Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period: \_\_\_\_\_\_\_Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = the grouping of objects or organisms based on a set of criteria.

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = A branch of biology that groups and names organisms.

**I.History:**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(384-322 B.C.)
   * Greek philosopher
   * 1st method of classification
     + 2 groups: \_\_\_\_\_\_\_\_\_\_\_\_\_\_& \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1707-1778)
   * Swedish botanist
   * System we still use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 word naming system)
     + Every living organism has a genus name and a species name!
     + Genus & species names:
       - Genus then species names
       - scientific name Ex: *Homo sapiens*
         * common name Ex: = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

o scientific name Ex: *Acinonyx jubatus*

* + - * + common name Ex: Cheetah
    - Writing scientific names (genus & species) (Latin):
      * The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ name is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; the species name is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Both genus and species names are always:
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or\_\_\_\_\_\_\_\_\_\_\_\_\_

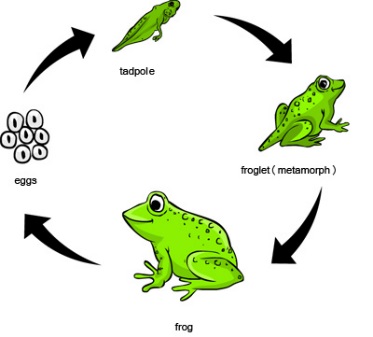
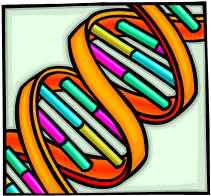
**II. Why are living things organized?**

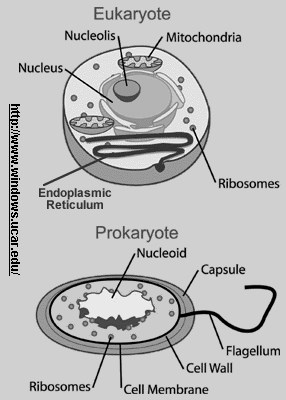
* + - Provides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_understanding-useful tool
    - Important to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- discoveries!
    - New sources of lumber, medicines, energy, etc…

1. **How are living things classified?** 
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- series of categories, each one larger than the previous one
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Very Broad Category)
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(least broad; mating possible)

Pneumonic Device to learn order:

**Dichotomous Keys**

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** keys are tools used to identify unknown organisms.
  + Every step of the key has \_\_\_\_ choices
  + All organisms must fit into \_\_\_\_ of the 2 steps.
  + Follow instructions throughout the key to find name of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organism
  1. Classified by similarities in:
     1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_stages (**structural**)
     2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_analysis (DNA/organic compounds) (genetic) \*\*\* Most widely accepted
     3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_patterns



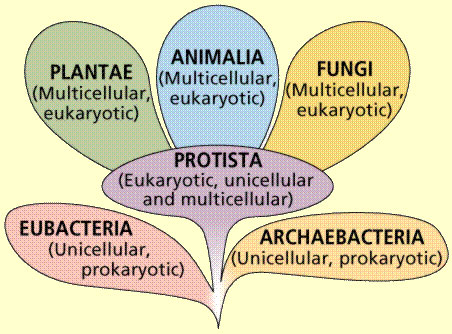
1. **DOMAINS:**

* Organisms are classified into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ according to cell type and structure
* Organisms are classified into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ according to cell type, structure, and nutrition
* 2 Cell Types:
  1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_= have membrane-bound nucleus and organelles; usually more complex than prokaryotic cells
  2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_= does NOT have a nucleus or other membrane-bound organelles
* 3 Domains:
  1. Bacteria
  2. Archaea (pronounced- ar KEE uh)
  3. Eukarya

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 
   * Prokaryotes
   * Cell walls contain peptidoglycan (polymer of sugars)
   * Contains Kingdom Eubacteria
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
   * More ancient than bacteria
   * Prokaryotes
   * Cell walls \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ contain peptidoglycan
   * Live in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ environments

o Boiling hot springs, salty latkes, thermal vents on the oceans’ floors, mud of marshes where there is NO oxygen

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** 
   * Eukaryotes
   * Contains Kingdom Protista, Kingdom Fungi, Kingdom Plants, Kingdom Animals

