

The Science of Classification

Classification: The process of putting similar things into groups.

Taxonomy: Is the science of classifying organisms.

History of Classification

- 384-322 B.C.



- **Aristotle** (Greek Philosopher)
- Created first written classification scheme
 - **TWO Groups - Plants & Animals**
 - **Animal group - anything that lived on land, in the water or in the air.**
 - **Plant group - based this on their different stems**



- 1700's - **Carols Linnaeus** - Swedish Biologist
 - established a simple system for classifying and naming organisms
 - Based on structural similarities of organism
 - Binomial Nomenclature - 2 name naming system - still in use today.
 - Created a system of groups called **TAXA or TAXON**
 - Each Taxon is a category into which related organisms are placed (ex. Domain, kingdom, Phylum ect.)
- The basic structure of the system was similar to how human organizations work, with groups-contained-within-groups, such as the military. Each particular type of living thing would be designated a **species**(from the same root word as "specific"). Closely-related species could be collected within a larger grouping, a **genus**; related genera are grouped into a **family**, families into an **order**, orders into a **class**, classes into a **phylum**, and phyla into a **Kingdom**, Kingdoms into **Domain** the biggest and most general group. In Linnaeus' time, there were just the Animal Kingdom and the Plant Kingdom, but later discoveries convinced

biologists (then called naturalists) that some distinct types of organisms, such as **Fungi** and some tiny single-celled organisms, should be given their own separate Kingdoms.

1) Who is Carl Linnaeus?

2) What is classification?

Modern Day Levels of Classification

Domain Kingdom Phylum Class Order Family Genus Species

The modern version added Domain, so:

D K P C O F G S

Can you make a sentence using the first letter of each classification subgroup?

D _____ K _____ P _____ C _____ O _____
 F _____ G _____ S _____

EX.

Taxa	Man	Box Elder Tree	Canadian lynx	Bobcat
Domain	Eukarya	Eukarya	Eukarya	Eukarya
Kingdom	Animalia	Plantae	Animalia	Animalia
Phylum/Division	Chordata	Anthophyta	Chordata	Chordata
Class	Mammalian	Dicotyledonae	Mammalia	Mammalia
Order	Primates	Sapindales	Carnivora	Carnivora
Family	Hominidae	Aceraceae	Felidae	Felidae
Genus	Homo	Acer	Lynx	Lynx
Species	sapiens	nugundo	canadensis	rufus

* Classification provides scientists and students a way to sort and group organisms for easier study.

* There are millions of organisms on the earth! (approximately 1.5 million have been already named)

Organisms are classified by their:

* physical structure (how they look) (this used to be the main way of classification a long time ago).

* evolutionary relationships

* embryonic similarities (embryos)

* genetic similarities (DNA)

* biochemical similarities (protein, RNA, DNA)

3) Why is classification important?

Taxonomy - the branch of science that classifies and names living things.

Nomenclature - a system for naming things

Binomial nomenclature - a two named--naming system

Using Binomial Nomenclature

1. Names must be Greek or Latin or latinized and are printed in italics. Like everything else printed in italics, they are **underlined when handwritten**.
2. The genus name (the *Homo* in *Homo sapiens*) is capitalized and must be a single word.
3. The species name (*sapiens* in *Homo sapiens*) can be either a single word or a compound word (a new word made up of two words).
4. Credit for authorship of names will be given to the person who first publishes it with an accurate and recognizable description of the organism.

What you should know are these 4 rules. Typically, you'll see questions on quizzes or exams.

4) Circle the accepted name for the following organisms.

Horse

1. equus cabballus
2. Equus Cabballus
3. *Equus cabbalus*

4. equus Caballus

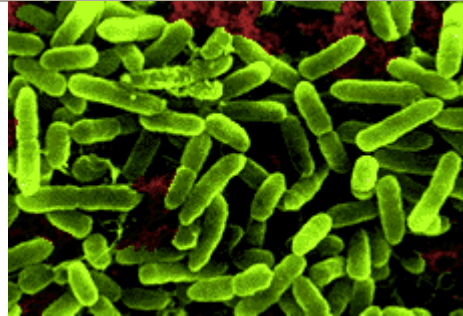
Fungi (succulent morel)

1. Morchella esculenta
2. Morchella esculenta
3. *Morchella Esculenta*
4. *Morchella esculenta*

IDENTIFYING ORGANISMS BY THEIR GENUS AND SPECIES NAMES IS CALLED THE BINOMIAL SYSTEM, OR BINOMIAL NOMENCLATURE. ("TWO-NAME NAMING")

