# Unit 8: Classification & Diversity of Life

**What you need to Know:**

1. HE.6.B.7—Interpret a Cladogram.
2. CDL.7.B.1—Differentiate among the different domains: Bacteria, Archaea, Eukarya
3. CDL.7.B.3—Identify the seven major taxonomic categories: Kingdom, Phylum, Class, Order, Family, Genus, Species
4. CDL.7.B.2—Differentiate the characteristics of the six kingdoms: Eubacteria, Archaea, Protista, Fungi, Plantae, Animalia
5. CDL.7.B.4—Classify and name organisms based on their similarities and differences applying taxonomic nomenclature using dichotomous keys.
6. CDL.7.B.8—Compare and contrast life cycles of familiar organisms: Sexual reproduction, Asexual reproduction, Metamorphosis, Alternation of generations
7. CDL.7.B.20—Identify the symmetry of organisms: Radial, Bilateral, Asymmetrical

**Vocabulary:**

| | |
|---|---|
| 1. Alternation of generation | Alternating sexual and asexual generation reproduction |
| 2. Asexual reproduction | Nonsexual means of reproduction which can include grafting and budding |
| 3. Cladogram | A branching diagram that illustrates taxonomic relationships based on the principles of claudistics |
| 4. Dichotomous key (classification key) | Classification tool used in identifying organisms or materials |
| 5. Domain | Taxonomic category that includes one or more kingdom (e.g., Bacteria, Archaea, Eukarya) |
| 6. Fungi | Microorganisms that lacks chlorophyll |
| 7. Genus | A category including closely related species; interbreeding between organisms within the same category can occur |
| 8. Host | Animal or plant on which or in which another organism lives |
| 9. Microbe | A microorganism |
| 10. Sexual reproduction | The process where two cells (gametes) fuse to form one hybrid, fertilized cell |
| 11. Species | A classification of related organisms that can freely interbreed |
| 12. Spore | A form taken by certain microbes that enables them to exist in a dormant stage. It is an asexual reproductive cell |
| 13. Taxonomic nomenclature | The procedure of assigning names to the kinds and groups of organisms according to their taxa |
| 14. Vaccine | A preparation of dead or weakened pathogen that is used to induce formation of antibodies or immunity against the pathogen |

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| **Bell Ringer Question and/or Answer:** | |
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## *1. HE.6.B.7—Interpret a Cladogram.*

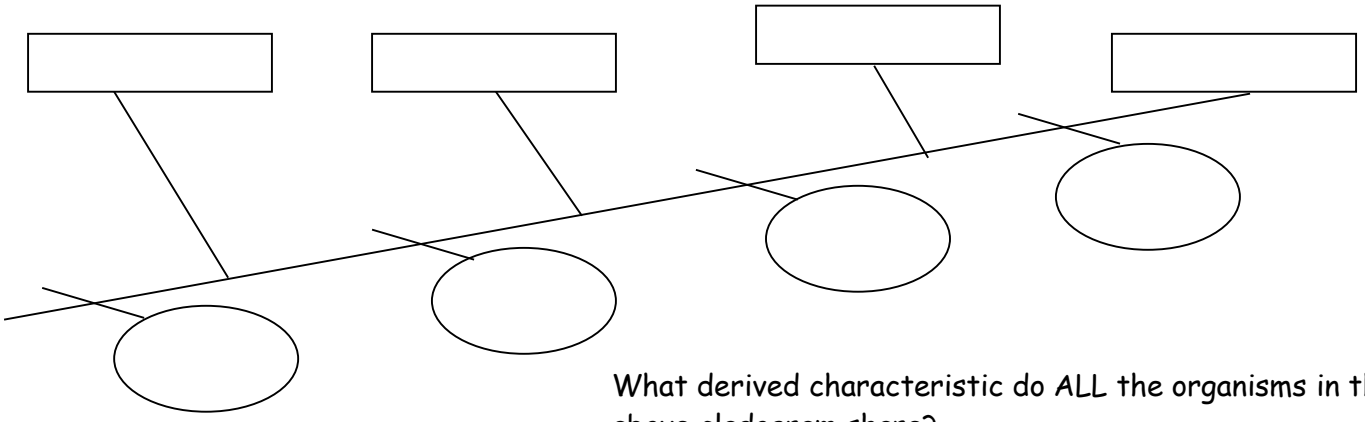
| | |
|---|---|
| Cladogram: | |
| Derived Characteristic: | |