**V.THE SIX KINGDOMS:**

1. **EUBACTERIA**
2. **ARCHAEA**
3. **PROTISTA**
4. **FUNGI**
5. **PLANTS**
6. **ANIMALS**

**Flow Chart of Domains & Kingdoms:**

**3**

**Domains**

**Bacteria**

**6**

**Kin**

**g**

**doms**

**Eubacteria**

**Eukarya**

**Archaea**

**Archaea**

**Protista**

**Plants**

**Fungi**

**Animals**

# A. EUBACTERIA

* Cell type –\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Cell walls with peptidoglycan
* Unicellular
* Autotroph (organism that makes their own food) or heterotroph (organism that gets its nutrients by feeding on other organisms)
* Common bacteria ***E. coli***

o Ex: bacteria you would find on your skin

o Ex: streptococcus bacteria causes strep throat

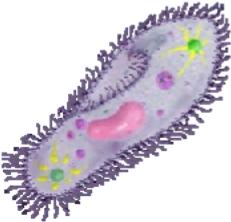
# B. ARCHAEA

* Cell type –**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Cell walls \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_contain peptidoglycan
* Unicellular
* Autotroph or heterotroph
* Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



# C. PROTISTA

* Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_group
* Cell type – eukaryote
* Unicellular and multicellular Slime mold
* Some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



* DO NOT have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Usually live in \_\_\_\_\_\_\_\_\_\_\_\_\_\_environments

Parameciumm

* Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, slime mold, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# D. FUNGI

* Cell type – eukaryote

Kelp

* Most multicellular
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- absorb nutrients obtained by

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dead organisms and wastes in environment

* Cell walls with chitin (polymer)
* Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_**,** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# E. PLANTS

* Cell type – eukaryote
* Multicellular
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (autotrophs)
* Most have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in their cell walls
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_organized into \_\_\_\_\_\_\_\_\_\_\_\_ (roots, stems, leaves)

# F. ANIMALS

* Cell type – eukaryote
* Multicellular
* Consumers that \_\_\_\_\_\_\_ and digest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for food
* No \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Have tissues organized into complex organ systems

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Kingdom Characteristics** | | | | | |
| **Domain** | Bacteria | Archaea | Eukarya | | | |
| **Kingdom** | Eubacteria | Archaea | Protists Fungi Plants Animals | | | |
| **Cell Type** | Prokaryotic | | Eukaryotic | | | |
| **Cell Walls** | Contains peptidoglycan | Does NOT contain peptidoglycan | Some with cellulose | Chitin | Cellulose | NO Cell walls |
| **Number of**  **Cells** | Unicellular | | Unicellular & Multicellular | Most  Multicellular | Multicellular | |
| **Nutrition** | Autotroph or heterotroph | | | Heterotroph | Autotroph | Heterotroph |

***DICHOTOMOUS KEYS***

* A tool to identity items in the natural world, such as trees, wildflowers, mammals, reptiles, rocks, and fish.
* Consists of a series of choices that lead the user to the correct name of a given item.
* "Dichotomous" means "divided into two parts". (keys always give 2 choices in each step)
* You simply compare the characteristics of an unknown organism against an appropriate dichotomous key.

o These keys will begin with **general** characteristics and lead to couplets indicating progressively specific characteristics

**Sample Key To Some Common Beans Used In The Kitchen:**

|  |  |
| --- | --- |
| 1a. Bean round | **Garbanzo bean** |
| 1b. Bean not round | Go to 2 |
|  |  |
| 2a. Bean white | **White northern** |
| 2b. Bean other than white | Go to 3 |
|  |  |
| 3a. Bean evenly pigmented | Go to 4 |
| 3b. Bean pigmentation mottled | **Pinto bean** |
|  |  |
| 4a. Bean black | **Black bean** |
| 4b. Bean reddish-brown | **Kidney bean** |

**GENERAL RULES OF THUMB- Using A Dichotomous Key:**

* 1. Read both choices in a couplet carefully. Although the first description may seem to fit your sample, the second may apply even better.

* 1. Keep notes telling what sequence of identification steps you took. This will allow you to double-check your work later and indicate sources of mistakes, if they have been made.

* 1. If you are unsure of which choice to make in a couplet, follow both forks (one at a time). After working through a couple of more couplets, it may become apparent that one fork does not fit your sample at all.

* 1. Work with more than one sample if at all possible. This will allow you to tell whether the one you are looking at is typical or atypical. This is especially true when working with plants – examine more than one leaf, branch, cone, seed, flower, etc.

* 1. When you have keyed out an organism, do not take your effort as the final result. *Double-check* your identification scheme, using your notes. Find a type specimen (if available) and compare your unknown to the type specimen. If a type specimen is unavailable, find a good description of the indicated taxonomic group and see if your unknown reflects this description.

