



Cornell Institute for Biology Teachers

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Title:

Teeth Unit

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**Appropriate
Level:**

Grades 2-7

NYS Standards

Standard 1: Analysis, Inquiry and Design (Mathematical Analysis): Key Idea 1: M1.1a, c; Key Idea 2: M2.1b; Key Idea 3: M3.1a. (Scientific Inquiry): Key Idea 1: S1.1a, b, S1.2a, S1.3a; Key Idea 3: S3.1a, S3.2a, S3.3a, S3.4a.

Standard 3: Mathematics: Key Idea 4: Modeling/Multiple representation; Key Idea 5: Measurement

Standard 6: Interconnectedness: Common Themes: Key Ideas: 1, 2, 3, 5

Standard 7: Interdisciplinary Problem Solving: Key Ideas: 1, 2

Standard 4: Physical Setting: Key Idea 3: 3.1c,d

Standard 4: The Living Environment: Key Idea 1: 1.1a, 1.2a; Key Idea 3: 3.1a,c; 3.2a,b; Key Idea 5.1a,b.

Abstract:

Students will investigate the characteristics of teeth and what teeth can tell about an animal's lifestyle:

- Students will sort and categorize 10 or 12 teeth.
- Given information about what canines, incisors and molars are, students will identify which teeth are which and why. They will predict which teeth came from what animal.
- Students will compare the given teeth to their own, decide what kind of teeth they have and which teeth are used to eat which kinds of food.
- Students will make a study of bacteria in the mouth and how the quantity is affected by brushing
- The unit will conclude with a study of jaws from carnivores, herbivores and omnivores. Based on the teeth structure, students will hypothesize which jaws belong to which type of animal.

**Special
Materials:**

CIBT Teeth Kit

**Time
Requirement:**

8-10 class periods (without extensions)

Additional Teacher Information

Objectives

- Students will identify different teeth by function, size and shape.
- Students will be able to identify canine, molar and incisor teeth.
- Students will study their own teeth, identify which are canines, molars and incisors and which are used to eat what food.
- Students will understand the scientific method and use it to study the effects of tooth brushing on the growth of bacteria.
- Students will be able to identify carnivores, herbivores and omnivores by studying their teeth. Students can tell what an animal eats and possibly where and how it lives by studying its teeth.

Teacher Preparation

Need to make agar petri plates. See information sheets in Activity Four.

CIBT Kit Contents

The CIBT Teeth Kit contains the following materials.

- Animal teeth – five examples of each kind. Skulls Unlimited, www.skullsunlimited.com, 1-800-659-SKULL.
- 60 petri dishes (100X15mm, VWR catalog # 25384-208)
- 4 pkgs. 11.5 grams dehydrated nutrient agar powder
- 2 500 ml beakers
- Plastic stirrer
- Oven mitts
- Ten small mirrors
- Thermometer
- Ten markers

- Teeth books (one copy of each unless otherwise stated):

4 copies of *How Many Teeth* by Paul Showers. Let's Read and Find Out About Science series, Harper Collins Publishers, 1991.

Second grade reading level. Excellent source of information for students. See Activity Two.

Throw Your Tooth on the Roof: Tooth Traditions from Around the World by Selby B. Beeler.
May only be available in hard cover.

Grandpa's Teeth by Rod Clement. Harper Collins Publishers, 1997.
Find out where Grandpa's lost teeth were.

My Loose Tooth. Random House 1999.
Step into Reading Level 1. Rhyming story about how to get a loose tooth to come out.

Student Resources

What Big Teeth You Have by Patricia Lauber. Scholastic, Inc., 1993.

Good information about teeth including description of incisors, canines and molars. Fourth grade reading level.

Teeth, Tusks and Fangs (Young Discovery Library) by Roger Dievart

Good source of information on physiology, uses, types and care of human and animal teeth, tusks and fangs. Third grade reading level.

Teeth and Tusks (Head to Tail) by Theresa Greenway

Dragon Teeth and Parrot Beaks: Even Creatures Brush Their Teeth by Almute Grohmann

Introductory Activity: What do you know?

