

Exam Preparation for Science and Social Studies Program

EXPreSS

June 8 through June 19
2009

TEACHER

Wednesday, June 10

Objective

Domain: Cells and Heredity

- Students analyze the similarities and differences between organisms of different kingdoms.

Time	Activity/Task	Assessment
10 min.	<p><i>Activating Strategy:</i> Photos of viruses, protists, and bacteria. Show the students the photos of 6 organisms (see activating strategy photos on the Wednesday materials section). Ask the students to write in their notebook what type organism they think each one is.</p>	Teacher checks each student's decision and asks some students to explain their decision aloud.
20 min.	<p><i>Student Work Session 1:</i> Group the students groups of three and give each group pictures of 10 different organisms including pictures of bacteria, viruses, and protists (see photos in the Wednesday materials section). Introduce the names of the 6 kingdoms and designate an area on the wall for each kingdom.</p> <ul style="list-style-type: none"> • Ask the students to place their pictures on the wall under the kingdom names they think their organisms belong. • Conduct a class discussion on the general characteristics of each kingdom and what to do with the pictures of the organisms that do not appear to fit in any category. • Using their notes and other classroom resources, have students complete the Six Kingdom graphic organizer that identifies the characteristics of the 6 kingdoms. <p><i>Teacher note: allow students the opportunity to construct their own graphic organizer OR provide them with an outline attached here(see Six Kingdom Graphic Organizer in the Wednesday materials section)</i></p>	Completed graphic organizer Participation in the classroom discussion
30 min	<p><i>Student Work Session 2: Kingdoms Station Lab</i> Students will rotate through a series of specimens where they will complete the Kingdoms Station Lab data collection sheet (see the Kingdoms Stations Lab handout in the Wednesday materials section). <i>Teacher note: Create stations with either live organisms or photos of them for students to rotate through. Many of these specimens can be collected in your neighborhood.</i></p>	Students will correctly complete the stations lab data collection sheet.

Wednesday, June 10 (continuation)		
Time	Activity/Task	Assessment
25 min.	<p><i>Formative Assessment:</i> Form new groups of students and hand out one kingdom circles bags (see the Kingdoms circles handouts in the Wednesday materials section) to each group. Have the students place the appropriate wedge describing a particular characteristic on the appropriate kingdom wedge. Walk from group to group checking the correctness of the work and once the students have the correct result ask each one of them to copy the information in their notebooks. Finally, ask the students to put all the materials in the plastic back and switch bags with another group. Repeat the process until each group has gone through all the different bags.</p>	Circle wedges are correctly placed.
25 min.	<p><i>Review Questions 5</i> Provide students with a set of questions (see Review Questions 5 handout in the Wednesday materials section) on the similarities and differences between organisms of different kingdoms. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answer to the questions and ask the students to correct their own answer if necessary and to write an explanation of why the answer needed to be corrected. The explanation must state the original reason the student choose the wrong answer and what makes the correct answer correct.</p>	Student questionnaire
10 min.	<p>Closure: Have students summarized what they have learned today OR teacher says a sentence (i.e. “there are 6 kingdoms”). The next student adds a sentence to what you said then the next student adds a sentence to that one. This continues around the room with each student adding on to what the previous student stated.</p> <p>HW- Find 5 organisms pictures to bring to class tomorrow. When they bring them in, have the names of six kingdoms posted around the room and allow students time to categorize the organisms they brought in. Have extras available for students who do not do the assignment and also provide each student with at least 2 other pictures they must categorize (these will probably be in the bacteria or Protist kingdoms).</p>	Student participation. Homework assignment.

Wednesday, June 10 (continuation)

Objective

Domain: Energy Transformations

- Students examine the phases of matter and the related atomic and molecular motion

Time	Activity/Task	Assessment
15 min	<p><i>Warm up for Energy Transformations Domain</i></p> <p>Place students in groups of 4, using a place mat/dry erase markers students will write everything they can remember about the phases or states of matter.</p> <p>Ask the students to number themselves from one to four. Then instruct the first student to write everything he/she can remember about the phases or states of matter. Rotate the place mat to the next student (student 2) and instruct the student to see if what his/her partner wrote jogs any memories that you would like to add to their list.</p> <p>After the placemat has made one complete rotation, have each group condense their ideas into a central idea and write in the middle.</p> <p>A group spokesman will then transfer the idea onto a post it note, read it to the class and place it on the “phase change” poster on the wall (a piece of butcher paper).</p> <p>Clear up misconceptions.</p> <p><i>Teacher note: give each group a post it note as they are condensing ideas. Use one color for this part of the lesson.</i></p>	Students’ placemat responses and group post it notes
10 min	<p><i>Phase Change Simulation</i></p> <p>Divide the class into two or three groups depending on class size. Each group must demonstrate solids, liquids, and, gases using their bodies as molecules. Solids will be tightly grouped with little movement, liquids are somewhat spread out with more movement (students hopping up and down), gases will be more spread out with greater movement.</p> <p>Discuss temperature’s role in phase change.</p>	Students’ models
15 min	<p><i>Pom- Pom Simulation</i></p> <p>Have students return to their groups of 4 with the placemat. Give each student a bag of pom poms and have them construct models of each phase of matter. Students will then draw pictures of their models with the corresponding temperatures.</p> <p><i>Teacher note: walk around the classroom and check for understanding by asking students questions as you view their models.</i></p>	Students’ drawings

Wednesday, June 10 (continuation)

Time	Activity/Task	Assessment
15 min	<p><i>Phase change Stations Labs</i></p> <p>Students can remain in the groups that they were in earlier to rotate through these stations labs. Each student should complete their own lab responses (see Phase Change Observation handout in the Wednesday materials section). Allow only 5 minutes per station. Instruct students about safety concerns briefly before beginning. See the Phases change stations lab in the Wednesday materials section.</p> <p><i>Teacher note: circulate around the lab to monitor and check for understanding clearing up misconceptions as they arise.</i></p>	Student lab responses
5 min	<p><i>Summary</i></p> <p>Have students return to their groups, have them retrieve their group's post it note from earlier. Give each group different color posts it note and have them add/delete or revise their earlier response. Place both notes back on the poster.</p>	Student responses

Wednesday, June 10 (continuation)

Objective

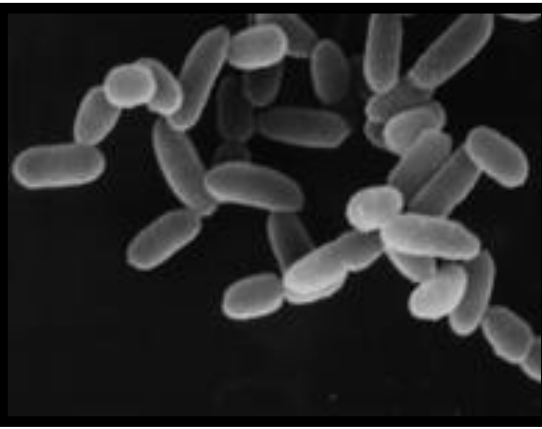
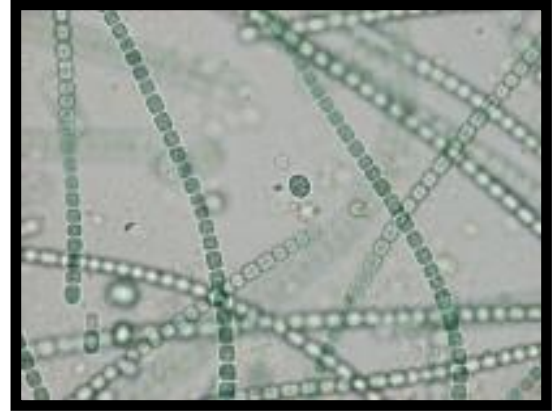
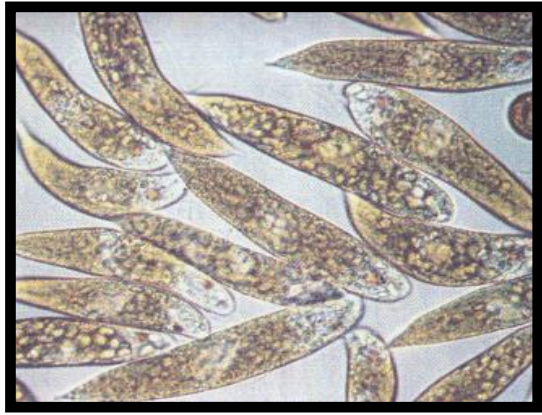
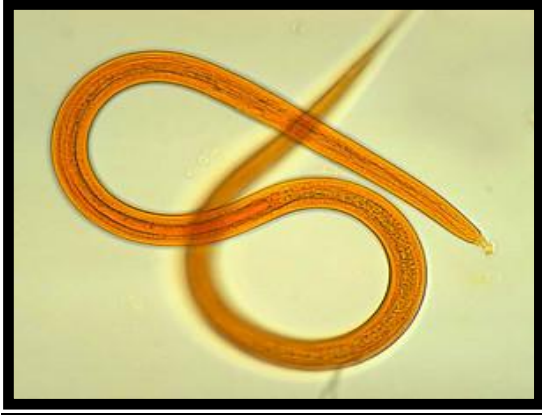
Domain: Energy Transformations

- Students understand radioactivity.