Six-Kingdom System

Evolved from Aristotle's 2 Kingdoms to the Present day 6 Kingdoms



Kingdom Bacteria and Archea

Characteristics of the Bacteria and Archea Kingdoms:

1. Prokaryotes
2. Heterotrophic and autotrophic
(**Heterotrophic** - Organism that can't synthesize (make) it's own food, consumer)
(**Autotrophic** - Organism that CAN make it's own food - photosynthesis, producer)
3. Anaerobic and aerobic
4. aquatic, terrestrial and in the air
5. mostly asexual
6. mostly non motile (1 form does move, flagella)

Things like: bacteria - both eubacteria (True bacteria) and archebacteria (ancient bacteria)



Kingdom Protista

Characteristics of the Protista Kingdom

1. Eukaryotes
2. Heterotrophic (consumer) and Autotrophic (producer)
3. Unicellular
4. Mostly aquatic
5. Mostly asexual
6. Motile and nonmotile

Things like: Protozoa, slime molds and algae



Kingdom Fungi

Characteristics of the Fungi Kingdom

1. Eukaryote
2. Heterotrophic (Decomposer)
3. Unicellular and Multicellular
4. Mostly terrestrial
5. asexual and sexual
6. nonmotile

Things like: Mushrooms, bread molds, water molds, yeasts, rusts, puffballs

Kingdom Plantae



Characteristics of Plantae Kingdom

1. Eukaryote
2. Multicellular
3. Autotrophic
4. Mostly Terrestrial
5. Asexual and Sexual
6. Nonmotile

Things like: mosses, ferns, conifers, and flowering plants

Kingdom Animalia



Characteristics of Animalia Kingdom

1. Eukaryote
2. Multicellular
3. Heterotrophic
4. Terrestrial and Aquatic
5. Sexual (a few asexual)
6. Motile (a few are nonmotile)

Things like: sponges, jellyfish, mollusks, round worms, flat worms, segmented worms, arthropods, starfish, fish, amphibians, reptiles, birds, mammals

Try doing this without help (text or friend). Circle the correct answer:

1) What is classification?

- a. Grouping things together on the basis of how they can survive
- b. Grouping things together on the basis of how they feed
- c. Grouping things together on the basis of the features they have in common
- d. Grouping things together on the basis of how they respire

2) Which of these is a kingdom?

- a. Madeline
- b. Chordata
- c. Annelids
- d. Fungi

3) Organism are first divided into large groups called kingdoms. What are kingdoms sub-divided into?

- a. Classes
- b. Hominidae
- c. Genus
- d. Phyla

4) Write the modern classification scheme in order.

5) Write the six kingdoms.

Skeleton

- Protects organs and soft tissues.
- Provides support for muscles.
- Two types of skeletons:

1.- Endoskeleton- Internal skeleton. Mammals, amphibians, birds, fish.

- **Worms and echinoderms (starfish) have fluid-filled internal cavities giving them support, called hydrostatic skeletons**

2.- Exoskeleton Hard, waxy covering outside of the body. Prevents water loss, Protection from predators. Insects, crustaceans. **Must be molted** making animal vulnerable to predators

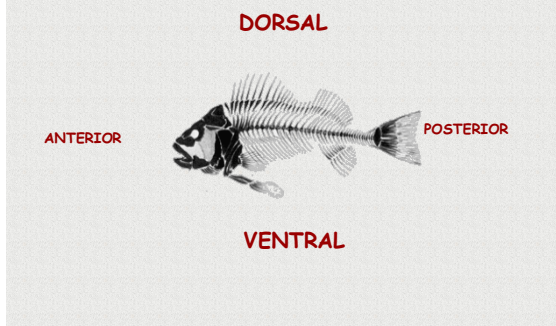
Movement

- Animals such as sponges may be **sessile** (attached & non-moving)
- Animals that move very little are said to be **sedentary** (clam)
- Animals that can move are **motile**

Surfaces

- **Dorsal** - back or upper surface
- **Ventral** - belly or lower surface
- **Anterior** - head or front end
- **Posterior** - tail or hind end opposite the head
- **Oral surface** (echinoderms) - is where the mouth is located (underside)
- **Aboral** surface (echinoderms) - is opposite the mouth (top side)

Surfaces (Most Animals)



Surfaces (Echinoderms)



Body Symmetry

- **Symmetry** is the arrangement of body parts around a central plane or axis
- **Asymmetry** occurs when the body can't be divided into similar sections (sponges)
- **Radial symmetry** occurs when body parts are arranged around a central point like spokes on a wheel (echinoderms)
- Most animals with radial symmetry are **sessile (attached)** or **sedentary (move very little)**
- **Bilateral symmetry** occurs when animals can be divided into **equal halves** along a single plane
- Organisms will have **right and left sides** that are mirror images of each other

Ectotherms- Cold blooded animals – Their temperature depends on the environment, their metabolism is 10 times lower than warm blooded animals.