To build a cladogram:

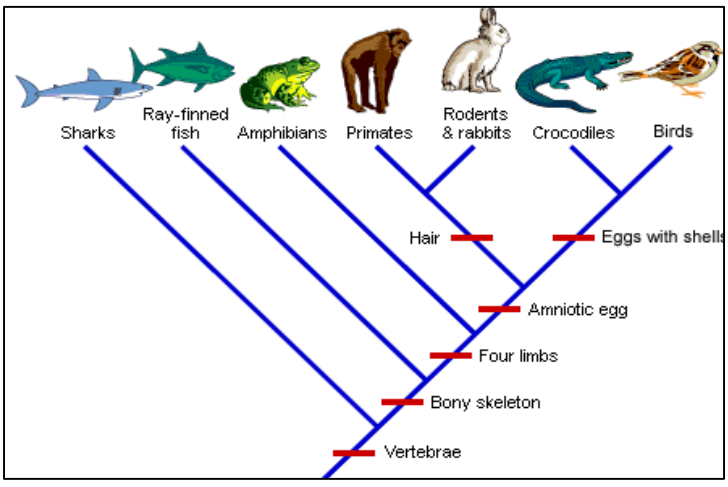
- Fill in the characteristics: (Hint: monkeys have thumbs)

| | Humans | Snake | Mouse | Monkey |
|---|---|---|---|---|
| **Hair** | | | | |
| **Thumbs** | | | | |
| **Eyes** | | | | |
| **Walk Upright** | | | | |
| **Total X's** | | | | |
| | | | | |

- Using the chart above, place the organisms in the boxes; derived characteristics in the circles.



What derived characteristic do ALL the organisms in the above cladogram share? _____

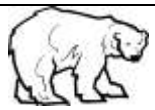



Use the cladogram to the left for the following:

1. According to the cladogram, which 2 organisms are most closely related: crocodiles and birds OR crocodiles and amphibians?

2. Which derived characteristic do only primates, rabbits, and rodents share?

3. Which organisms do NOT have a bony skeleton?

| Organism: | Bear | Human | Lamprey | Sunfish | Newt | Chimpanzee | Lizard |
|---|---|---|---|---|---|---|---|
| Picture: |  |  |  |  |  |  |  |
| Characteristics: | Backbone, jaws, four limbs, amniotic egg, mammary glands | Backbone, jaws, four limbs, amniotic egg, mammary glands, opposable thumb, upright posture | Backbone | Backbone, jaws | Backbone, jaws, four limbs | Backbone, jaws, four limbs, amniotic egg, mammary glands, opposable thumbs | Backbone, jaws, four limbs, amniotic egg |

| | Bear | Human | Lamprey | Sunfish | Newt | Chimpanzee | Lizard |
|---|---|---|---|---|---|---|---|
| Backbone | | | | | | | |
| Jaws | | | | | | | |
| Four limbs | | | | | | | |
| Amniotic egg | | | | | | | |
| Mammary gland | | | | | | | |
| Opposable thumb | | | | | | | |
| Upright posture | | | | | | | |
| Total X's | | | | | | | |

Which species is the oldest?

What characteristic do all of the organisms share?

Which species is most closely related to humans in this cladogram?

How are the newt and lizard different?