Time	Activity/Task	Assessment
10 min	<p><i>Pre-assessment- Radioactivity</i></p> <p>Chalk Talk- On a large piece of butcher paper, write “Radioactivity” in a circle in the center of the paper. In groups of 3, have students draw “talk bubbles” off of the main topic and write everything they know about the topic in their “bubble”. Have them initial their bubble.</p> <p>Clear up misconceptions based on their responses.</p>	Student responses
20 min	<p><i>Twizzlers Lab</i></p> <p>Give each student a piece of graph paper and 1 Twizzler. The teacher will be the timer for each $\frac{1}{2}$ life and announce to the class each time they are to “take a bite”. They only have 30 seconds to record their results after each $\frac{1}{2}$ life.</p> <p>Give the student time to draw their graph on a graph paper and answer the analysis questions (see Twizzlers Lab in the Wednesday materials section). As time allows it, ask some of the students to share their answer to the questions with the class and check for understanding of the concept of half life.</p>	Student lab report
15 min	<p><i>$\frac{1}{2}$ Life Calculations</i></p> <p>Model for the students how to calculate half-life and the amount remaining (see Sample Problems in the Wednesday materials section).</p> <p>Give each student one of the four Half life calculation cards (see Half Life Calculation Cards in the Wednesday materials section) and ask them to solve it.</p> <p><i>Teacher note: While the students are solving their problem walk around the classroom to answer any questions that the students may have on how to calculate half life times.</i></p>	Half life calculation cards
15 min.	<p><i>Review Questions 6</i></p> <p>Provide students with a set of questions (see Review Questions 6 handout in the Wednesday materials section) on the concepts of half life and radioactivity.</p> <p>Conduct a group discussion of the answer to the questions and ask the students to correct their own answer if necessary and to write an explanation of why the answer needed to be corrected. The explanation must state the original reason the student choose the wrong answer and what makes the correct answer correct.</p>	Student questionnaire

Wednesday's Materials Section

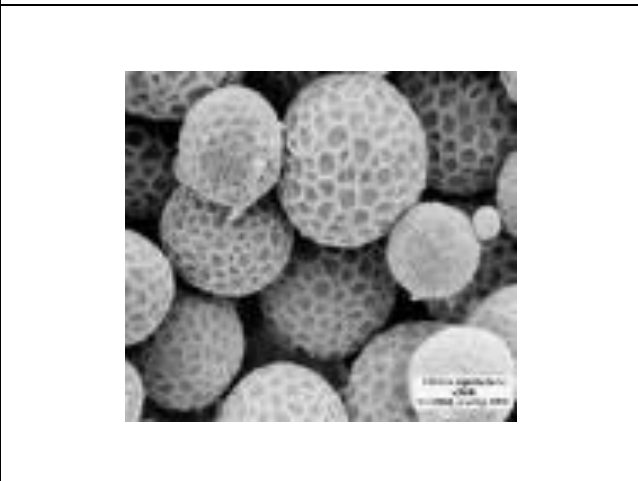
Organisms Pictures



Photos of Organisms

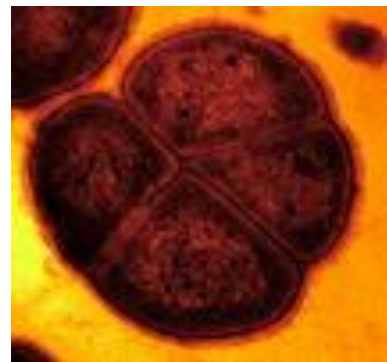
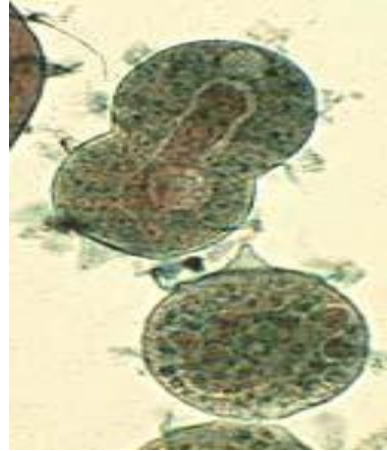


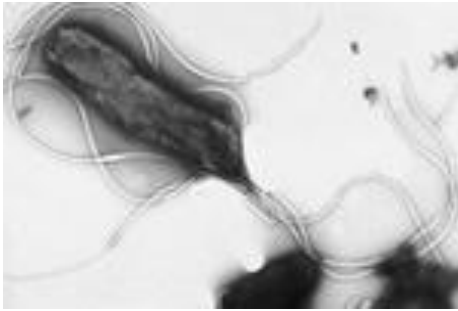












Six Kingdom Classification System Graphic Organizer

	Archaeobacteria	Eubacteria	Protista	Fungi	Plantae	Animalia
Common Characteristics						
Common Examples						
Cell Type (prokaryote or eukaryote)						
Complexity (unicellular or multi-cellular)						
Mode of Nutrition (autotrophic or heterotrophic)						
Type of Habitat						
Type of Reproduction (asexual or sexual or both)						

Kingdom Stations Lab

Station #	Organism	Body Type	Cell Type	Nutrition	Reproduction	Cell Structure
1						
2						
3						
4						
5						
6						

Station #1

Organism

Fungi



Characteristics

Fungi are not plants. The living body of the fungus is a mycelium made out of a web of tiny filaments called hyphae. The mycelium is usually hidden in the soil, in wood, or another food source. These webs live unseen until they develop mushrooms, truffles, cups, etc. Most fungi build their cell walls out of chitin, this is the same material as the hard outer shells of insects. Fungi feed by absorbing nutrients from the organic material in which they live. Fungi do not have stomachs. They must digest their food before it can pass through the cell wall in the hyphae. Fungi reproduce by releasing spores from a fruiting body, which is the mushroom. The mushroom releases spores into the air, and the wind carries the spores off to start the next generation.

Station #2

Organism

Praying
Mantis



Characteristics

Praying Mantis is named for its prominent front legs, which are bent and held together at an angle that suggests the position of prayer. These insects are formidable predators. They have triangular heads poised on a long “neck” or elongated thorax. Mantis can turn their head 180 degrees.

Mantises are typically green or brown, so they are well camouflaged on the plants among which they live. The Praying Mantis uses their front legs to snare their prey that generally consists of moths, crickets, grasshoppers, flies, and other insects.

Females regularly lay hundreds of eggs in a small case, and nymphs hatch looking much like tiny versions of their parents.

Station #3

Organism

Euglena



Characteristics

Euglenas are single cell organisms that live in freshwater. Euglenas are green like plants and thus carry out photosynthesis. However, unlike plants Euglena does not have a cellulose cell wall. In addition, Euglenas possess a long whip-like structure on one side that propels them through water.

Euglena is unique in that it is both heterotrophic (must consume food) and autotrophic (can make its own food). The euglena has a stiff pellicle outside the cell membrane that helps it keep its shape. In the center of the cell is the nucleus, which contains the cell's DNA and controls the cell's activities. The interior of the cell contains a jelly-like fluid substance called cytoplasm.

Station #4

Organism

African
Elephant



Characteristics

The African elephant is the largest living land mammal. Elephants can live in nearly any habitat that has adequate quantities of food and water. Elephants consume about 5% of their body weight and drink 20-50 gallons of water per day.

The life-cycle of an elephant has been arbitrarily broken up into three main divisions; baby, adolescent, and adult. Elephants are colloquially called pachyderms which mean thick-skinned animals. The skin is covered with hair. Female elephants have one calf after a twenty-two month pregnancy.

Station #5

Organism

White Pine



Characteristics

The White Pine has the distinction of being the tallest tree in eastern North America growing to be 50' – 80' feet in height. Their leaves are in the form of needles, 3 to 5 inches long, with five, slender, flexible needles per fascicle. The needles appear blue-green because of 3 or more glaucous lines of stomata.

The trees reproduced sexually by seeds that are transported by wind. The cone production begins when the tree is between 5 – 10 years old. Good seeds are produced every 3 – 5 years, with some seed produced in intervening years. The bark of the these trees darken and thicken as the tree ages, smooth and gray on young growth it becomes gray-brown, deeply furrowed with broad ridges of irregular rectangular purple-tinged scaly plates as the tree gets older.

The White Pines are moderately fire resistant and can grow on nearly all soil types.

