Chapter 5 General Science

The Kingdoms of Life

**biologist**- a scientist who studies the behavior and characteristics of living things

**classification**- the grouping of organisms by their type

**kingdom**- one of the five main groups in biological classification

**phylum**- the largest of the groupings of organisms below kingdom (plural, phyla)

**species**- organisms that can reproduce together and have offspring that can also reproduce

**protist**- a tiny one-celled organism that is neither plant nor animal but may have characteristics of both.

**alga**- a plantlike protist (plural, algae)

**protozoan**- an animal-like protist (plural, protozoa)

**moneran**- a tiny organism that has DNA but no true nucleus (plural, monera)

**bacterium**- a tiny one-celled moneran seen only through a microscope (plural, bacteria)

**fungus**- an organism that gets its food by breaking down dead matter and absorbing useful elements from it (plural, fungi)

**5-1 Classifying Organisms**

How are items arranged in a supermarket? In other words, how are they grouped?

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Classification systems make it easier to find, describe, and work with a large numbers of different objects. Let’s write some examples when we use classification.

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\* More than 1 million kinds of animals are known today. Name as many as you can in 3 minutes. Go! \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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At least 324,000 kinds of plants are known. Name as many as you can. Go!

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What makes plants different from animals? How do you know? Explain.

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**The Kingdoms of Life**

**Biologists** are constantly studying known plants and animals but search for new ones as well. They have a **classification** for each type. Biologists study many characteristics of organisms to decide how they should be grouped. In all, there are five main groups in biological classification. Each one is called a **kingdom**.

\* You already know a lot about two of the kingdoms- the Plant Kingdom and the Animal Kingdom. The biggest difference is the way the organisms get their food. Animals must eat other organisms for food. Plants use chlorophyll and sunlight to make their own food.

Copy the chart on page 65 *The Five Kingdoms of Life*

\* In each of the five kingdoms, there are smaller groupings of organisms. The largest of these is called a **phylum**. The Animal Kingdom has about 20 phyla. All animals that have backbones are part of the phylum called Chordata. Within each phylum, there are many smaller groupings, including class, order, family, and genus. **Species** are the smallest groupings. Humans belong to the class *Mammalia* (Mammals) and the species *Homo sapiens*.

\* There are about 50,000 species of animals with backbones. There are more than 1 million species of animals without backbones. The species name is usually given as a combination of both the genus and species names.

**5-2 Earth’s Simplest Organisms**

**Protists**

\* People used to believe there were only two kingdoms- plants and animals. Then, the microscope was invented. It showed new kinds of organisms. Name as many microscopic organisms as you can in two minutes. Go! \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Today, we call these organisms **protists**. Protists were given their own kingdom because of their characteristics. Some are like plants. One plantlike protist is called an **alga**. You may have seen algae growing on lakes or floating in the sea. They are usually green, red, or brown. What you are really seeing is a giant colony of algae. A single alga is usually too small to be seen without a microscope.

\* One animal-like protist is a **protozoan**. Protozoan often have tiny shells. When they die, these shells pile up on the ocean floor. The chalk in the old classrooms is made up of these shells. Protists that live in water form the base of aquatic food webs.

**Monera**

A **moneran**, like protist, a plant, and an animal, has DNA in its cells. However, it does not have a true nucleus to hold the DNA. The DNA floats around in the cytoplasm. For this reason, scientists decided to give monera their own kingdom- the Moneran Kingdom.

\* The Moneran Kingdom is made up of different kinds of bacteria (**bacterium**). Like the protists, bacteria are found everywhere. They live in the ocean, the sky, and even your skin. Many bacteria actually live in your body.

\* Some bacteria are very useful. We use them to make many kinds of foods, such as cheese and yogurt. Other types of bacteria are very dangerous. They can cause sickness and even death. *Clostridium botulinum* bacteria produces a deadly poison. This is commonly known as **botulism**. Improperly canned foods can contain this poison. Do not buy foods in cans that are bulging, crushed, or opened.

**Fungi**

\* If you leave bread out for a long time, something soft and fuzzy might grow on it. The fuzzy substance is called *mold*. Mold is a **fungus**.

\* People used to group fungi with plants. After all, they have a lot in common with plants. They grow in one place. They do not move around looking for their food, as most animals do. However, fungi are missing one important plant characteristic- chloroplasts. That means they cannot make their own food using photosynthesis. Fungi cannot be monera either, because they do have a true nuclei in their cells. Finally, fungi are too big to be protists. So scientists created a kingdom just for them. Fungi includes molds, yeasts, and mushrooms. Fungi get their food from dead organisms or dead matter on an organism. For example, athlete’s foot is a fungus that eats the dead skin on people’s feet.