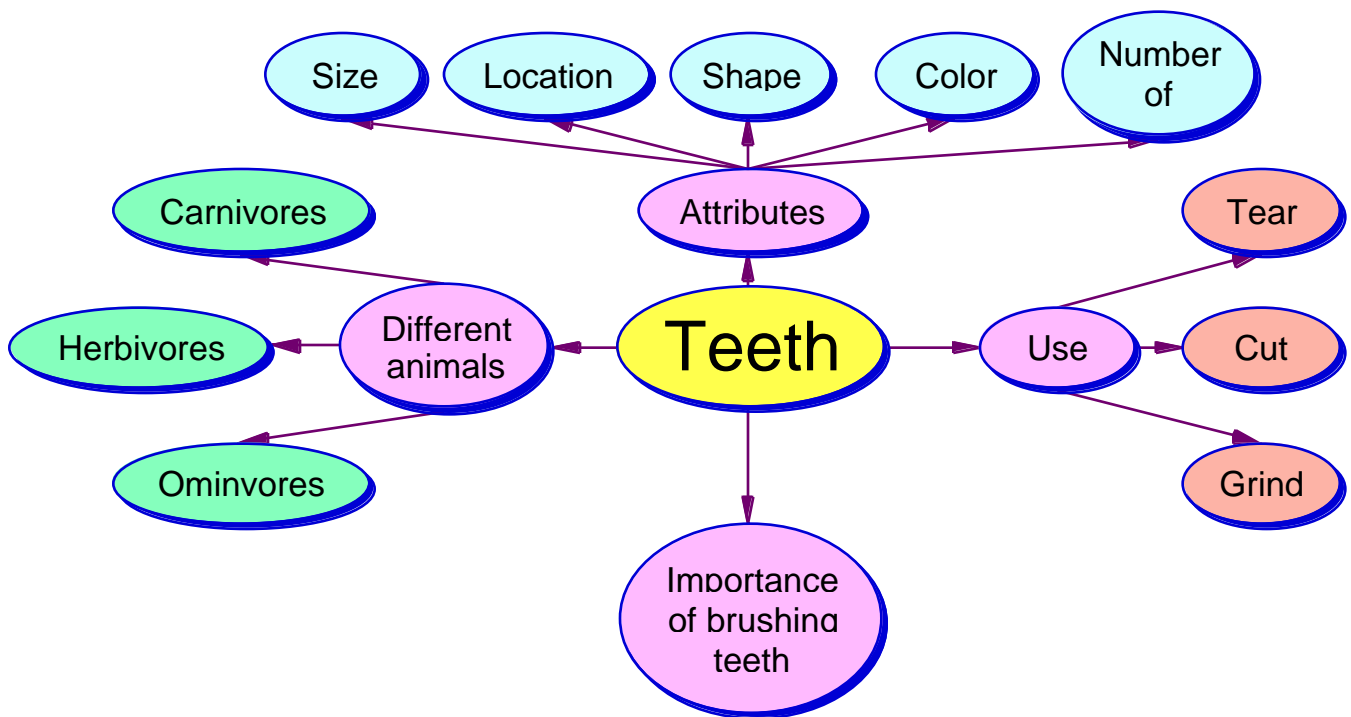
Purpose

Find out what students already know about teeth and what questions they might have about teeth.

Procedure

1. Use semantic mapping to illustrate information students know already about teeth. (The map below was done using the computer program Inspiration and is used only as an illustration of what your students might come up with.)
2. List questions students have about teeth, both their own and in different animals. (Mapping often contributes questions since students disagree about information on a subject.)

Studying Teeth



Activity One: Oh, What Big Teeth You Have!

Purpose

Students will examine a group of teeth and sort them based on size, shape and function. Students will be able to identify canines used for tearing, incisors used for cutting, and molars used for grinding.