Station #6

Organism

Cyanobacterium



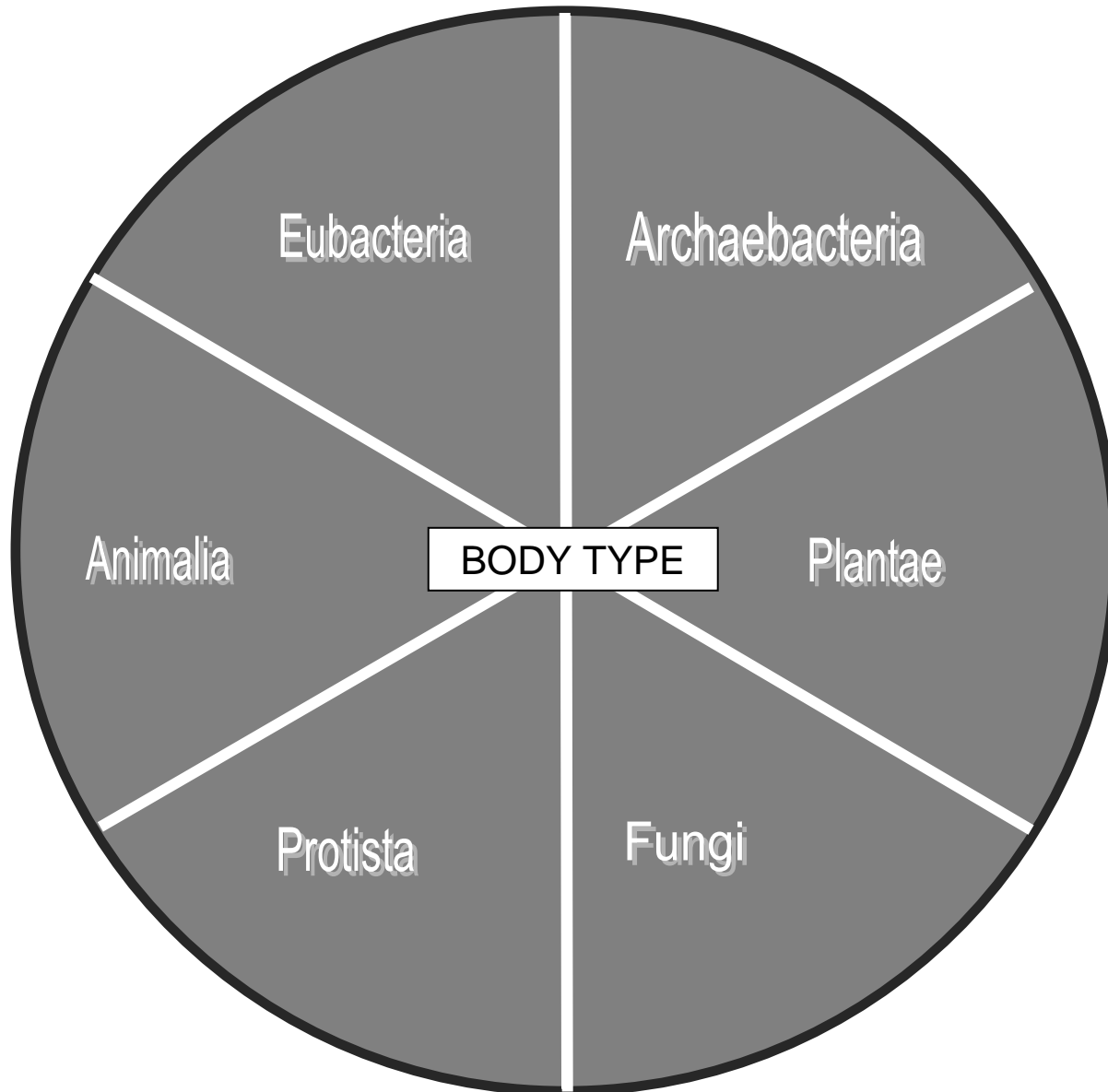
Characteristics

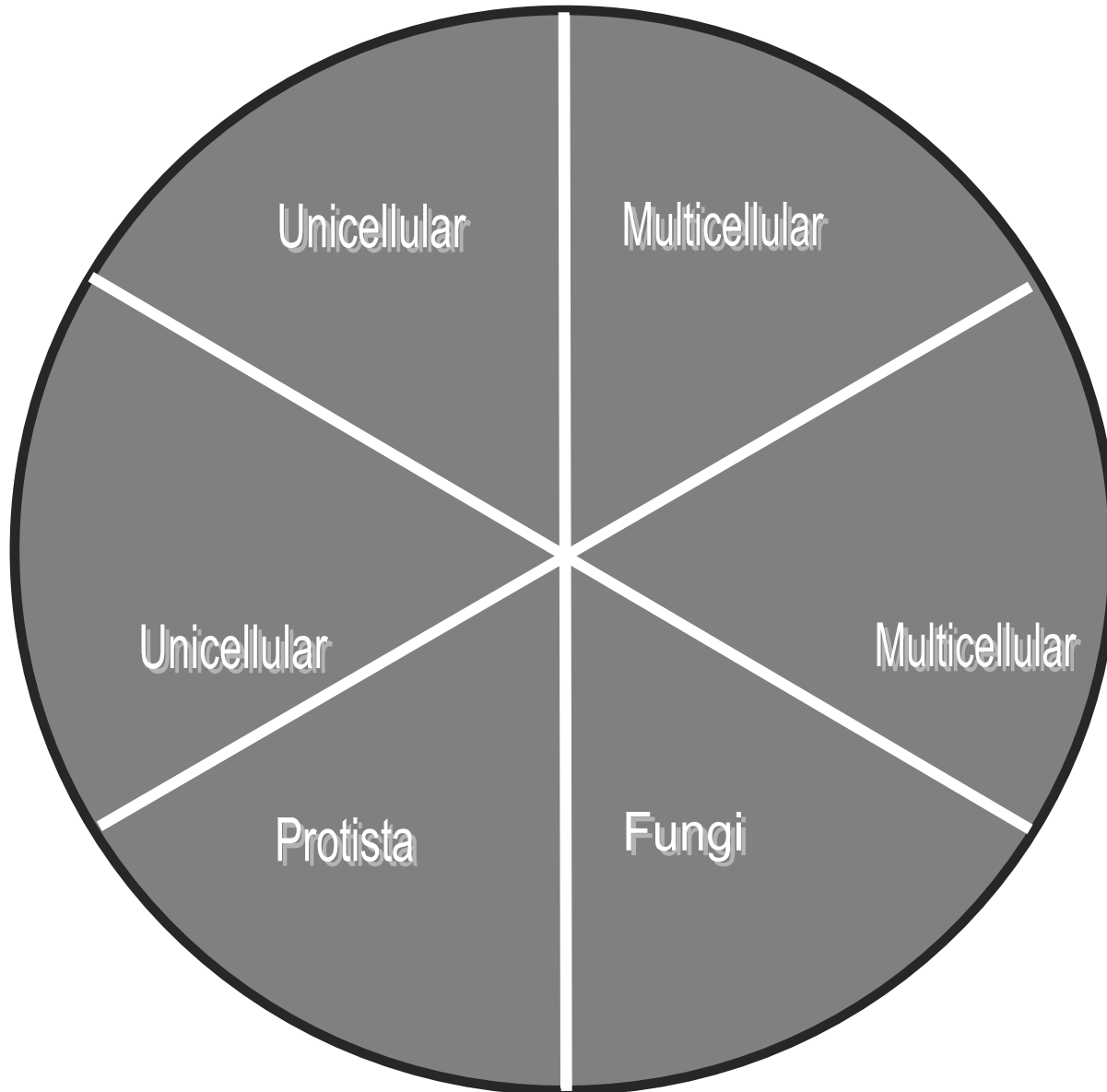
The cyanobacteria are aquatic and photosynthetic organisms. They are quite small and usually unicellular, though they often grow in colonies large enough to see. Cyanobacteria are very important to plants as the chloroplast with which plants make food for themselves is actually a Cyanobacterium living within the plant's cells. Like other bacteria, cyanobacteria have no nucleus or internal membrane systems. In many species, however, the external membrane has been folded to increase total surface area.

The ability of cyanobacteria to perform oxygenic photosynthesis is thought to have dramatically changed the composition of life forms on Earth by provoking an explosion of biodiversity and leading to the near-extinction of oxygen-intolerant organisms.

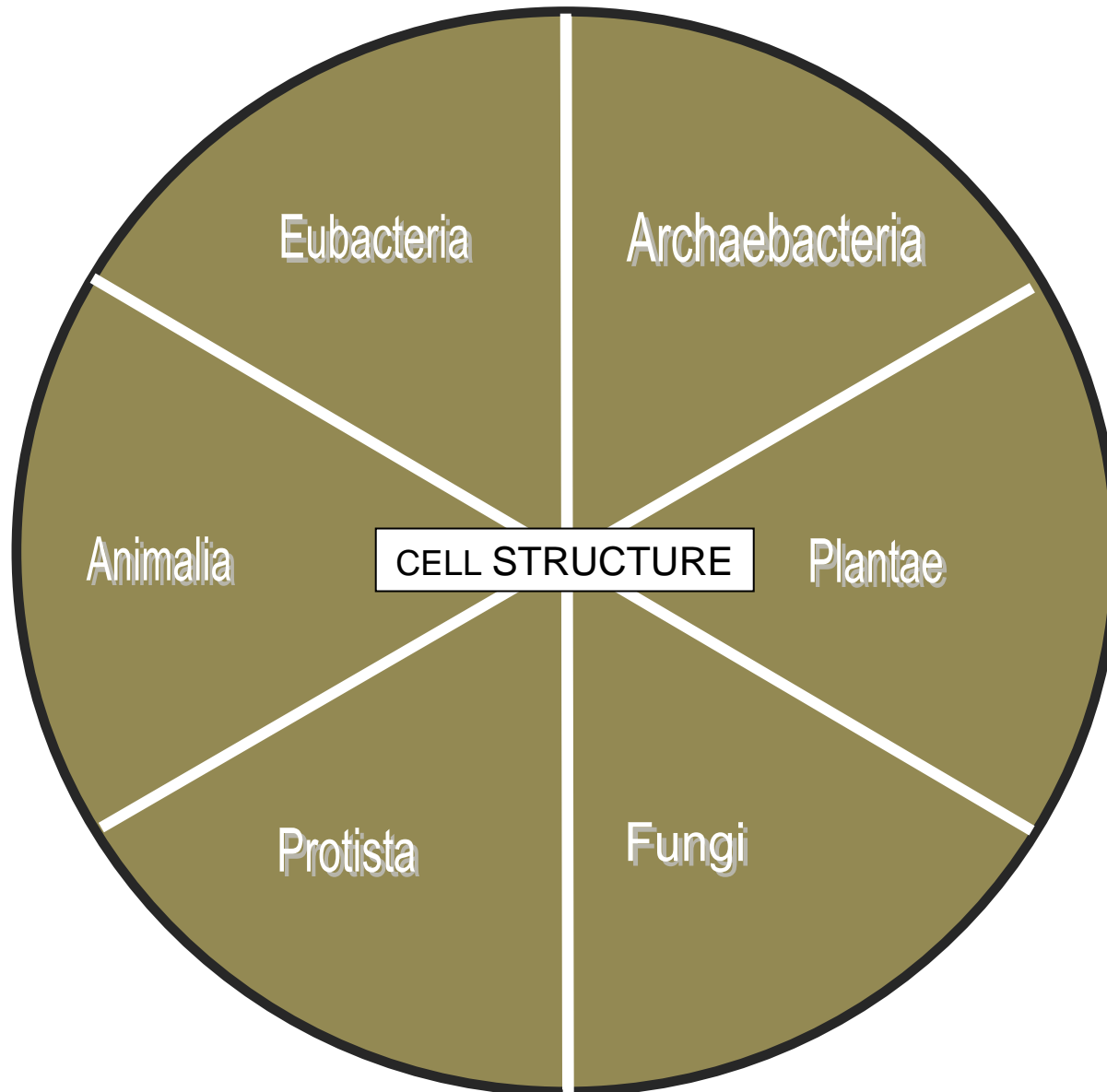
Cyanobacteria reproduce by binary fission (splitting in two).