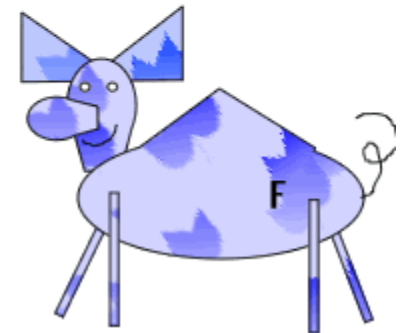
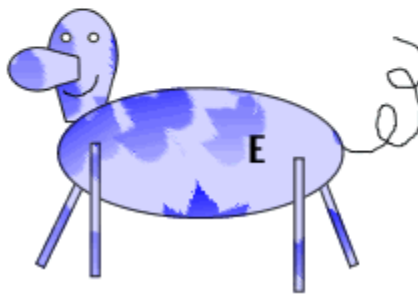
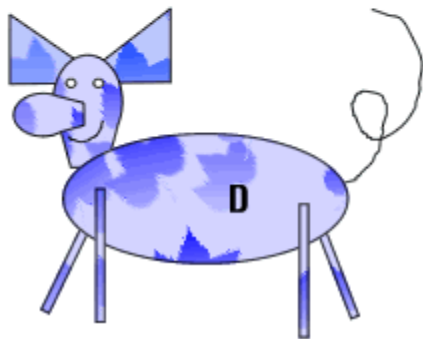
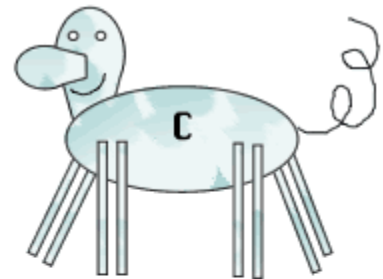
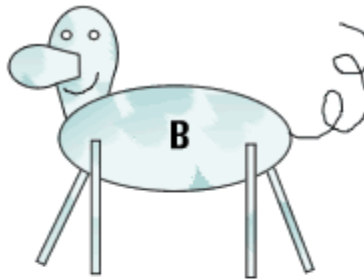
Ex. Amphibians and reptiles

Endotherms – Warm blooded animals – Their temperature is independent from the environment; their metabolism is 10 times higher than ectotherms. Ex. Mammals

Using Dichotomous Keys

A dichotomous key is a written set of choices that leads to the name of an organism. Scientists use these to identify unknown organisms.

Consider the following animals. They are all related, but each is a separate species. Use the dichotomous key below to determine the species of each.



1.	Has green colored bodygo to 2
	Has purple colored body go to 4
2.	Has 4 legsgo to 3
	Has 8 legs <i>Deerus octagis</i>
3.	Has a tail <i>Deerus pestis</i>
	Does not have a tail <i>Deerus magnus</i>
4.	Has a pointy hump <i>Deerus humpis</i>
	Does not have a pointy hump.....go to 5
5.	Has ears <i>Deerus purplinis</i>
	Does not have ears <i>Deerus deafus</i>

What Do You Know?

1. Every organism's scientific name consists of [one | two | three] words.
2. "Sea Monkey" is an example of a [common name | scientific name].
3. The science of naming and classifying organisms is called [nomenclature | taxonomy]
4. Organisms in the same genus, such as *Canis lupus* and *Canis familiaris* MUST also belong to the same [species | phylum].
5. The taxon (group) directly under Phylum is [class | order].
6. Plantae and Animalia are two examples of [species | kingdoms].
7. Organisms that can interbreed with one another are classified as the same[species | genus].
8. The evolutionary history of a species is called [phylogeny | taxonomy]
9. Biologists usually classify things according to their [habitat | appearance]
10. The naming system developed by Linnaeus is called [systematic | binomial nomenclature]
11. Organisms with the names: *Quercus rubra* and *Quercus phellos* belong to the same [genus | species]
12. The taxon (group) directly below Order is [family | class]
13. For black bears and polar bears to be in the same family, they must also be in the same [genus | order]
14. The second word of a scientific name is always [capitalized | lowercase]
15. The scientific name is always written in [all capitals | italics]