* 1. When a measurement is indicated, make sure that you take the measurement using a calibrated scale. Do not “eyeball” it or take a guess.

**CONSTRUCTING YOUR OWN DICHOTOMOUS KEY:**

* 1. Examine the objects closely and find distinguishing characteristics in order to separate the objects.
     + - Pay particular attention to those characteristics that seem to be different for groups of objects.
       - Be aware that the more groups you try to distinguish, the more characteristics you have to note.
       - Create a flow diagram in order to help with numbering the couplets.
  2. Group together objects that have similar characteristics (similar size, shape, color, features).

o *DO NOT USE VAGUE or MISLEADING descriptions!!*

* 1. Determine which characteristic gives you the *LEAST* number of subgroups. This is a good candidate starting point for the key.
  2. Then determine how to break down each subgroup into smaller subgroups, using couplets of characteristics.
  3. Keep working until you have separated all of your objects into their own groups

**GENERAL RULES OF THUMB- Making a Dichotomous Key:**

* + 1. Start with the most general characteristics and progress to increasingly more specific characteristics.

* + 1. Leave a space between *each couplet* to make the key easier to read.

* + 1. Use constant measurements, not ones that are highly variable.

* + 1. Use measurements when possible, avoiding descriptors like large or small if possible.

* + 1. Try to use terms that are useable without complicated equipment, the simpler, the better. You may wish to develop a key that can be used in the field and one that can be used in the laboratory.

* + 1. Use characteristics that are found year-round, not seasonal if at all possible

(sometimes the point of a key is identifying organisms based on seasonal characteristics, such as flowers). If your key is seasonal, indicate it in the title of the key.

* + 1. Choices are more effective if they are positive (“this characteristic is”….rather than “this characteristic is not”). This is not always possible.

* + 1. Precede the description with the part that is being described (leaves are red…instead of red leaves present).

* + 1. Start the choices in a couplet with the same word, if possible.

* + 1. Start EACH couplet with different words, if possible.

Classification Vocabulary:

1. **Aristotle** = 1st method of classification; 2 groups: plants & animals

1. **Linnaeus** = system of classification we still use today; binomial nomenclature

1. **Taxonomy** = A branch of biology that groups and names organisms.

1. **Classification** = The grouping of objects or information based on a set of criteria

1. **Binomial nomenclature** = 2 word naming system for every organism (genus & species) names are underlined or italicized, genus name is capitalized and species name is lowercase

1. **Taxa** = series of categories, each one larger than the previous one (domain, kingdom, phylum, class, order, family, genus, species); kingdom is the broadest, only one genus

1. **Autotroph** = organism that makes their own food. Ex: plants-photosynthesis

1. **Heterotroph** = organism that gets its nutrients by feeding on other organisms; organism that does not make their own food

1. **Eukaryotic cells** = have membrane-bound nucleus and organelles; usually more complex than prokaryotic cell

1. **Prokaryotic cells** = does NOT have a nucleus or other membrane-bound organelles

1. **Bacteria** = prokaryotes; cell walls contains peptidoglycan; unicellular

1. **Archaea** = prokaryotes; unicellular; no peptidoglycan in their cell walls; found in extreme environments

1. **Protists** = Most diverse group; Unicellular and multicellular; some plant-like, animal-like and funguslike; Eukaryotic organisms that *lack* complex organ systems and lives in moist environments

1. **Fungi** = multicellular; heterotrophic (do not make their own food) eukaryotes that absorb nutrients obtained by decomposing dead organisms and wastes in environment

1. **Plants** = multicellular; photosynthetic autotrophs (make their own food); eukaryotes; most have cellulose in their cell walls and tissues organized into organs

1. **Animals** = Multicellular; consumers that eat and digest other organisms for food; no cell walls; have tissues organized into complex organ systems

1. **Dichotomous key** = tool used to identify organisms; couplets arranged from general to specific
2. **Domain** = taxonomic group above Kingdom. There are three of these: Archaea, Bacteria, and Eukarya
3. **Kingdom** = taxonomic rank composed of phyla
4. **Phylum** = taxonomic group made of related classes
5. **Class** = taxonomic group made of related orders
6. **Order** = taxonomic group made of similar families
7. **Family** = taxonomic group made of one or more genera
8. **Genus** = taxonomic group made of one or more species
9. **Species** = a group of similar organisms that can breed and produce fertile offspring