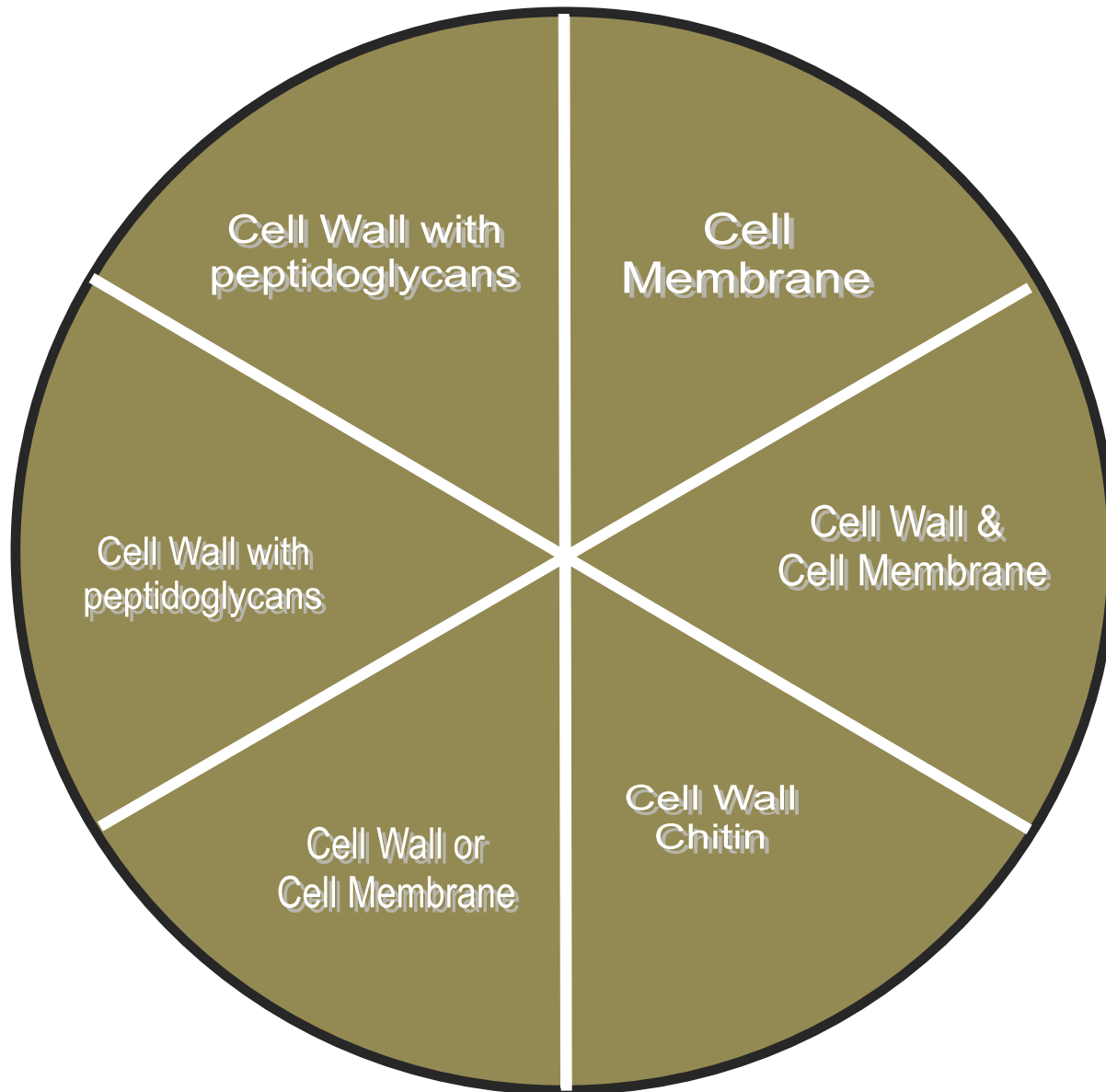
Kingdom Circles: Body Type



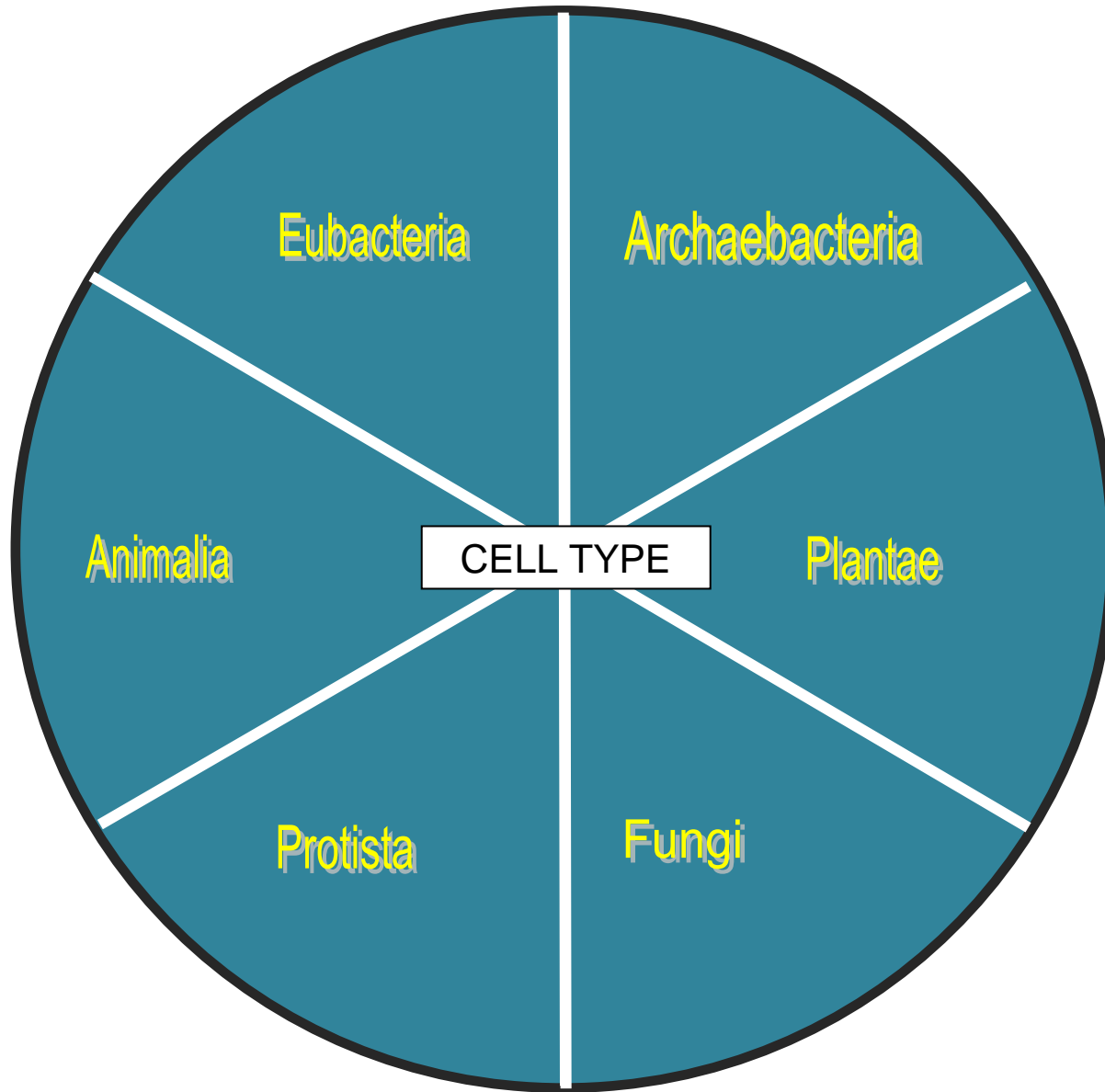


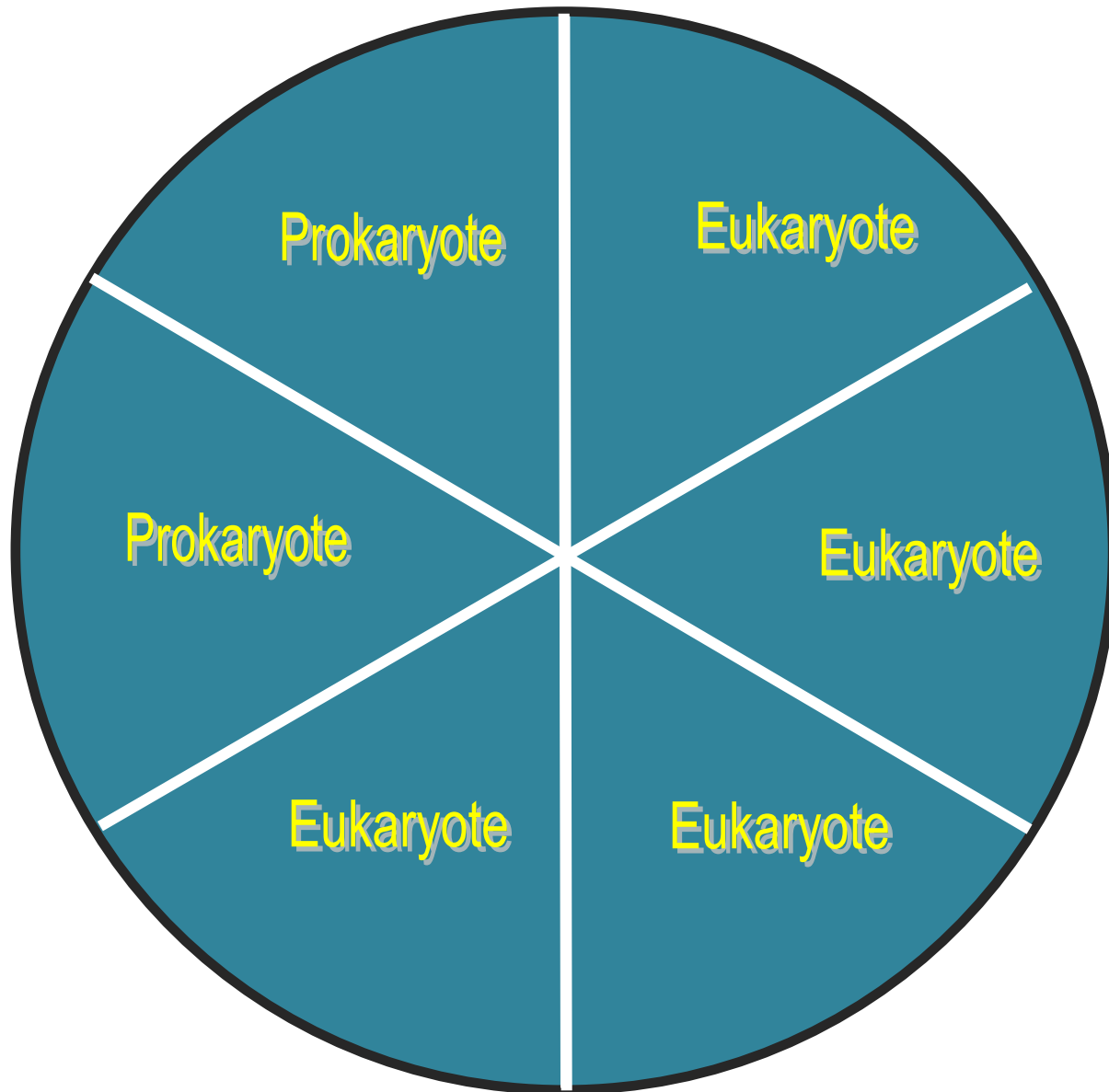
Kingdom Circles: Cell Structure



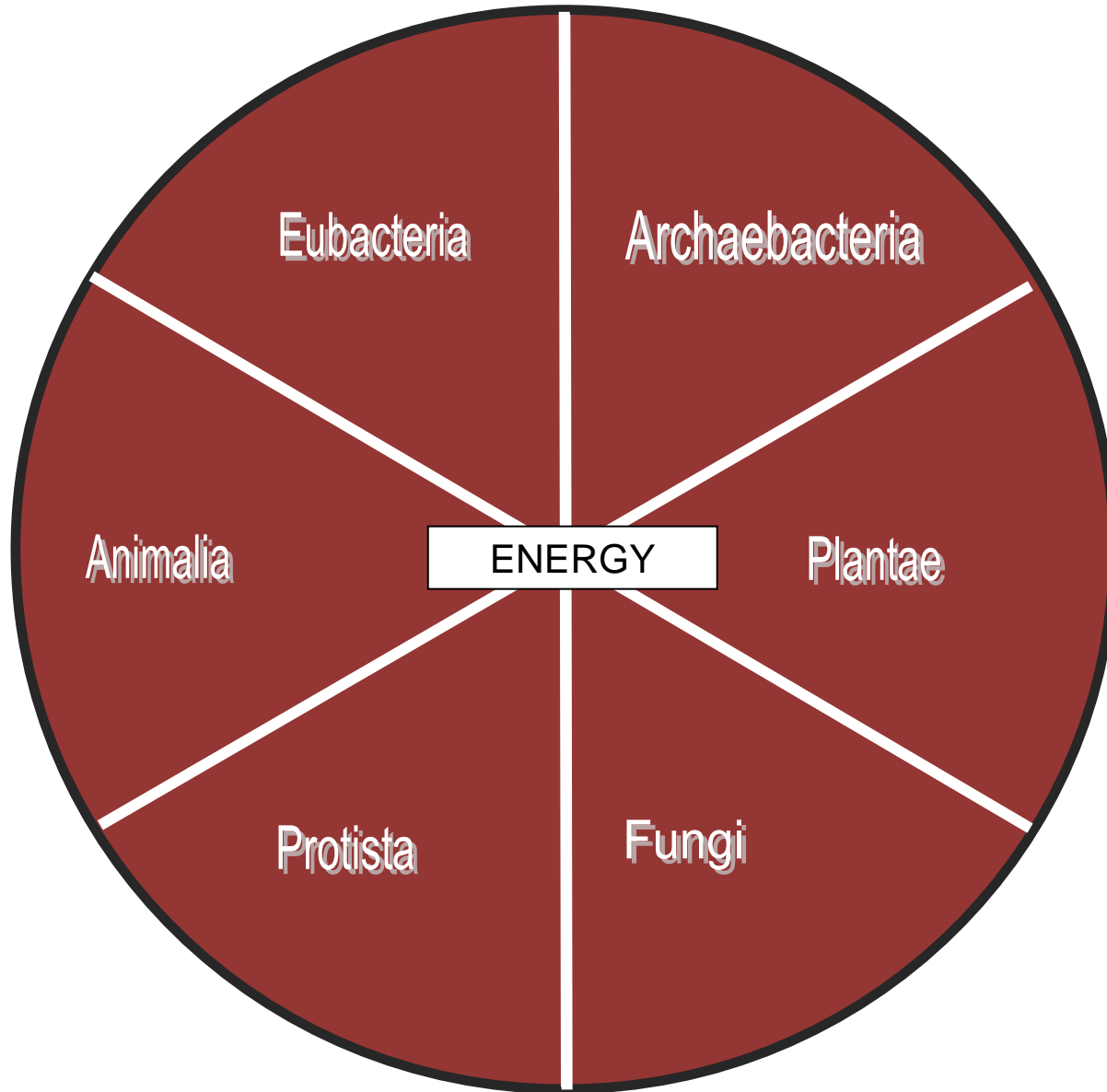


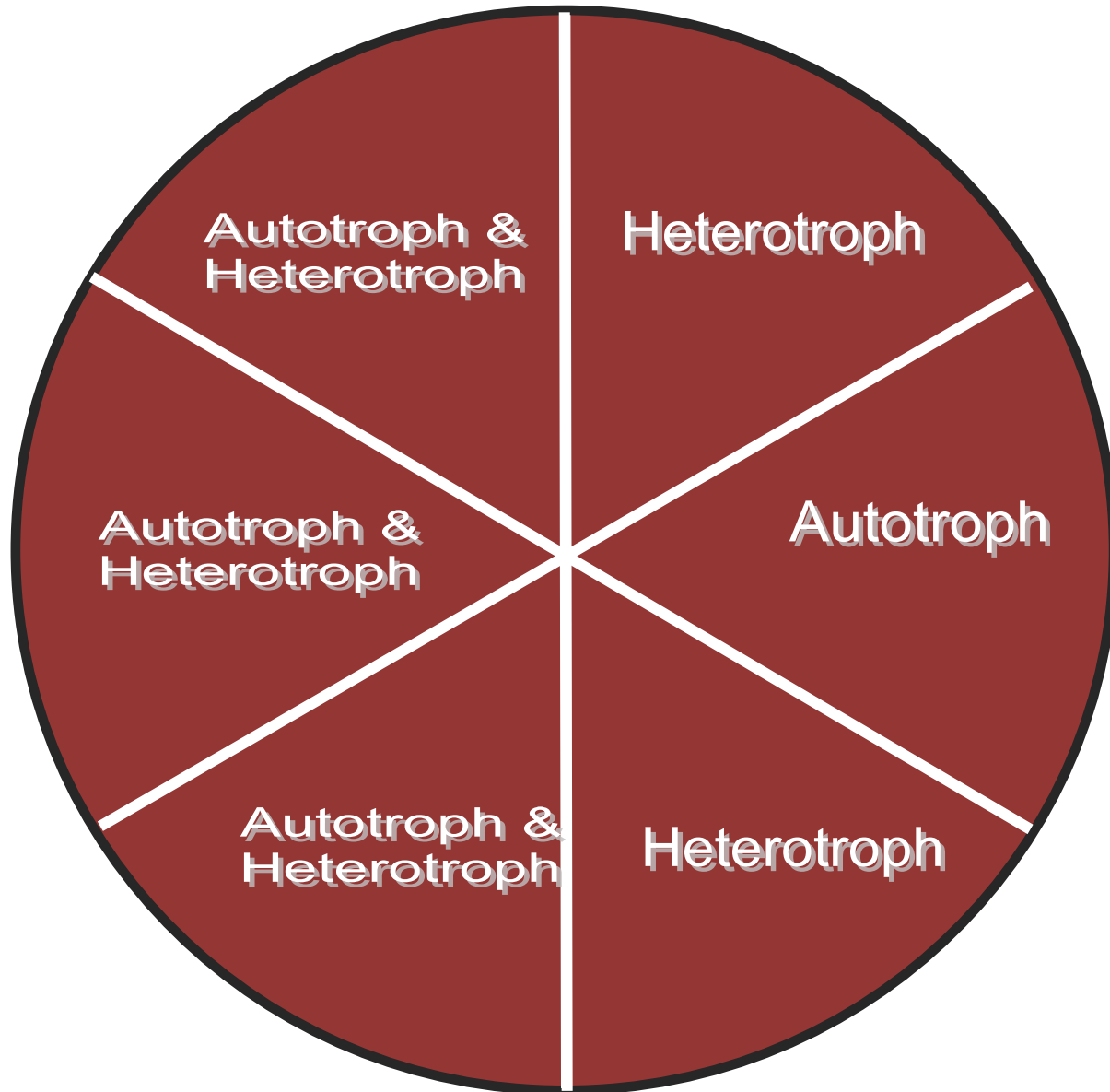
Kingdom Circles: Cell Type



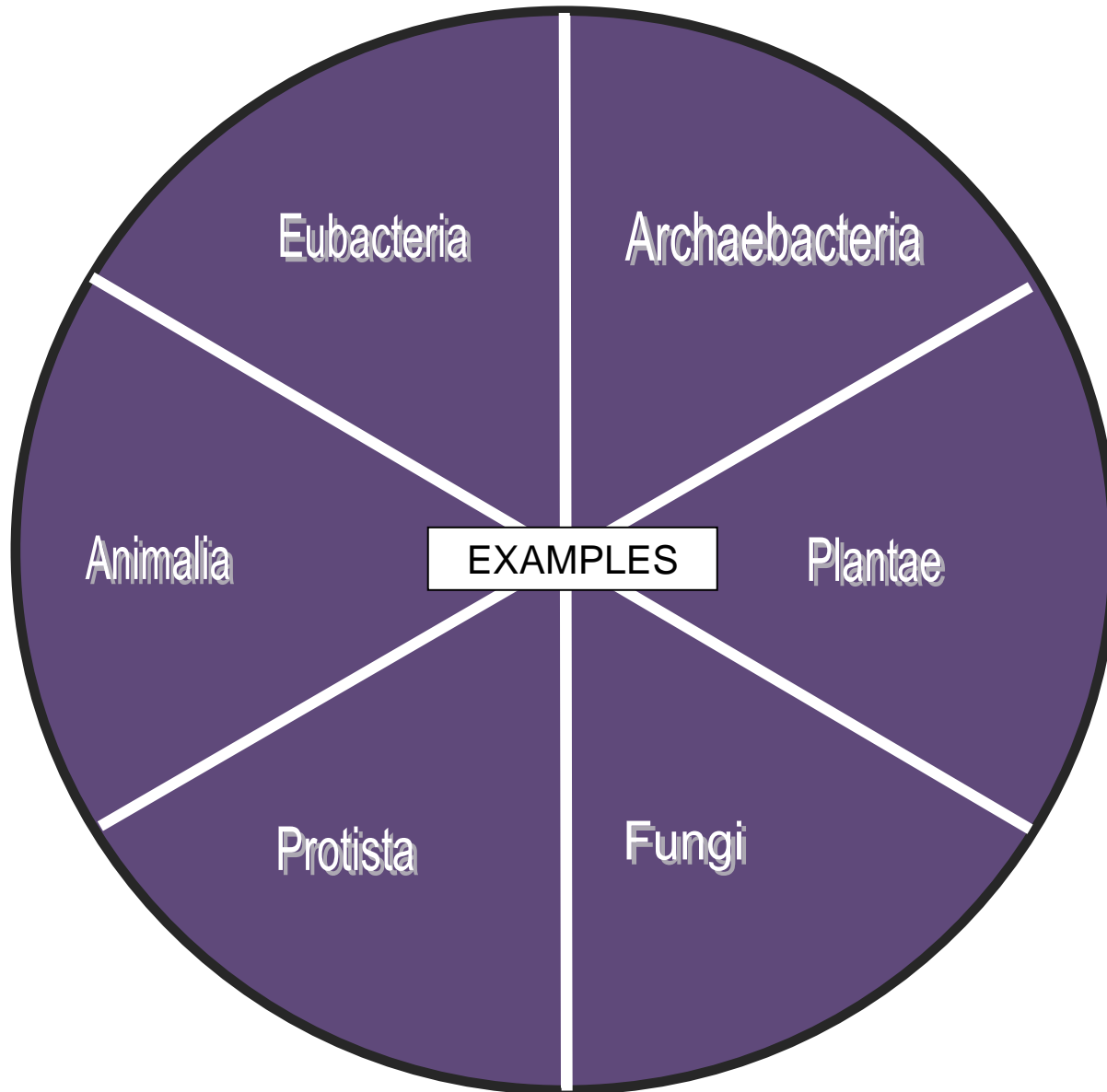


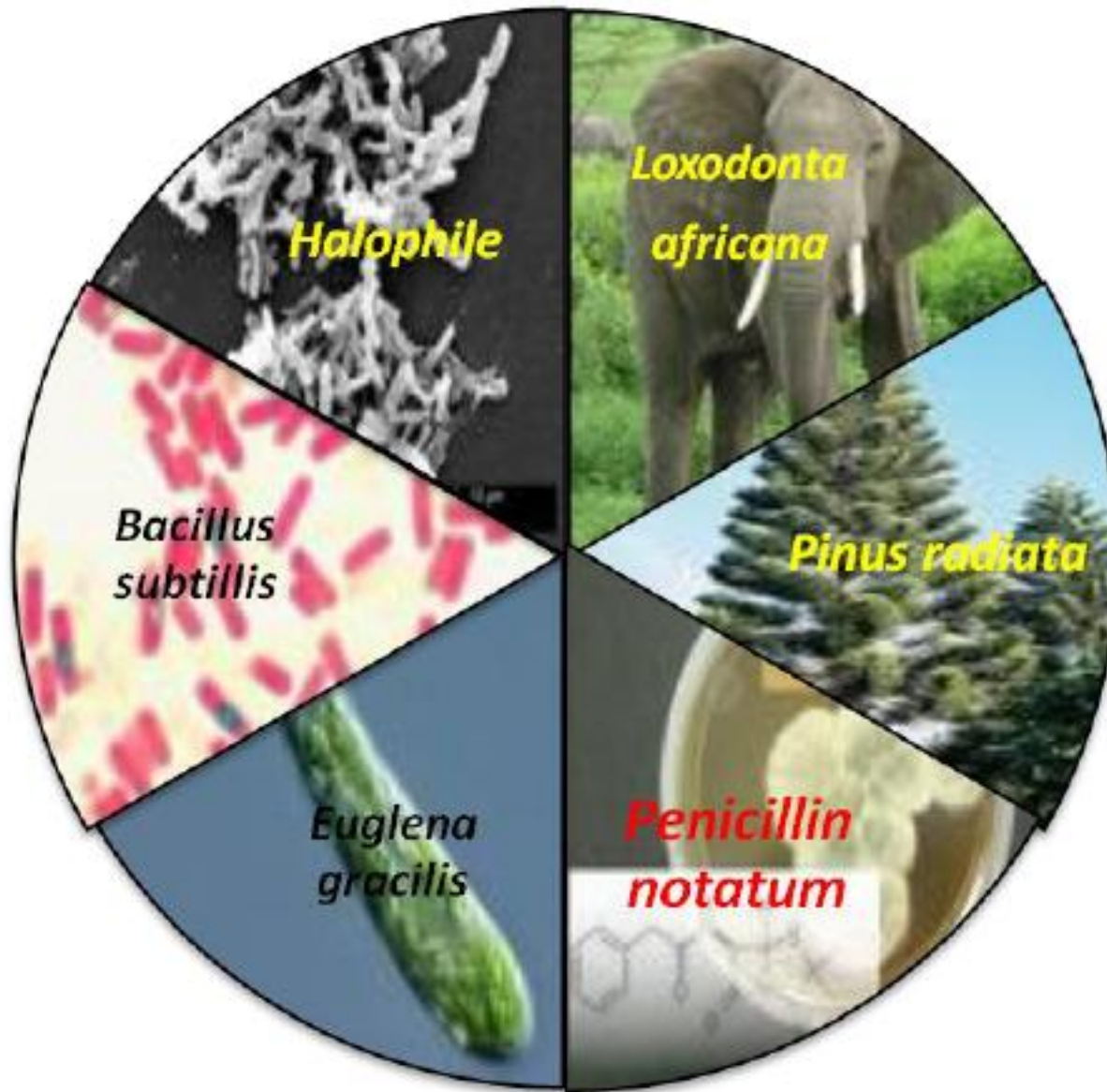
Kingdom Circles: Energy



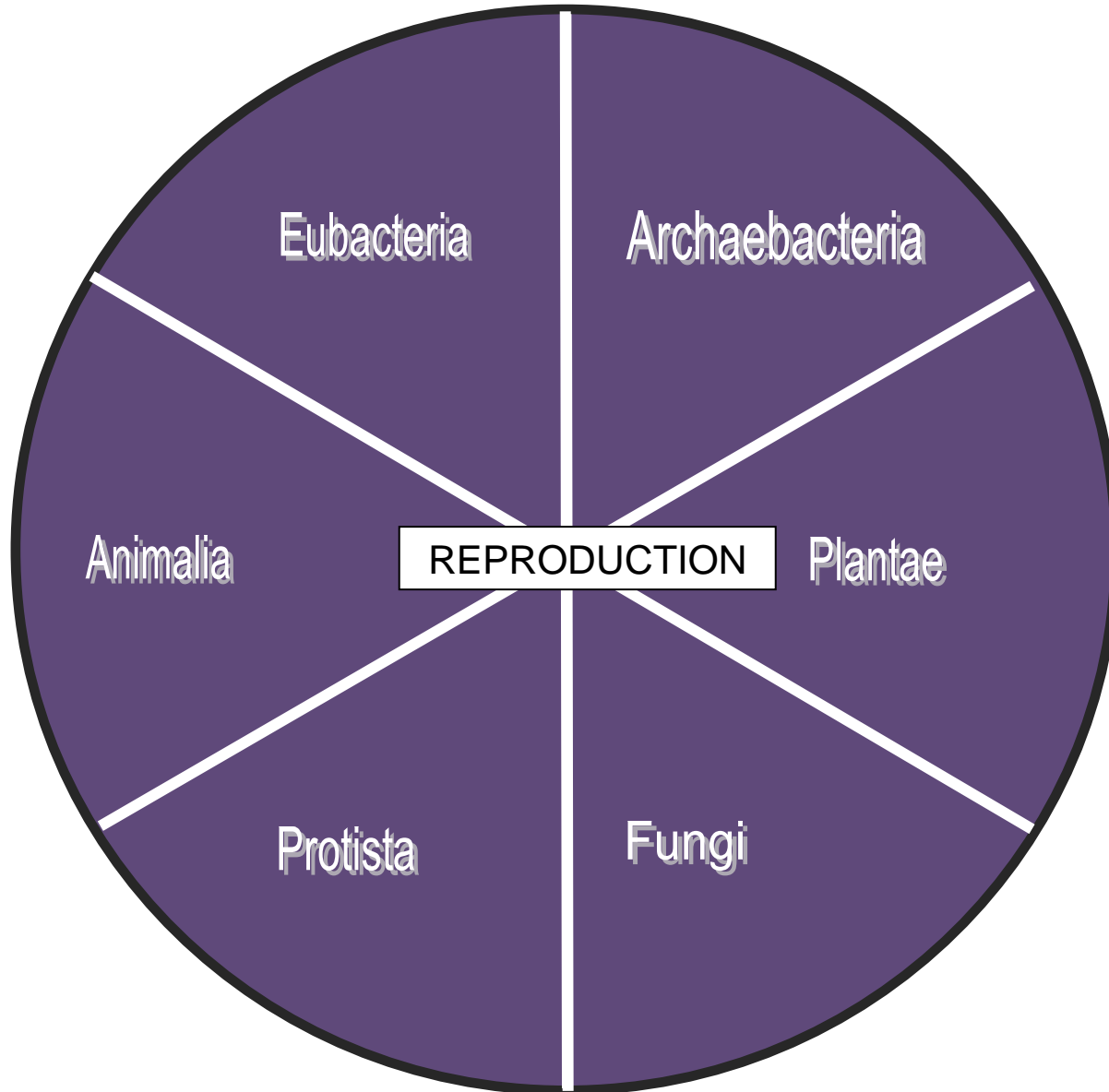


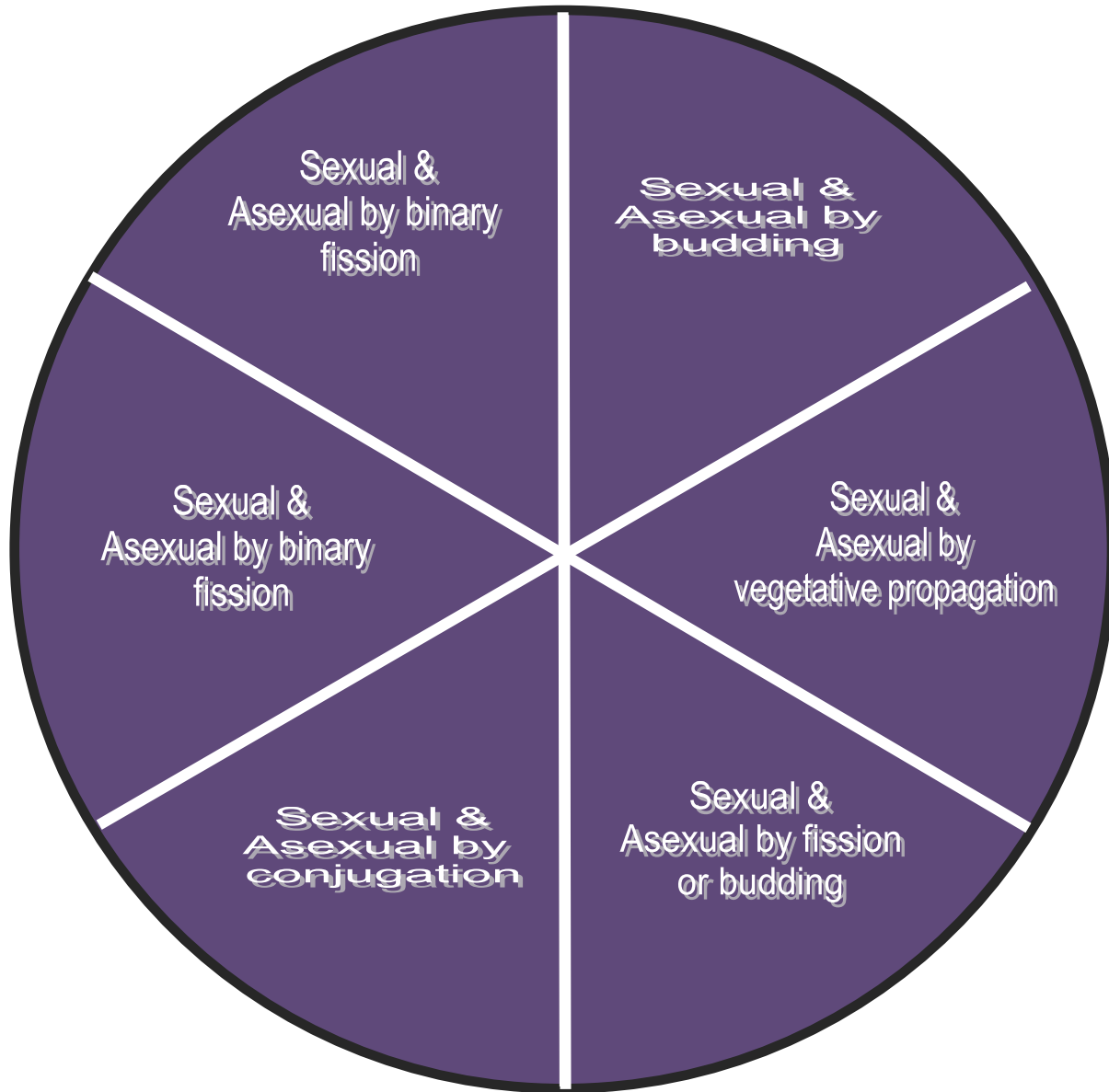
Kingdom Circles: Examples





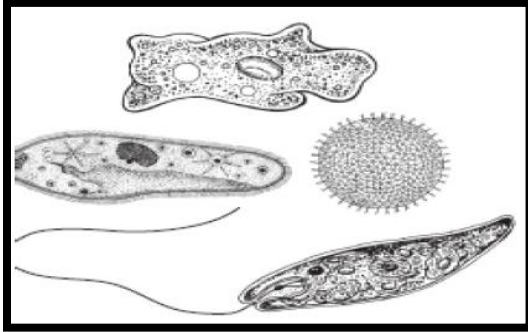
Kingdom Circles: Reproduction





Review Questions 5
Similarities and Differences between Organisms of Different Kingdoms

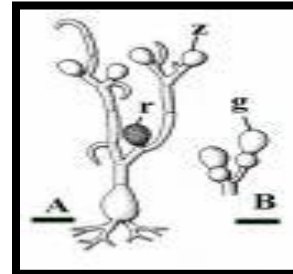
1. The diverse organisms shown in the diagram below belong to the same kingdom.



To which kingdom do these organisms belong?

- A. Animalia
 - B. Fungi
 - C. Plantae
 - D. Protista
2. This kingdom is composed of autotrophs which obtain their energy exclusively from photosynthesis.
- A. Archaeobacteria
 - B. Animals
 - C. Protists
 - D. Plants
3. Members of this kingdom are exclusively anaerobic unicellular prokaryotes including a range of organisms that live in extreme environments.
- A. Archaeobacteria
 - B. Eubacteria
 - C. Protists
 - D. Animals

4. The heterotrophic eukaryotic multi-celled organism shown below absorbs its nutrients from its environment (called a saprophyte) with a network of hyphae shown in A. It reproduces asexually via budding. To which kingdom does it belong?



- A. Archaeobacteria
 - B. Eubacteria
 - C. Protists
 - D. Fungi
5. An outbreak of disease is being researched by the CDC in Atlanta. The organism causing the disease is a heterotroph with cells that do not have walls and enzymes released from organs in its digestive system. To which kingdom does this pathogen belong?
- A. Archaeobacteria
 - B. Eubacteria
 - C. Protists
 - D. Fungi

6. A fungus has a wall composed of a polysaccharide similar to cellulose, which is also found in the exoskeleton of insects. This material is
- A. chitin
 - B. hemicellulose
 - C. leucine
 - D. protein-lipid layers
7. Which of the following are prokaryotic organisms?
- A. Bacteria
 - B. Oak trees
 - C. Mushrooms
 - D. Brown algae