Draw the cladogram:

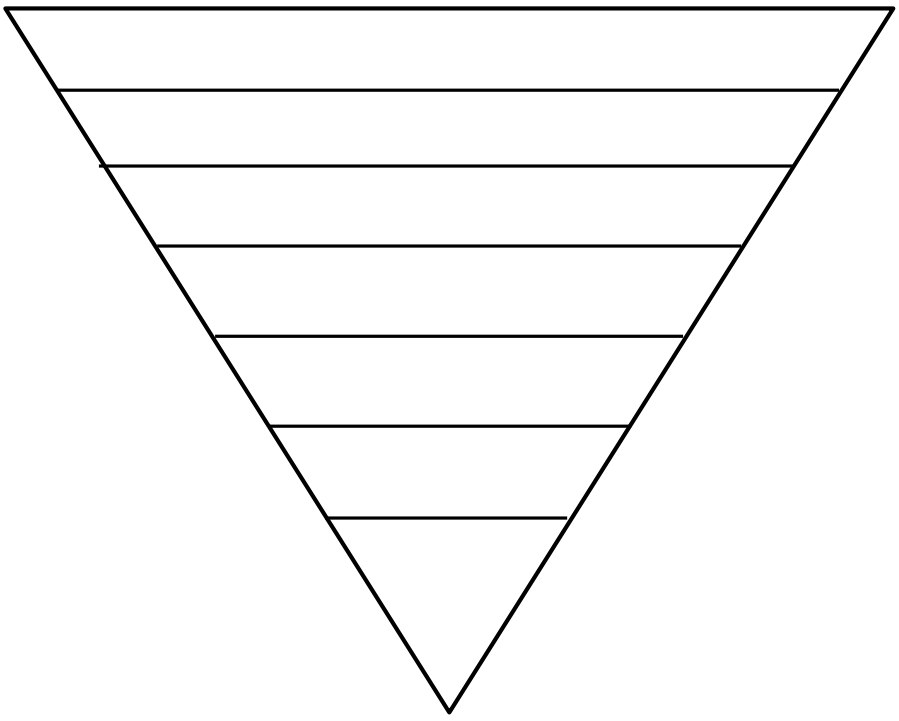
1. *CDL.7.B.1—Differentiate among the different domains: Bacteria, Archaea, Eukarya.*

## Domains: Largest taxon containing all living things.

| Bacteria | Archaea | Eukarya |
|---|---|---|
| | | |

2. *CDL.7.B.3—Identify the seven major taxonomic categories: Kingdom, Phylum, Class, Order, Family, Genus, Species*

Taxon



Scientific Naming:

K_____ P_____ C _____ O _____ F _____ G _____ S _____

K_____ P_____ C _____ O _____ F _____ G _____ S _____

*3. CDL.7.B.2—Differentiate the characteristics of the six kingdoms: Eubacteria, Archaea, Protista, Fungi, Plantae, Animalia*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Domains** | | | | | | |
| **Kingdoms** | | | | | | |
| **Characteristics**<br><br>**1. # of cells**<br>**2. Type of cell**<br>**3. How energy obtained** | | | | | | |

Fill in the chart based on the 6 kingdom's characteristics.

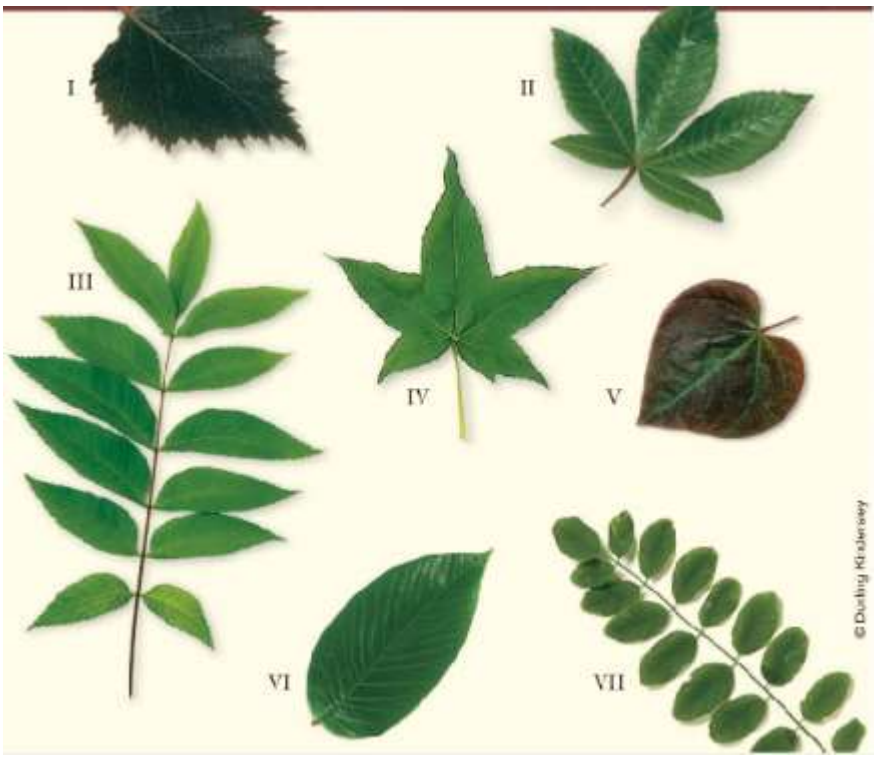
| Characteristic | Archaea | Eubacteria | Protista | Fungi | Plantae | Animalia |
|---|---|---|---|---|---|---|
| Eukaryote | | | | | | |
| Autotroph | | | | | | |
| Nucleus | | | | | | |
| Unicellular | | | | | | |
| Chloroplasts | | | | | | |
| Heterotroph | | | | | | |
| Peptidoglycan | | | | | | |
| Multicellular | | | | | | |
| Ancient | | | | | | |
| Prokaryote | | | | | | |