We will now complete the mushroom/fungus webquest

<http://herbarium.usu.edu/fungi/funfacts/factindx1.htm>

Fungi- The Hidden Kingdom

**The part of the fungus that we see is only the “fruit” of the organism.**

**Launching Pads**

**Any mushroom can be called a toadstool, but this word usually refers to a poisonous mushroom.**

**Biodiversity**

**Despite their importance, none of the 711 federally listed endangered and threatened species under the jurisdiction of the U.S. Fish and Wildlife Service are fungi.**

**Fungal Shotguns**

**Shooting the spores into the daylight gives them a better chance of landing in a sunny place where grass or other plants are growing. The cows that made the dung for the previous batch of *Pilobolus* will probably eat these spore covered plants and start the process all over again.**

Gold in the Soil

**In November, 2000, a new record of over $400 *an ounce* was set an an auction of white truffles. At those prices, the average two-ounce candy bar would cost you $800!**

**The Ultimate Treasure Hunt: Finding Truffles**

**Truffle hunters in Italy and France use pigs and mixed-breed dogs to sniff out truffles. Dogs are preferred to pigs because pigs love to eat truffles. Notice the staff held by the truffle hunter in the picture with the pig. The hunter uses the staff to force the pig to back off, once the pig has located a truffle.**

**Giant Puffballs**

**They range from golf ball size to as large as a watermelon. A big specimen of the giant puffball (*Calvatia gigantea*) can be almost two feet long and contain 7,000,000,000,000 (7 trillion)** [**spores**](http://herbarium.usu.edu/fungi/funfacts/Puffspor.htm)**.**

**Earth Stars**

**sac (sak): a hollow part of a plant or animal, shaped like a pouch or small bag**

**Pitted Delights**

**Morels are found in many different kinds of places. Our records at the University of Michigan show that they are found in cedar and hemlock swamps, in mixed hardwood forests, under aspens, near dead American elms, and in apple orchards. Morels are often produced in great abundance after forest fires and even in bark mulch on flower beds. The common feature of all these records seems to be wet soil that is high in organic matter and shaded by trees, especially hardwoods.**

**Lichens**

**This life habit has allowed lichens to successfully colonize many different habitats. Lichens have a truly remarkable resistance to drought. A dry lichen can quickly absorb from 3 to 35 times its weight in water! Lichens can also absorb moisture from dew or fog, even from the air itself if the humidity is very high and the temperature is low. They also dry out slowly, making it possible for the photosynthesizing partner(s) to make food for as long as possible. This ability to quickly absorb and retain water from many sources makes it possible for lichens to live in harsh environments like deserts and polar regions, and on exposed surfaces like bare rocks, roofs and tree branches.**

**Dispersal**

**Passive mechanisms for dispersal include**

* **Wind**
* **Water**

**\* Animals**

**Slime Molds**

**Some spores can stay dormant for 75 years and then germinate.**

**What’s in a Name**

**Scientists carefully research and study the relationships between fungi and other forms of life in order to understand them and assign scientific names based on their understanding.**

**Fairy Rings**

**If there are no barriers, free rings can grow outward at up to 8 inches (20 cm) per year. They can reach a diameter of over 30 feet (10 m). One ring formed in France by the fungus *Clitocybe geotropa* is almost a half mile (600 m) in diameter. This ring is thought to be 700 years old.**

**Ant Gardens**

**Ant nest mounds extend up to three feet underground. They consist of many chambers--2000 in an average sized colony. Each chamber is 8 to 12 inches (200-300 mm) in diameter. Nest building raises a huge mound of soil. Ants constructing an average-sized mound carry 88 tons (80,000 kg) of soil to the surface.**

**Terminators**

**The species used for biocontrol are often parasites. Fungi that parasitize insects are a valuable weapon for biocontrol. Usually, the spores of a parasitic fungus are sprayed on the pest insects. The fungal attack takes place in three stages: entry into the host, growth, and spore production by the mature fungus. The picture on this page shows the spore producing structure of *Cordyceps australis* sprouting from the corpse of its host, an ant.**

**Decomposition**

**All living things, and a few other surprising substances, are considered organic. The speed at which the decomposition occurs, called the "rate of decomposition", depends on the temperature, moisture and chemical composition of the organic matter.**

**Penicillin: The First Miracle Drug**

**Patients with bacterial infections, who don't finish their antibiotic prescriptions completely, also allow resistant bacteria to develop. This happens because a small number of semi-resistant bacteria, which needed the full course of antibiotics to kill them, survive. Instead of being a small part of the bacteria causing an infection, the more resistant bacteria take over when sensitive bacteria are killed by the antibiotic.**

**Endocarditis**

**The treatment of fungal endocarditis can require surgery to remove colonies of fungi from the heart, and anti-fungal drug therapy for 6-8 weeks.**