8. For which group of organisms is binary fission the most common type of asexual reproduction?
- A. Simple plants like mosses and ferns
 - B. Advanced flowering plants
 - C. Invertebrates such as worms
 - D. Unicellular organisms like amoebae
9. Sunlight, together with which of the following, would best illustrate that electromagnetic waves carry energy and can interact with matter?
- A. Fungi
 - B. mRNA
 - C. Chloroplasts
 - D. Mitochondria
10. In photosynthesis, light energy is converted to
- A. nuclear energy
 - B. chemical energy
 - C. convection energy
 - D. electromagnetic energy
11. Binary fission is a type of asexual reproduction, and is most common in
- A. fungi
 - B. amoebae
 - C. vascular plants
 - D. gymnosperms
12. Bread molds, a type of fungi, reproduce sexually by conjugation and asexually by
- A. spores
 - B. budding
 - C. cloning
 - D. meiosis
13. Which of the following distinguishes the organisms in the kingdom Fungi from other eukaryotic organisms?
- A. fungi are unicellular
 - B. fungi reproduce sexually
 - C. fungi obtain nutrients by absorption
 - D. fungi make food through photosynthesis
14. Which of these kingdoms includes prokaryote organisms that were among the first forms of life to evolve?
- A. Fungi
 - B. Algae
 - C. Plantae
 - D. Archaeobacteria

15. A microbiologist notices a strange organism growing on the leftover lasagna that he has left in the lab refrigerator for 2 months. He removes a sample of the organism and places it under an electron microscope. He notes that the organism has no nuclear membrane and no mitochondria in its cells. Though very small in size, a cell wall is present. He notes that the organism seems to be strictly single-celled. Based on the structure of the cells, what type of organism is this likely to be?

- A. A eukaryote in kingdom fungi
- B. A eukaryote in kingdom protista
- C. A prokaryote in kingdom plantae
- D. A prokaryote in kingdom eubacteria

16. Which statement describes how single-celled eukaryotes, such as amoebas, eliminate waste from their cells?

- A. Amoebas excrete urine to eliminate waste materials
- B. Amoebas use pseudopodia to eliminate waste materials
- C. Amoebas use exocytosis to eliminate waste materials
