

Lab

Dichotomous Key for the Six Kingdoms

Background Information

The Six Kingdom Classification System:

When **Carolus Linnaeus** first grouped organisms into their appropriate kingdoms, he found that all organisms could be conveniently placed into either the plant or animal kingdom. Linnaeus created his system in the eighteenth century, basing it on the knowledge available then. As biologists gathered more information over the years, it became clear that the two kingdoms were not ample to include all organisms.

For example, microorganisms, which were discovered only after the development of the microscope, look and act significantly different from plants and animals. As you may remember, some cells are so primitive that they do not have a true nucleus.

Because of discoveries of new life forms and changing ideas about those characteristics of greatest importance in classifying organisms, the most generally accepted classification system now contains six kingdoms. They are **Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, and Animalia**.

Kingdom Key:

- 1a. The organism is unicellular and lacks a nucleus. It is called a prokaryote and is always microscopic in size. Bacteria are the only members of this group go to 2a
- 1b. The organism is not like the statement in 1a go to 3a
- 2a. The bacteria are found living in extremely harsh environments Kingdom Archaeobacteria
- 2b. The bacteria are found living in normal environments Kingdom Eubacteria
- 3a. The organism is eukaryotic and mostly microscopic. It may be either unicellular or multicellular. Protozoans and algae make up this kingdom Kingdom Protista
- 3b. The organism is not like the statement in 3a go to 4a
- 4a. The organism is usually large enough to be seen without a microscope, however, some animals may be microscopic. It does not have cell walls. Food is ingested. All animals, from the simple sponges to the complex mammals, are in this kingdom Kingdom Animalia
- 4b. The organism is like 4a, except it has cell walls and its food is not ingested go to 5a
- 5a. The organism is plant-like. It has cell walls made of cellulose and is able to make its own food (photosynthesis). Trees, shrubs, and grasses are examples of this large kingdom Kingdom Plantae
- 5b. The organism cannot make its own food. It absorbs its food. The cell walls are made of chitin. Yeast, mushrooms, and molds are an example of this kingdom Kingdom Fungi

Dichotomous Key for the Animal Phyla

General Information

In this lab you will be presented with an assortment of organisms to classify. **Most** of the samples will be from the animal kingdom. Your task will be to classify each sample correctly. First determine the **kingdom** for which the organism belongs. If you determine that this organism is in the kingdom Animalia, **continue** to classify it into the proper phylum and possibly, the correct **class**.

The classification key you will use is very simple. Each statement will have two choices, either YES, it looks like this or NO, it does not. This two choice classification process is called a **dichotomous key**. The following is an example of how to successfully read a dichotomous key. If your answer to statement 1a is NO, then statement 1b must be YES and you continue to the choice that is designated at the end of the dotted line. Classify each animal into its proper phylum and, when possible, class.

Animal Phyla Key

- 1a. The animal is very simple with a body that is quite porous, it is aquatic and a filter feeder, internal skeleton made of spongin, carbonate or silicate Phylum Porifera
- 1b. The animal is not like the statement in 1a go to 2a

- 2a. The animal is thin and sack-like or tube-like with tentacles and stinging cells, radial symmetry is present, strictly an aquatic animal Phylum Cnidaria
- 2b. The animal is not like the statement in 2a go to 3a

- 3a. The animal is worm-like but not snake-like go to 4a
- 3b. The animal is not worm-like go to 6a

- 4a. The animal appears as a flattened worm, it is triploblastic; acoelomate, it has a mouth but no anus; it has a two way digestive tract Phylum Platyhelminthes
- 4b. The animal is not like the statement in 4a go to 5a

- 5a. The animal is a smooth-bodied worm; triploblastic, body cavity is a pseudocoelom; it has a complete digestive tract with mouth and anus Phylum Nematoda
- 5b. The animal is a segmented worm with a true body cavity called a coelom; it has a complete digestive tract with one way traffic, both mouth and anus are present Phylum Annelida

- 6a. The animal lives in salt water; its body is typically five-part radial symmetry ; it moves with many tube feet Phylum Echinodermata
- 6b. The animal is not like the statement in 6a go to 7a

- 7a. The animal has a soft body usually with some type of shell or tentacles with suction cups; muscular foot; adults have bilateral symmetry; highly unusual group of animals (slugs, snails, clams, and octopuses) Phylum Mollusca
go to the **Key for Classes of Mollusca**
- 7b. The animal is not like the statement 7a go to 8a
- 8a. The animal has an exoskeleton made of chitin; the legs are jointed; open circulatory system is present Phylum Arthropoda
go to the **Key for Arthropoda**
- 8b. The animal has or had a notochord and gill slits when it was developing as an embryo; an endoskeleton is usually present; a dorsal nerve cord originates from a head region Phylum Chordata
go to the **Key for Classes of Chordata**

