

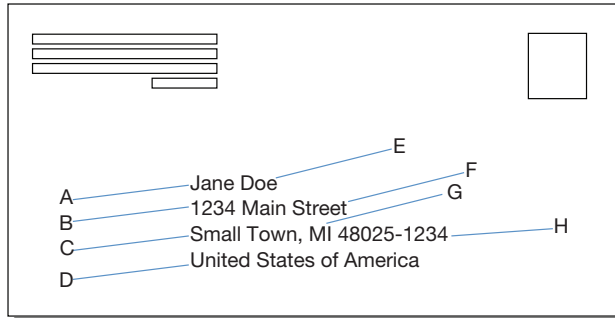
# Biological Classification

How are organisms grouped, sorted, and classified?

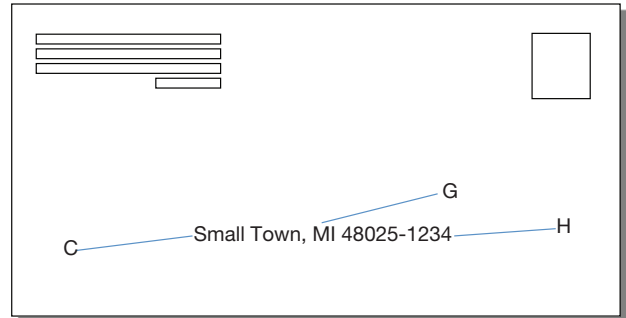
## Why?

From the time we begin to talk, we start to name things. We like to see how things are related. It is natural then, that biologists would name and organize organisms into a classification system. In this activity you will learn about the major classification groups and how organisms are named.

## Model 1 – Addressing an Envelope



**Addressed Envelope 1**



**Addressed Envelope 2**

1. According to the envelope in Model 1, who is supposed to receive the letter?
2. Decide with your group which of the two letters in Model 1 will be more successful at reaching its destination. Justify your choice.
3. In Addressed Envelope 1, which four letters (A–H) correspond to the most specific part of the address?
4. In Addressed Envelope 1, which four letters (A–H) correspond to the most general part of the address?
5. In recent years, the United States Post Office has introduced a zip code plus 4 (H). Thinking about what you've learned about addresses, why would this additional information be added to address labels?



## Model 2 – Taxonomy

	<b>Envelope</b> (Jane Doe)	<b>Taxa</b>	<b>Lion</b> <i>(Panthera leo)</i>	<b>Tiger</b> <i>(Panthera tigris)</i>	<b>House Cat</b> <i>(Felis catus)</i>
Country		Kingdom	Animalia	Animalia	Animalia
State and Zip			Chordata	Chordata	Chordata
Town			Mammalia	Mammalia	Mammalia
Street name			Carnivora	Carnivora	Carnivora
House No.			Felidae	Felidae	Felidae
Last name			<i>Panthera*</i>	<i>Panthera</i>	<i>Felis</i>
First name			<i>leo</i>	<i>tigris</i>	<i>catus</i>

6. Using the envelope outline from Model 1, classify the full address by writing the appropriate information in the “Envelope” column in Model 2.

### Read This!

Carolus Linneaus (1707–1778) is known as the father of modern taxonomy. Taxonomy is the science of finding, describing, and categorizing organisms with the ultimate goal to name the species. In traditional Linnean taxonomy the seven major taxonomic groups are (in order from least specific to most specific) Kingdom, Phylum, Class, Order, Family, Genus, and Species. Modern taxonomy categorizes the six kingdoms into three domains.



7. Use the Linnaean taxonomic groupings to complete the third column of the table above.
8. Which two of the three cats listed in Model 2 are most closely related? Explain your answer.
9. At which taxonomic level do the two cats you identified in Question 8 separate?
10. What is the most specific taxonomic grouping in which all three cats are the same?
11. What is different about the way the genus and species names are written compared to the other taxa?



12. The genus and species names are collectively referred to as the scientific name. It is written in a form known as **binomial nomenclature**, a two-term Latin naming system. There are three rules for writing a scientific name using this system. Analyze the information in Model 2 to complete the rules below:

**Rule 1:** The scientific name is always written in \_\_\_\_ parts, with the genus name written \_\_\_\_\_ and the species name \_\_\_\_\_.

**Rule 2:** The scientific name is always written in \_\_\_\_\_. If it is handwritten, it is written in cursive or underlined.

**Rule 3:** The first letter of the genus name is a \_\_\_\_\_ letter.

13. This system is used all over the world. Why do you think Latin is used instead of a more modern language?

14. Using this system, would it be possible for two different species to have the same name?

15. In Linnaeus's time, classification was based on the appearance of organisms. Think about the appearance of organisms such as tadpoles and frogs, sharks and dolphins, and penguins and eagles. What are the limitations of classifying organisms by only their appearance?

16. Considering advances in science, discuss with your group what might be a more reliable way to classify organisms. List at least three additional ways besides appearance.