- D. Amoebas use a contractile vacuole to eliminate waste materials

17. A certain kingdom contains heterotrophic, eukaryotic organisms with cell walls. Organisms in this kingdom are usually multi-celled, but a few single-celled exceptions do exist. No organism in this kingdom can photosynthesize or move on its own. What kingdom is this?

- A. Plantae
- B. Eubacteria
- C. Fungi
- D. Animalia

18. Four clear glass jars are filled half-way with water and half-way with a mixture of carbon dioxide and oxygen. No food is placed in the jars. Organisms from four different kingdoms are placed separately into the four jars. The jars are sealed and placed in direct sunlight for six months. After this period the jars are checked to see if there are living inhabitants. Which classification of organisms lacks the characteristics necessary to survive the conditions in the jar for six months?

- A. Fungi
- B. Plantae
- C. Photosynthetic eubacteria
- D. Algae

19. Which example lacks the basic structures of a living organism and cannot metabolize or maintain homeostasis?

- A. A strep throat bacteria
- B. A cold virus
- C. A green algae
- D. A yeast

20. A certain kingdom's members are always multi-celled autotrophs, and thus, have chloroplasts for sugar production. Cell walls, composed of cellulose, surround the cells of these organisms. Identify this kingdom.

- A. Algae
- B. Fungi
- C. Plantae
- D. Protista

21. Which of this criterion is used to classify organisms into the modern classification system?

- A. Diet
- B. Life span
- C. Similarities to fossils
- D. The habitat in which they live

22. An important difference between viruses and living cells is that viruses

- A. Cannot reproduce outside of cells
- B. Contain more nuclei than cells
- C. Cannot mutate but cells can
- D. Need an energy source but cells do not

23. Experimental Observation

- | |
|---|
| <ul style="list-style-type: none">1. Nucleus is present2. Cell wall is present3. Chloroplasts and mitochondria are both present |
|---|

The eukaryotic organism described above should be classified as

- A. An animal
- B. A bacterium
- C. A fungus
- D. A plant

24. Unlike plants, fungi cannot make their own food because they do not have

- A. Roots
- B. Hyphae
- C. Spores
- D. Chlorophyll