Key to the Classes of Chordata

- 1a. The animal is fish-like and has fins (not flippers or web feet) go to 2a
- 1b. The animal is not like the statement in 1a go to 5a
- 2a. The animal is fairly small and lacks a skeleton; it is a filter feeder, there is a notochord for support Subphylum Cephalochordata
- 2b. The animal is not like the statement in 2a go to 3a
- 3a. The fish is eel-like and has a circular mouth with rasping teeth; it is parasitic Class Agnatha
- 3b. The animal is not like the statement in 3a go to 4a
- 4a. The animal has an internal skeleton of bone Class Osteichthyes
- 4b. The animal has an internal skeleton of cartilage Class Chondrichthyes
- 5a. The animal has feathers covering its skin Class Aves
- 5b. The animal is not like the statement in 5a go to 6a
- 6a. The animal has hair covering its skin Class Mammalia
- 6b. The animal is not like the statement in 6a go to 7a
- 7a. The animal has scales covering its body Class Reptilia
- 7b. The animal has smooth skin; lacks scales, feathers, and hair Class Amphibia

Key to the Classes of Arthropoda

- 1a.. The animal lacks antennae Subphylum Chelicerata
- 1b. The animal is not like the statement in 1a go to 2a
- 2a. The animal has two pair of antennae..... Subphylum Crustacea
- 2b. The animal has one pair of antennae Subphylum Uniramia
..... go to 3a
- 3a. The animal has six legs and three body sections, head, thorax, and abdomen Class Insecta
- 3b. The animal is not like the statement in 3ago to 4a
- 4a. The animal has a body of many segments with one pair of legs per segmentClass Chilopoda
- 4b. The animal has a body of many segments with two pair of legs per segment Class Diplopoda

Key to the Classes of Mollusca

- 1a. The animal has a shell of two pieces, a top and bottom; moves with a wedge-shaped muscular foot Class Bivalvia
- 1b. This animal is not like the statement in 1a go to 2a
- 2a. The animal has tentacles present; it may or may not have a shell go to 3a
- 2b. The animal has eight overlapping, dorsal plates; there is no obvious head Class Polyplacophora
- 3a. The animal has one or two pairs of tentacles growing from the head Class Gastropoda
- 3b. The animal has four or more pairs of tentacles growing from the head Class Cephalopoda

Number	Common Name	Kingdom	Phylum	Subphylum	Class
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Glossary of Terms Used in This Dichotomous Key

acoelomate -	an animal that does not have a body cavity for its organ systems. A flatworm does not have a body cavity.
antennae -	jointed appendages used by some animals for the sense of touch or smell.
coelom -	true body cavity that forms between the mesoderm layers of all higher animals. Vertebrates, echinoderms, mollusks, annelids, and arthropods, all have true body cavities.
diploblastic -	animals formed from only two germ layers, ectoderm and endoderm. These animals lack a mesoderm layer.
endoderm -	embryonic germ layer that gives rise to the respiratory and digestive systems in animals.
endoskeleton -	skeleton that forms inside the animal. Vertebrates have an internal skeleton made of bone or cartilage.
ectoderm -	embryonic germ layer that gives rise to the skin and nervous system in animals.
exoskeleton -	skeleton found on the outside of some animals. Insects and clams have outside skeletons formed of different materials.
germ layers -	embryonic cell layers that continue to divide and eventually specialize into all of the cells of an animals body. The three basic layers are called the ectoderm, mesoderm, and endoderm. They are named by their position to each other.
ingest -	to take food in and then digest it. Animal eat their food and then digest it in a fairly efficient manner.
mesoderm -	embryonic germ layer that gives rise to the muscular, circulatory, and reproductive systems in animals.
nematocysts -	stinging cells found on animals like jellyfish or hydra.
notochord -	a cartilaginous rod of tissue used for support in all chordates. This structure is usually replaced by vertebrae in animals called chordates.
one-way digestion -	an animal with a mouth for food to enter and an anus for undigested food to exit. Most animals have this type of digestion pathway.
porous -	full of many holes.
pseudocoelom -	a body cavity formed between the mesoderm and endoderm of only a few types of animals.
radial symmetry -	a body pattern like a sea star. Some times referred to as five-part radial symmetry.
rasping -	triangular teeth arranged in a circle around the mouth. Sea lamprey have a mouth with rasping teeth.
tentacles -	soft appendages that grow from the head region of some animals. The snail and octopus have tentacles for different purposes.
triploblastic -	animals formed from three germ layers, ectoderm, mesoderm, and endoderm. Most animals are triploblastic.
two-way digestion -	a digestive pathway that has only one opening for food to enter and exit. Only a few simple animals have this type of digestion.
vertebrate -	an animal with an internal skeleton of which specialized bone called vertebrae surround and protect a dorsal nerve cord. Birds, mammals, fish, reptiles and amphibians are vertebrates.