the history of a species

1. **vestigial structures**- structures or organs that seem to ________ any useful ____________ that had a function in early ancestor

2. Examples of vestigial structures found in many organisms. (e.g. human _________, wings of Ostriches)

V. Evolutionary Biology Today (10.5)

A. **Fossils** provide a record of ______________

1. **Paleontology**- study of ___________ or extinct organisms

2. Fossil evidence shows change in _______ over time.

3. New fossils found that fill in "_______" (transitional forms)

B. **Molecular** and ___________ evidence support fossil and anatomical evidence

1. **DNA sequence analysis**- more closely related have more similar ______

2. **Pseudogenes**- _________ that no longer function. Similarities in organisms suggest common ancestor

3. **Protein comparisons**- Similarities in ____________

found in specific ______ types suggest common ancestor

C. Evolution unites all fields of biology

1. New discoveries and tools helping to study _______________ of evolution

2. Principles used to study _________, disease, ecology, etc.