25. Which pair of structures *best* shows that plant cells have functions different from animal cells?

- A. Cytoplasm and mitochondria
- B. Chloroplasts and cell walls
- C. Nuclei and centrioles
- D. Ribosomes and cell membranes

26. When an animal eats, food stays in the stomach for a period of time. When a unicellular organism, such as *Paramecium*, takes in food, the food is contained in which organelle?

- A. Chloroplast
- B. Mitochondrion
- C. Nucleus
- D. Vacuole

27. A mushroom and a humpback whale are alike because both are

- A. Motile
- B. Heterotrophic
- C. Prokaryotic
- D. Unicellular

Phase Change Stations Labs

STATION 1 Ice, Ice, Baby

Teacher note: At this station, place a beaker that is about halfway filled with ice. Set this up a few minutes ahead of time so that the ice has some time to melt, leaving some ice and some water in the beaker.

Materials:

Beaker

Thermometer- Laser or Traditional

Ice

Instructions

1. The ice in beaker #1 is changing phase. Draw a picture showing what is happening to the motion of the molecules as the ice changes phase.
2. Check the temperature of the ice/water mixture. What do you think will happen to the temperature as the ice turns to water?
3. Shoot the outside of the bottom of the beaker with the laser thermometer (or use a traditional thermometer). Record the temperature.
4. Shoot the outside of the top of the beaker at the point where the ice is just turning to water (or use a traditional thermometer). Record the temperature.

Phase Change Stations Labs

STATION 2 Colored Molecules?

Teacher note: Students will be able to observe how temperature affects the rate at which the particles disperse due to molecular motion.

Materials:

2 Beakers, 1 with water at room temperature, 1 with cold water
Food coloring
Timing device

Instructions

One of these beakers contains room temperature water and the other contains cold.

1. Place 2 drops of food coloring in the room temperature water and time how long it takes for the water to completely turn color. Write it down.
2. Place 2 drops of food coloring in the cold water and time how long it takes for the water to completely turn color. Write it down.
3. Write an explanation of the effect temperature has on how fast particles move.