**Data Warehouse**

**Mycologists (biologists that study fungi) collect or are given mushrooms and other fungi as part of their research. Research collections result when these fungi are dried and saved.**

**Data Mining**

**The Michigan Fungus database only contains 35,000 specimen records, 12% of the 280,000 specimens in the collection.**

**\*\*Spend 15 minutes playing any of the games available on the home page.**

Fungi- The Hidden Kingdom

**The part of the fungus that we see is only the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the organism.**

**Launching Pads**

**Any mushroom can be called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but this word usually refers to a poisonous mushroom.**

**Biodiversity**

**Despite their importance, none of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ federally listed endangered and threatened species under the jurisdiction of the U.S. Fish and Wildlife Service are fungi.**

**Fungal Shotguns**

**Shooting the spores into the daylight gives them a better chance of landing in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_place where grass or other plants are growing. The cows that made the dung for the previous batch of *Pilobolus* will probably eat these spore covered plants and start the process all over again.**

Gold in the Soil

**In November, 2000, a new record of over $\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *an ounce* was set an an auction of white truffles. At those prices, the average \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ candy bar would cost you $800!**

**The Ultimate Treasure Hunt: Finding Truffles**

**Truffle hunters in Italy and France use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to sniff out truffles. Notice the staff held by the truffle hunter in the picture with the pig. The hunter uses the staff to force the pig to back off, once the pig has located a truffle.**

**Giant Puffballs**

**They range from \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ size to as large as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A big specimen of the giant puffball (*Calvatia gigantea*) can be almost two feet long and contain 7,000,000,000,000 (7 trillion)** [**spores**](http://herbarium.usu.edu/fungi/funfacts/Puffspor.htm)**.**

**Earth Stars**

**Define sac (sak): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Pitted Delights**

**Name all of the places where morel mushrooms are found.**

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**The common feature of all these records seems to be \_\_\_\_\_\_\_\_ soil that is high in organic matter and shaded by trees, especially hardwoods.**

**Lichens**

**This life habit has allowed lichens to successfully colonize many different habitats. Lichens have a truly remarkable resistance to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A dry lichen can quickly absorb from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_times its weight in water! Lichens can also absorb moisture from dew or fog, even from the air itself if the humidity is very high and the temperature is low. They also dry out slowly, making it possible for the photosynthesizing partner(s) to make food for as long as possible. This ability to quickly absorb and retain water from many sources makes it possible for lichens to live in harsh environments like \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and on exposed surfaces like bare rocks, roofs and tree branches.**

**Dispersal**

**Passive mechanisms for dispersal include**

**\* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Slime Molds**

**Some spores can stay dormant for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ years and then germinate.**

**What’s in a Name**

**Scientists carefully research and study the relationships between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and other forms of life in order to understand them and assign scientific names based on their\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Fairy Rings**

**If there are no barriers, free rings can grow outward at up to \_\_\_\_\_\_\_\_\_\_inches (20 cm) per year. They can reach a diameter of over \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feet (10 m). One ring formed in France by the fungus *Clitocybe geotropa* is almost a half mile (600 m) in diameter. This ring is thought to be \_\_\_\_\_\_\_\_\_\_\_ years old.**

**Ant Gardens**

**Ant nest mounds extend up to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ feet underground. They consist of many chambers--2000 in an average sized colony. Each chamber is \_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_ inches (200-300 mm) in diameter. Nest building raises a huge mound of soil. Ants constructing an average-sized mound carry 88 \_\_\_\_\_\_\_\_\_\_\_\_\_ (80,000 kg) of soil to the surface.**

**Terminators**

**The species used for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are often parasites. Fungi that parasitize insects are a valuable weapon for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Usually, the spores of a parasitic fungus are sprayed on the pest insects. The fungal attack takes place in three stages:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The picture on this page shows the spore producing structure of *Cordyceps australis* sprouting from the corpse of its host, an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Decomposition**

**All living things, and a few other surprising substances, are considered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The speed at which the decomposition occurs, called the "rate of decomposition", depends on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the organic matter.**

**Penicillin: The First Miracle Drug**

**Patients with bacterial infections, who don't finish their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_completely, also allow resistant bacteria to develop. This happens because a small number of semi-resistant bacteria, which needed the full course of antibiotics to kill them, survive. Instead of being a small part of the bacteria causing an infection, the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_bacteria take over when sensitive bacteria are killed by the antibiotic.**

**Endocarditis**

**The treatment of fungal endocarditis can require surgery to remove colonies of fungi from the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and anti-fungal drug therapy for 6-8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Data Warehouse**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (biologists that study fungi) collect or are given mushrooms and other fungi as part of their research. Research collections result when these fungi are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Data Mining**

**The Michigan Fungus database only contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_specimen records, 12% of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ specimens in the collection.**

**\*\*Spend 15 minutes playing any of the games available on the home page.**