List 2 examples for each of the kingdoms.

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

5. *CDL.7.B.4—Classify and name organisms based on their similarities and differences applying taxonomic nomenclature using dichotomous keys.*

| | |
|---|---|
| **Dichotomous Key:** | |




I. _____

II. _____

III. _____

IV. _____

V. _____

VI. _____

VII. _____

**Dichotomous Key for Leaves**

1. Compound or simple leaf
   - 1a) Compound leaf (leaf divided into leaflets) .....go to step 2
   - 1b) Simple leaf (leaf not divided into leaflets) .....go to step 4
2. Arrangement of leaflets
   - 2a) Palmate arrangement of leaflets (leaflets all attached at one central point) .....*Aesculus* (buckeye)
   - 2b) Pinnate arrangement of leaflets (leaflets attached at several points) ....go to step 3
3. Leaflet shape
   - 3a) Leaflets taper to pointed tips .....*Carya* (pecan)
   - 3b) Oval leaflets with rounded tips .....*Robinia* (locust)
4. Arrangement of leaf veins
   - 4a) Veins branch out from one central point .....go to step 5
   - 4b) Veins branch off main vein in the middle of the leaf .....go to step 6
5. Overall shape of leaf
   - 5a) Leaf is heart shaped .....*Cercis* (redbud)
   - 5b) Leaf is star shaped .....*Liquidambar* (sweet gum)
6. Appearance of leaf edge
   - 6a) Leaf has toothed (jagged) edge .....*Betula* (birch)
   - 6b) Leaf has untoothed (smooth) edge .....*Magnolia* (magnolia)

## Dichotomous Key on Norns

Norns belong to the **genus Norno** and can be divided into eight species that are generally located in specific regions of the world. Use the dichotomous key to identify the norns below. **Write their complete scientific name (genus + species) in the blank**.

1. Has pointed ears ..... ..... go to 3
   Has rounded ears .....go to 2
2. Has no tail ..... Kentuckyus
   Has tail ..... Dakotus
3. Ears point upward ..... go to 5
   Ears point downward .....go to 4
4. Engages in waving behavior ..... Dallus
   Has hairy tufts on ears .....Californius
5. Engages in waving behavior ..... WalaWala
   Does not engage in waving behavior.....go to 6
6. Has hair on head ..... Beverlus
   Has no hair on head (may have ear tufts) .....go to 7
7. Has a tail ..... Yorkio
   Has no tail, aggressive ..... Rajus

A_____

B_____

C_____

D_____

E_____

F_____

G_____

H_____

6. *CDL.7.B.8—Compare and contrast life cycles of familiar organisms: Sexual reproduction, Asexual reproduction, Metamorphosis, Alternation of generations*

## Sexual vs. Asexual Reproduction:

The name of my organism is _____

In your article, do the following:

