I. Taxonomy

**Taxonomy** is the science associated with the naming and classifying of organisms. All living things can be organized into unique units of classification called **species**. Each species has been given a scientific name that is unique to it. The present system of naming species is called **binomial nomenclature** (two name - naming system). Each species has a name based upon two names. The first term is called the **genus** name and designates a group of organisms with similar characteristics to which the species belongs. For example, all oaks belong to the genus *Quercus*. The second name is called the **specific epithet**, and as the term implies it is specific to the species. For example, the scientific name for the southern red oak is *Quercus falcata*. The scientific name of the live oak is *Quercus virginiana*, same genus but different species of oak.

Do not confuse common names and scientific names. Any species may have several common names but only one scientific name. The southern red oak is also know as the Spanish oak.

Well over 1 million species have been described. In order to communicate effectively biologists have developed as system of classification that organizes living things into groups that demonstrate evolutionary relationships between species. The system is in the form of a **hierarchy** - a series of interrelated groupings. The **Domain** level is the broadest and most inclusive. All living things can be placed into one of three domains.

- **Archaea** – primitive prokaryotes; generally associated with extreme habitats and unusual metabolism
- **Bacteria** – prokaryotic bacteria and blue-green algae
- **Eukarya** – all eukaryotes
  - **Protists** - simple plant and animal like forms
  - **Kingdom Fungi** – fungi; heterotrophic decomposers
  - **Kingdom Plantae** – plants; multicellular photosynthetic autotrophos
  - **Kingdom Animalia** – animals; heterotrophic feeders

As you move through the hierarchy it becomes progressively more restrictive. Millions of different organisms could be grouped together at the Domain level, however at the Species level only a single unique organism is present.
The levels are: **Kingdom - Phylum (Division) - Class - Order - Family - Genus - Species.**

The classification of man is a good example of how the system works.

Kingdom Animalia (1,011,031)

Phylum Chordata (45,000)

Subphylum Vertebrata (42,000)

Class Mammalia (4,000)

Order Primates (233)

Family Homonidae (5)

Genus *Homo* (1)

Species *sapiens*

### II. What is a species?

Most species recognized today have been designated as separate species based upon certain measurable physical features. This classical approach to taxonomy that describes species based upon what they look like is called the **morphological species concept.** The **biological species concept** defines a species as a group that has the potential to produce fertile offspring. This concept infers genetic compatibility between individuals. Biological species are the result of barriers to reproduction. A variation on the biological species concept is the molecular species concept. In this concept speciation is based upon differences in genes at the molecular level.

<table>
<thead>
<tr>
<th>Morphological Species Concept</th>
<th>Biological Species Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>can be applied to living and extinct species</td>
<td>can only be applied to living species</td>
</tr>
<tr>
<td>organisms can be sexual or asexual</td>
<td>organisms must be sexual</td>
</tr>
<tr>
<td>can be applied to widely separated populations</td>
<td>only applied to reproductive populations</td>
</tr>
<tr>
<td>physical characteristics can be confusing</td>
<td>not dependent upon physical appearance</td>
</tr>
<tr>
<td></td>
<td>in artificial environments mating between species can occur that would never take place in the wild</td>
</tr>
</tbody>
</table>

### III. Constructing a Dichotomous Key

A **taxonomic key** is used for identifying an organism that someone else has described but is unknown to you. The key consists of a series of alternative choices that make the user choose between characteristics. By making the correct choices, the user arrives at the name of the organism.
Keys such as this are called *dichotomous keys* because at each question they branch into two directions. When using a dichotomous key always read both choices, even if the first appears correct.

Use the key below to determine the hypothetical name of the figures below. Notice that there is 1a and 1b. Start with 1a and the first figure. If the description of the figure fits 1a then move to the choices listed under 2. If the figure fits 1b then go to the choices under 3. Eventually the name of the figure will appear at the end of the line. Choose a different figure and begin again.

Key

1a. Figure without distinct corners .................................................. 2
1b. Figure with distinct corners ...................................................... 3
2a. Figure with radius the same around circumference ..................... Elcric
2b. Figure with radius varying around circumference ...................... Lavo
3a. Figure with three sides ........................................................... 4
3b. Figure with four or more sides .................................................. 5
4a. All sides of equal length ......................................................... Legnairt
4b. Only two sides of equal length ................................................ Legnairtosi
5a. Figure with only right angles ................................................. Erauqs
5b. Figure with other than right angles ........................................ Nogatco
Construct a dichotomous key that will distinguish between the members of the class. Determine ahead of time the characteristics that will be used. Remember, at each number there must be only two choices. If there are men and women in the class, the most obvious first choice would be to separate the individuals by sex.

1a. ________________________________
1b. ________________________________
2a. ________________________________
2b. ________________________________
3a. ________________________________
3b. ________________________________
4a. ________________________________
4b. ________________________________
5a. ________________________________
5b. ________________________________
6a. ________________________________
6b. ________________________________
7a. ________________________________
7b. ________________________________
8a. ________________________________
8b. ________________________________
9a. ________________________________
9b. ________________________________
10a. ______________________________
10b. ______________________________
11a. ______________________________
11b. ______________________________
12a. ______________________________
12b. ______________________________
13a. ______________________________
13b. ______________________________