Classification of Living Things

I. Background Information
   A. classification = grouping items into categories based on the similarities and differences in their characteristics.
      1. Before the categories are chosen, the reason or purpose for the classification must be understood so the most useful groupings can be selected.
   B. Most classification systems place an individual item into one and only one category so there is no confusion as to where it belongs or where it can be found.
      1. This is called a dichotomous classification system because the item is placed in “either one group or the other”.
   C. taxonomy = the science of describing, classifying, and naming living things.
      1. Taxonomy is important for 2 reasons:
         a. it gives a unique name to a specific type of organism, making it easier to identify and discuss.
         b. it helps us study organisms and their relationships to other organisms.
      2. Scientists who work in this field are called taxonomists.

II. Classification Through History
   A. Early Classification
      1. For thousands of years, people have been grouping the objects around them in an attempt to organize them and make their lives easier.
         a. Even Neanderthal Man would have grouped animals into those that are good food sources (prey) and those they had to be careful of (predators) and plants into edible and poisonous.
   B. Aristotle’s Classification System
      1. Aristotle, a Greek philosopher who lived more than 2000 years ago, was among the first to develop a scientific classification of living things.
      2. He divided organisms into 2 large groups or kingdoms: plants and animals.
         a. He then broke the plant kingdom down into 3 smaller groups based on the size and structure of the plants.
         b. He broke the animal kingdom down into smaller groups based on what the animal used for transportation (land, water, or air).
      3. While Aristotle’s system was used for many years, it came under criticism from modern taxonomists because it had too many exceptions, particularly in the animal kingdom.
         a. Classifying animals according to what is used for transportation works for animals such as tigers and fish, but a duck can be found moving in all 3 environments, making it difficult to classify.
   C. Modern Classification
      1. Today, organisms are classified using physical characteristics such as:
         a. body structures
         b. size
         c. shape
         d. color
         e. genetic and chemical make-up
      2. Taxonomists also look at the organism’s phylogeny to find how it is related to other organisms.
         a. phylogeny = the evolutionary history of an organism; a study of an organism’s ancestors to determine what it evolved from and what other organisms it might be related to.

III. Levels of Classification
   A. Taxonomists classify living things by placing them into 8 taxonomic groups, starting with the largest group, domain.
      1. The addition of the domain was a recent change in the classification system, introduced in 1990.
      2. This change emphasizes how different prokaryotes are from eukaryotes.
         a. It even shows that the within the prokaryotes there are such significant differences that they need to be placed in to separate groups.
B. The taxonomic groups used to classify all living things are:
   1. Domain
   2. Kingdom
   3. Phylum
   4. Class
   5. Order
   6. Family
   7. Genus
   8. species

C. Each group has a set of characteristics used to determine which organisms should be included in it.
   1. First you would determine which domain the organism belongs in.
      a. The 3 domains are:
         1. **Domain Archaea**—this group contains prokaryotic organisms that live in extreme conditions (extremely salty or hot environments).
         2. **Domain Bacteria** (also called Eubacteria)—this group contains all other bacteria that live in more “normal” conditions (these are the typical bacteria we think of).
         3. **Domain Eukarya** (also called Eukaryota)—this group contains all of the eukaryotic organisms (basically, anything that is not a bacterium).
   2. Next you would determine which kingdom within that domain the organism belongs in based on its characteristics.
      a. Taxonomists determine this by looking at such characteristics as whether or not it is single-celled or many-celled, if it makes its own food or must get it from other organisms, and if it can move on its own.
         1. Archaea and Bacteria only have one kingdom each.
         2. Eukarya has 4 kingdoms (from the most simple to the most complex): Protista (Protist), Fungi, Plantae (Plant), and Animalia (Animal).
   3. Once in a kingdom, the organism is placed into one of the kingdom’s phylum groups based on its characteristics. This process continues until the organism is classified into the appropriate group in each of the 7 taxonomic categories.
      1. The complete classification for a human being is:
         
         Domain—
         Kingdom—
         Phylum—
         Class—
         Order—
         Family—
         Genus—
         species—

D. When trying to decide how closely related 2 organisms are, you need to determine how many taxonomic groups they share.
   1. The more groups they share, the more characteristics they have in common, therefore, the more closely related they are.
      a. If they share all the way down to species, they are the same type of organism.
      b. Organisms in the same species can mate with each other and produce offspring that can also produce offspring (these are called fertile offspring).