1. Circle any key words you find
    a. Defined words
    b. Words repeated throughout the article
    c. If you only chose 5, you would know what the article was about
2. Underline how the organism reproduces (your organism may have more than one way)
    a. Include the entire explanation
3. Put a box around any advantages to this you find
    a. Meaning, advantages of their reproduction type to the organism itself

| | Sexual | Asexual |
|---|---|---|
| How many parents does it take? | | |
| Is there genetic variation in the offspring? | | |
| Are organisms generally simpler or more complex? | | |
| Advantages: | | |

My organism, _____, reproduces _____

## Alternation of Generations:

Sexual reproduction involves the two alternating processes of meiosis and fertilization. In meiosis, the chromosome number is reduced from the diploid to the haploid number. In fertilization, the nuclei of two gametes fuse, raising the chromosome number from haploid to diploid. Whatever variation in details there may be from one organism to another, these two activities must occur alternately if sexual reproduction is to continue.

In animals, meiosis makes the haploid gametes — sperm and eggs — directly. These single cells fuse to form the zygote which will develop into another diploid animal.

In most plants, meiosis and fertilization divide the life of the organism into two distinct phases or "generations". This is called **alternation of generations**. In this process, the organism switches back and forth between a multicellular diploid and a multicellular haploid stage during the life cycle.

- The sporophyte generation carries its chromosomes as doubles (diploid). The sporophyte generation, as its name indicates, produces spores. Spores carry

chromosomes as singles. The spores then develop into the gametophyte generation.

- The gametophyte generation produces sex cells — sperm and eggs. Like the gametophyte itself — and like the sex cells of animals — the sex cells carry chromosomes as singles (haploid). The gametophyte generation is usually tiny compared to the sporophyte generation.
- Fertilization of the sex cells brings chromosome doubles back together in the fertilized egg. The life cycle is completed with the development of the sporophyte, which carries chromosomes as doubles.

1. What is alternation of generations?

## Metamorphosis:

Metamorphosis means "change of form." It's the way insects grow and mature. Their lives are divided into separate stages for resting, growing and reproducing. There is a difference between gradual growth and growth in stages. Humans grow gradually. You began life as a baby and grow a little at a time until you're an adult. While you're growing, the basic plan of your body doesn't change. You have the same body your whole life. Insects grow in stages. The cycle of stages is called metamorphosis. For many insects, the stages are so different from one another that you might not recognize them as the same animal.

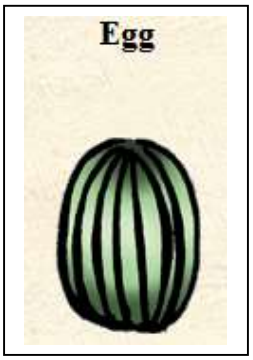
Complete metamorphosis is the way butterflies, bees, flies, beetles and many other insects develop. Complete metamorphosis has four stages: egg, larva, pupa and adult.

1. What does metamorphosis mean?

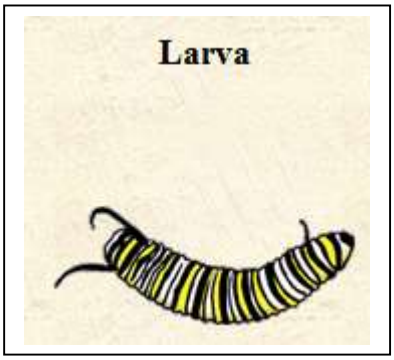
2. Which organisms go through metamorphosis?

3. Why do we use the term metamorphosis to describe the life cycle of these organisms?

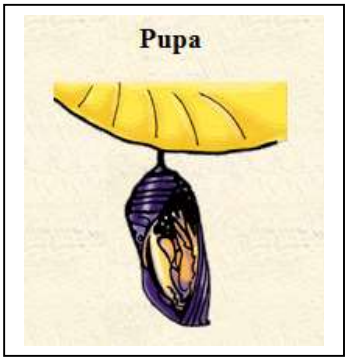
http://exhibits.pacsci.org/insects/metamorphosis.html




Every insect begins life as an egg. The egg is the embryo stage.