## Model 3 – Domains and Kingdoms

Domain	Kingdom	Cell Organization	Type of Cells	Energy Source
Eukarya	Animalia	Multicellular	Eukaryotic	Heterotrophic, ingestion
	Plantae	Multicellular (most forms)	Eukaryotic	Autotrophic
	Fungi	Multicellular (most forms)	Eukaryotic	Heterotrophic, absorption
	Protista	Unicellular (most forms) Multicellular (some colonial)	Eukaryotic	Autotrophic or Heterotrophic, ingestion or absorption
Archaea	Archaeobacteria	Unicellular	Prokaryotic	Autotrophic or Heterotrophic, absorption
Bacteria	Eubacteria	Unicellular	Prokaryotic	Autotrophic or Heterotrophic, absorption

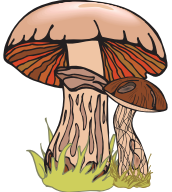
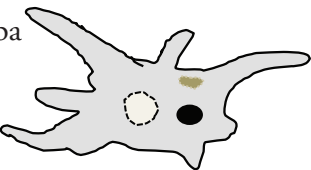



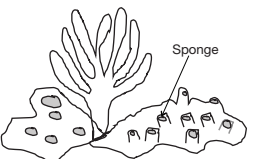
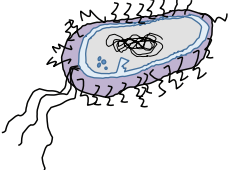
17. Look carefully at Model 3 and compare the kingdom arrangement to the domain arrangement. Which group is larger, domain or kingdom? Justify your answer and use information from the model in your explanation.
  
18. Refer to the Domains in the chart in Model 3.
  - a. How many domains are shown?
  
  - b. Which domain includes eukaryotic organisms?
  
  - c. Which domains include prokaryotic organisms?
  
19. Refer to the Kingdoms in the chart in Model 3?
  - a. How many kingdoms are shown?
  
  - b. Which kingdoms contain eukaryotic organisms?
  
  - c. Which kingdoms contain prokaryotic organisms?
  
20. Which kingdoms contain only unicellular organisms?

21. In which domain would you place the kingdom Archaeobacteria?
22. In Model 3, organisms are described as **autotrophic** or **heterotrophic** in the way they get nutrition. What do these terms mean?





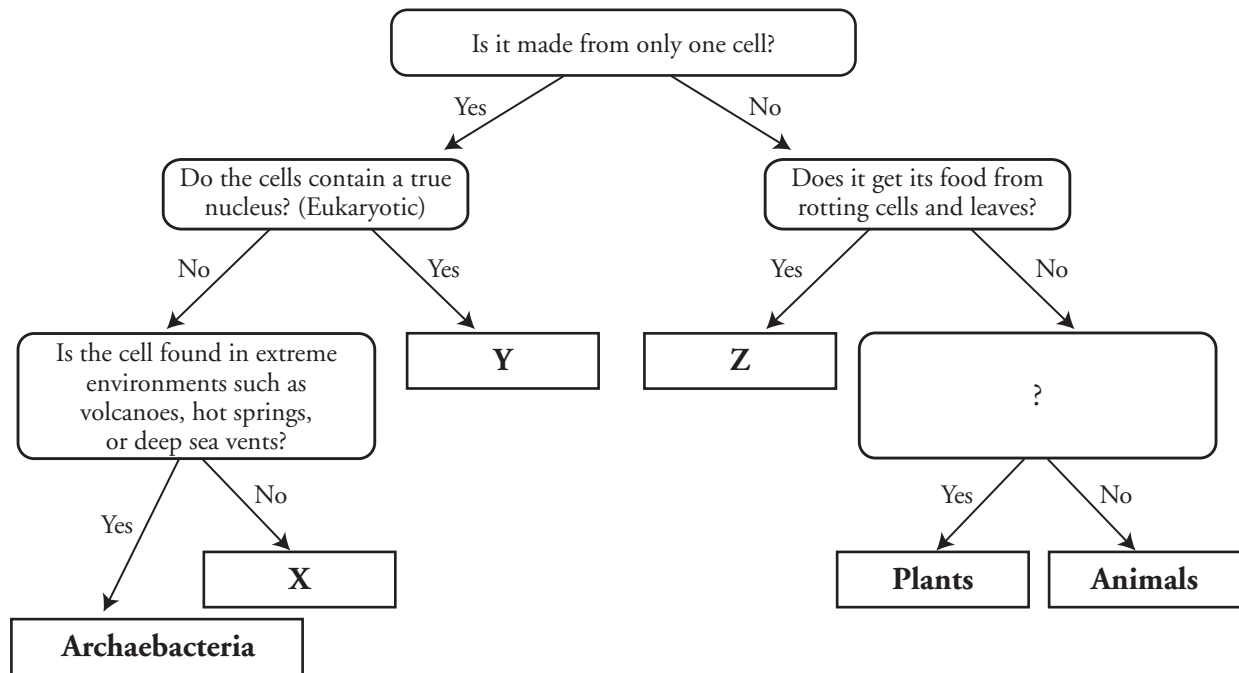
23. As a group, discuss and complete the following table by filling in the boxes with the corresponding characteristics of each organism.

Organism	Cell Organization	Type of Cells	Energy Source	Kingdom
Mushrooms 				
Amoeba 				
Flower 				
Frog 				
Millipede 				
Sponge 				
Bacteria 				



## Extension Questions

### Model 4 – Dichotomous Key



The diagram above is called a **dichotomous key**. By answering a series of yes and no questions and following the arrows, a final level of classification can be reached. This diagram represents the six-kingdom model of organization.

24. For every question box in the flow chart, what are the possible answers?
25. What questions and answers lead you to the decision that an organism is from the kingdom Archaeobacteria?
26. Using information from the previous models, fill in the missing kingdoms X, Y, and Z.
27. What question could you insert in the box with a “?” to help distinguish between animals and plants?

28. Using a similar flow chart, develop a dichotomous key for the seven organisms listed in the chart at Question 23.

29. Create a mnemonic phrase to remember the eight major taxonomic groupings.

30. How would a scientist have made the distinction between a unicellular and a multicellular organism in the 17th century (1600s), the mid-20th century (1900s), and in the 21st century?