Phase Change Stations Labs

STATION 3 What Can the Matter Be?

Teacher note: This station is set up as an “observation only” station. Students will be able to observe boiling, evaporation, condensation, and precipitation.

Materials:

- Beaker of water on hotplate that is continuously boiling.
- Ring stand and ring with a small piece of glass placed on top of the ring directly over the boiling water on the hotplate (approximately 6 inches apart)

Instructions

1. Draw a diagram of the experimental set-up and describe the evidence that you can see that a phase change is taken place. Identify in your diagram where you see this evidence.
2. Draw a diagram showing the motion of the molecules as they go through each phase change.

Twizzlers Lab- $\frac{1}{2}$ Life

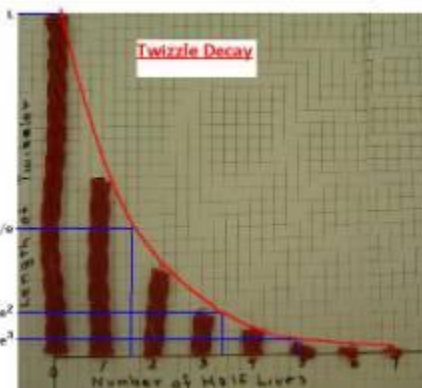
Materials:

1 Twizzlers
Graph paper
Timer
1 Pair of Scissors

Instructions:

Before beginning, draw an X and a Y axis on your graph paper. Label the Y axis “amount” and the X axis “Time”.

1. Hold the “undecayed” Twizzler vertically against the Y axis with one end at the origin. Mark the length. This represents the beginning amount. See photo below.



2. Make several equally space marks on the X axis. Each mark represents 30 seconds.
3. The teacher announces "TAKE A BITE"! Each student must eat HALF the length of the Twizzler or cut it in half.
4. Record the new Twizzler length on your graph at the 30 seconds mark.
5. After 30 seconds repeat step 3 until the Twizzler can no longer be halved, taking a bite every 30 seconds.
6. Finish graphing your results.

Analysis/Conclusions

1. Did the Twizzler ever completely disappear? Explain.
2. What is the half life time of your radioactive Twizzler? Explain.
3. If you had started with a Twizzler twice as long, how would that affect the shape of the resulting graph? Explain.
4. How would your graph look if each $\frac{1}{2}$ life took 60 seconds?

Half Life Matrix: Example Problem

How many grams of iodine 131 (half life- 5 days) would be left after 20 days if you start with 25 grams? Answer: 1.56 g

The half life is			5 days
Number of half-lives passed	Amount of Matter		Time
0	Started with	25 g	0 { <u> </u> days }
1	How Much is left	12.5g	5 days
2	How Much is left	6.25 g	10 days
3	How Much is left	3.12 g	15 days
4	How Much is left	1.56 g	20 days
5	How Much is left		

Half Life Calculations Cards

Card #1

Problem

How long will it take 600 grams of Plutonium 239 (half life 24,000 years) to decay to 18.75 grams?

- A. 120,000 yrs.
- B. 24,000 yrs.
- C. 3 half-lives
- D. 600 yrs

Calculation Template

The half life is		days	
Number of half-lives passed	Amount of Matter		Time
0	Started with		0 { <u> </u> }
1	How Much is left		
2	How Much is left		
3	How Much is left		
4	How Much is left		
5	How Much is left		

Card #2

Problem

K-42 has a half-life of 15.5 hrs. If 13.125g of K-42 remains undecayed after 62.0 hours, what was the original sample size?

- A. 26.25g
- B. 39.36g
- C. 52.5g
- D. 13.125g

Calculation Template

The half life is		days
Number of half-lives passed	Amount of Matter	Time
0	Started with	0 { <input type="text"/> }
1	How Much is left	
2	How Much is left	
3	How Much is left	
4	How Much is left	
5	How Much is left	

Card #3

Problem

An isotope of cesium (cesium-137 has a half -life of 30 years. If 20 mg of cesium-137 disintegrates over a period of 90 years, how many mg of cesium-137 would remain?

- A. 5 mg
- B. 10 mg
- C. 20 mg
- D. 2.5 mg

Calculation Template

The half life is		days
Number of half-lives passed	Amount of Matter	Time
0	Started with	0 { <input type="text"/> }
1	How Much is left	
2	How Much is left	
3	How Much is left	
4	How Much is left	
5	How Much is left	

Card #4

Problem

Thallium-208 has a half-life of 3 min. How long will it take for 120.0 g to decay to 7.50 g?

- A. 6 min.
- B. 9 min.
- C. 3 min.
- D. 1.5 min.

Calculation Template

The half life is			days
Number of half-lives passed	Amount of Matter		Time
0	Started with		0 { <input type="text"/> }
1	How Much is left		
2	How Much is left		
3	How Much is left		
4	How Much is left		
5	How Much is left		

Card #5

Problem

If 60 g of Lithium-9 has a half-life of 100 years, how long will it take for lithium-9 to decay to 15 g?

- A. 400 yrs.
- B. 300 yrs.
- C. 200 yrs.
- D. 100 yrs.

Calculation Template

The half life is		days
Number of half-lives passed	Amount of Matter	Time
0	Started with	0 { <input type="text"/> }
1	How Much is left	
2	How Much is left	
3	How Much is left	
4	How Much is left	
5	How Much is left	

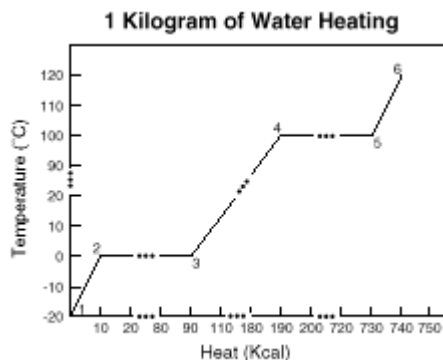
Review Questions 6

Half Life and Phases of Matter

1. What fraction of carbon-14 will remain after it has decayed for 3 half-lives?

- A. $1/16$
- B. $1/2$
- C. $1/4$
- D. $1/8$

Use the diagram above to answer questions 2-4.



2. Between points 4 and 5, energy is being used to change water from a

- A. solid to a liquid
- B. solid to a gas
- C. liquid to a gas
- D. liquid to a solid

3. Between points 2 and 3 the water is in which of the following states?

- A. solid
- B. liquid
- C. gas
- D. liquid and gas

4. Between which points would you expect to receive the worst burns?

- A. 3 and 4
- B. 4 and 5
- C. 5 and 6
- D. 4 through 6

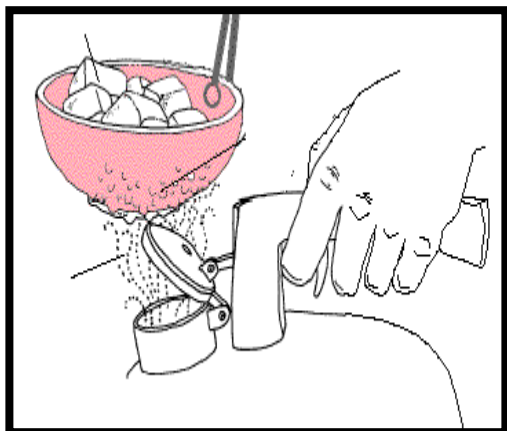
5. Which of the following changes occurs as a solid is heated?

- A. The kinetic energy of the solid decreases.
- B. The average density of the solid increases.
- C. The specific heat capacity of the solid decreases.
- D. The average molecular speed in the solid increases.

6. Carbon-14 has a half-life of approximately 5,700 years. Analysis of the carbon in a piece of charred wood found in an excavation revealed that the carbon has 25 percent of the amount of carbon-14 that is found in the carbon of living trees. Which of the following is most nearly the age of the excavated wood?

- A. 160 years
- B. 5,700 years
- C. 11,400 years
- D. 23,000 years

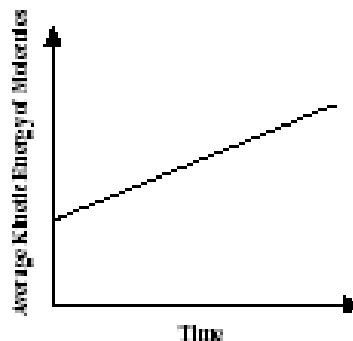
7. See the figure below



The particles are moving most quickly in the:

- A. Ice in the bowl
 - B. Drops of water on the bowl
 - C. Steam under the bowl
 - D. Water inside the teapot
8. Which of the following correctly describes molecules of two different gases if they are at the same temperature and pressure?
- A. They must have the same mass.
 - B. They must have the same velocity.
 - C. They must have the same average kinetic energy.
 - D. They must have the same average potential energy.
9. A sample of Francium-212 will decay to one-sixteenth its original amount after 80 minutes. What is the half-life of francium-212?
- A. 10 min.
 - B. 20 min.
 - C. 30 min.
 - D. 80 min.

10. The graph below represents changes in molecular motion in a solid plastic cylinder over time.



These changes in the molecules of the plastic cylinder must be accompanied by which of the following?

- A. an increase in mass
 - B. a decrease in volume
 - C. an increase in temperature
 - D. a decrease in heat capacity
11. Which arrangement correctly shows the molecular movement for the phases of water, going from the slowest to fastest (least amount of kinetic energy to the greatest amount of kinetic energy)
- A. Gas-Liquid-Solid
 - B. Liquid-Gas-Solid
 - C. Solid-Liquid-Gas
 - D. Solid-Gas-Liquid

12. In which of the following situations would water molecules have the least energy?

- A. when water is frozen as ice
- B. in a mixture of ice & water
- C. when water is boiling
- D. when water is superheated steam

13. Which ONE of the following is a TRUE statement?

- A. In the gas state, molecules move around freely.
- B. Liquids do not change shape easily.
- C. Gas molecules move more slowly as they are heated.
- D. Plasma is the most common state of matter found on Earth.

14. How long does it take a 180g sample of Au-198 to decay to 1/8 its original mass?

- A. 1 half-life
- B. 2 half-lives
- C. 3 half-lives
- D. 4 half-lives

15. Health officials are concerned about radon levels in homes. The half-life of radon-222 is 3.82 days. If a sample of gas contains 4.38 micrograms of radon-222, how much will remain in the sample after 15.2 days?

- A. 27 mg
- B. .54 mg
- C. 2.19 mg
- D. .27 mg