The larva hatches from the egg. The larva is the eating and growing stage. Some insects don't eat at all after this stage. Larvae don't look like adults. Caterpillars, grubs and maggots are larvae that grow up to be butterflies, beetles and flies as adults. A larva's exoskeleton can't stretch or grow, so the larva sheds its skin, or molts, several times as it grows.




When a larva has finished growing, it forms a pupa (plural: pupae). The pupa is the insect's transforming stage. Outside, the pupa looks as if it's resting. But inside, the entire body is rearranging. New organs, muscles and body parts develop.

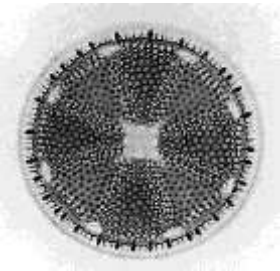

When it has finished changing, the pupa molts one last time, emerging as an adult. The adult is the reproductive stage. The adult has all the identifiable insect features: three body sections, six legs, two antennae and usually wings.

## *7. CDL.7.B.20—Identify the symmetry of organisms: Radial, Bilateral, Asymmetrical*

Symmetry:

| | | |
|---|---|---|
| **Radial Symmetry:** | | Ex: |
| **Bilateral Symmetry:** | | Ex: |
| **Asymmetry:** | | Ex: |

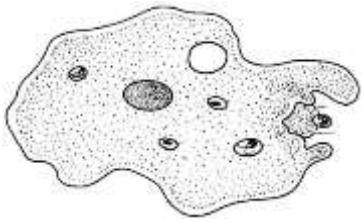
Classify the following organisms as having radial, bilateral, or asymmetry:



1. _____

2. _____

3. _____



4. _____

5. _____

6. _____

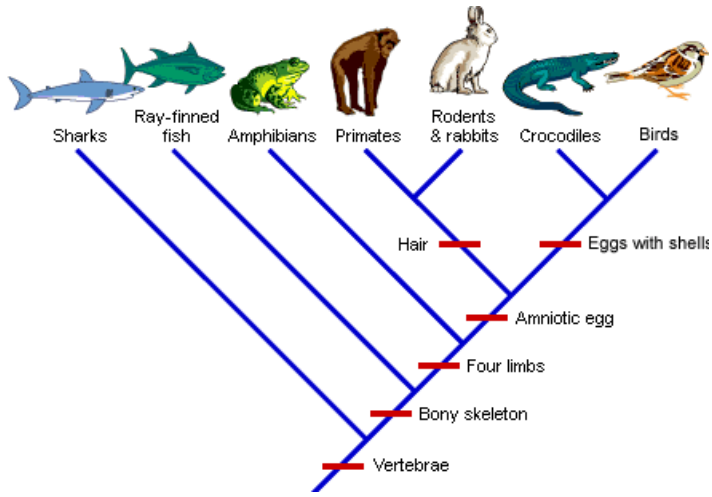
8. *CDL.7.B.6—Compare and contrast the structures and characteristics of viruses (lytic and lysogenic cycles) with non-living and living things*

| Characteristics of Viruses: | Characteristics of Living Things: |
|---|---|
| | |

# Classification and Diversity of Life Test Review

**This is not all inclusive; you still need to study your other review and your notes.**

1. What is a dichotomous key?
2. What term is used to describe a scientific name?
3. What is a cladogram?
4. What is the largest taxon?
5. Which taxon is the most specific group?
6. Which domain has ancient prokaryotes that live in extreme places?
7. What is taxonomy?
8. Which domain has organisms with nuclei in their cells?
9. List the 6 kingdoms.
10. Which domain has prokaryotes that have peptidoglycan in their cell walls?
11. How many parents does sexual reproduction require?
12. What kingdom belongs in Archaea?
13. What is a derived characteristic?
14. What kingdom belongs in Bacteria?
15. How many parents does asexual reproduction require?
16. What is it called when an organism is made of a single cell?
17. What is it called when an organism is made of many cells?
18. What does metamorphosis mean?
19. What is a term for an animal without a backbone?
20. What does symmetry mean and what are the three types?




21. What derived characteristic do only primates and rabbits share?
22. What kind of symmetry is a human?
23. What kind of symmetry is a star fish?