Procedure

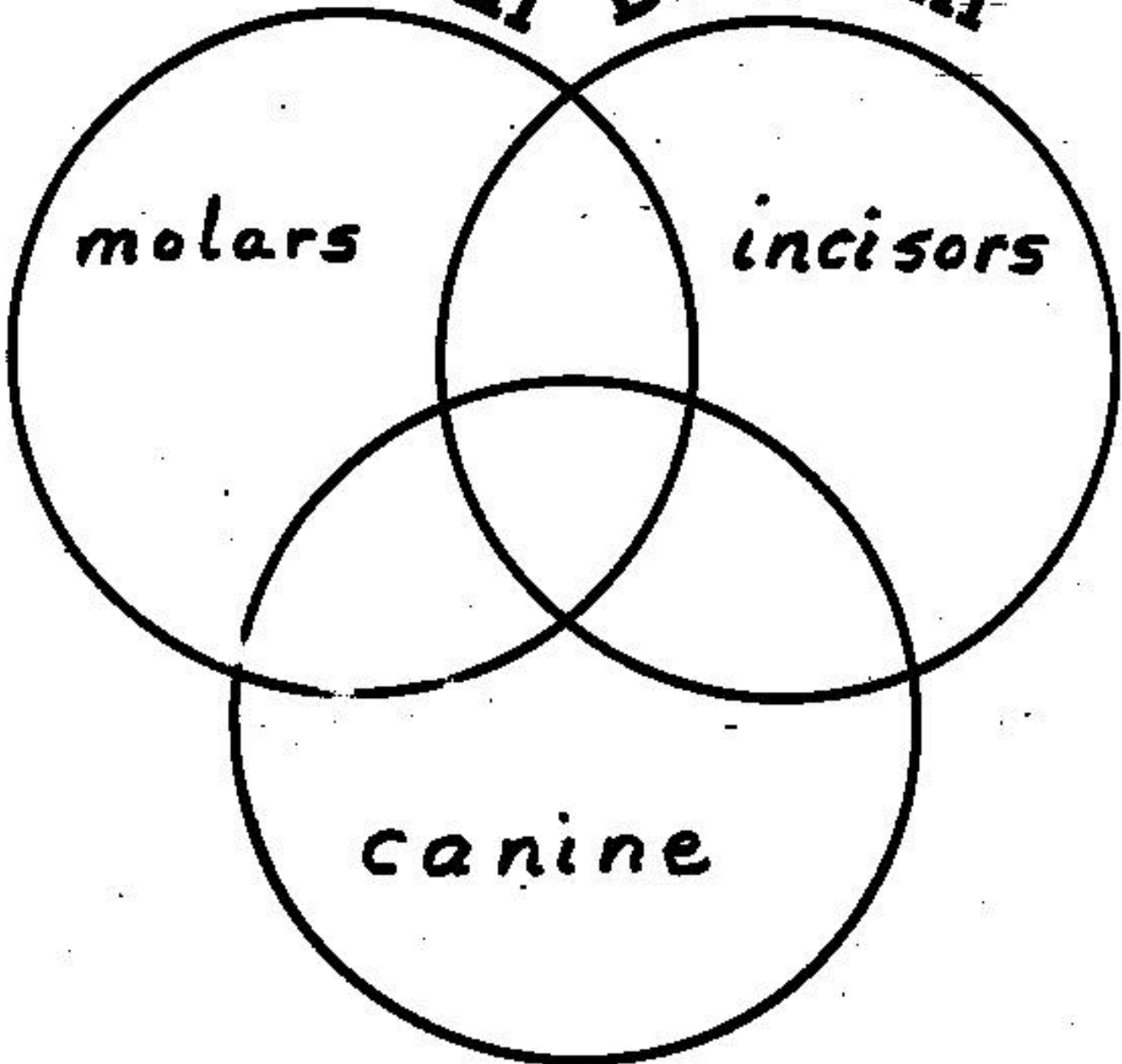
1. Students will be divided into groups of about four.
2. Each group of students will be given a number of assorted teeth (including canines, molars and incisors from a representative group of animals).
3. Students will sort the teeth into groups based on a common characteristic that they define. The teacher will circulate among groups and check for understanding; for example, point to a tooth and ask why it is included in a particular group. The teacher may need to help students think of such characteristics as size, shape and function.

Optional: Students leave their teeth and move to another group's set of teeth. They try to tell what criteria the previous group used to sort the teeth.
4. Students will describe the different shape and size of each tooth and measure the length and width of each tooth. Brainstorm as a class different words that would describe the shape of the teeth. Then have students, working alone or possibly in pairs, do the first worksheet.
5. Ask the students to identify the top and bottom of each tooth. They may need help in this. Some discussion of roots of teeth may be appropriate here. Note to teachers: the code of each tooth is on the bottom or root.
6. Students will identify which teeth have a point similar to a pencil, are flat with ridges and large roots or have a sharp edge similar to a knife or a scraper. The teacher will introduce the corresponding scientific names: canines, molars, incisors.
7. Students will complete the second worksheet stating what kind of tooth each is (canine, incisor, molar) and why.
8. As a follow-up activity, students will be given a list of names of animals from which the teeth came. For each tooth, students will hypothesize what animal it came from and give reasons for their choice. (See the third worksheet.)
9. Students will use a Venn diagram to show differences and similarities among the three kinds of teeth. (For example, all three are teeth; incisors and canines are sharp; molars are flat.)
10. See Teeth Code sheet to identify teeth.

Teeth Identified by Code

- A cow molar
- B beaver incisor
- C coyote molar
- D bear canine
- E cow incisor
- F bobcat canine
- G coyote canine
- H bobcat molar
- I horse molar
- J coyote incisor
- K racoon canine
- L bobcat incisor
- M racoon molar
- N beaver molar
- P racoon incisor
- Q horse incisor

Venn Diagram



Activity Two: What Are My Teeth Like?

Purpose

Students will count their own teeth and graph class teeth data. Then they will try to identify canines, incisors and molars based on the information gained in Activity One.

Materials

- Coffee Stirrers or Q-tips
- *How Many Teeth* book
- Mirrors (one per group)

Procedure

1. Students will predict how many teeth they have.
2. Students will count how many teeth they have and graph the class data about teeth. Using a coffee stirrer or Q-tip to touch each tooth as they count may help.

If working with high school students, have elementary students count how many teeth high school students have. Is it more or less? Why?

3. Class discussion – students will answer questions about the class data:

How many more students have 18 teeth than 16 teeth? (or similar questions)

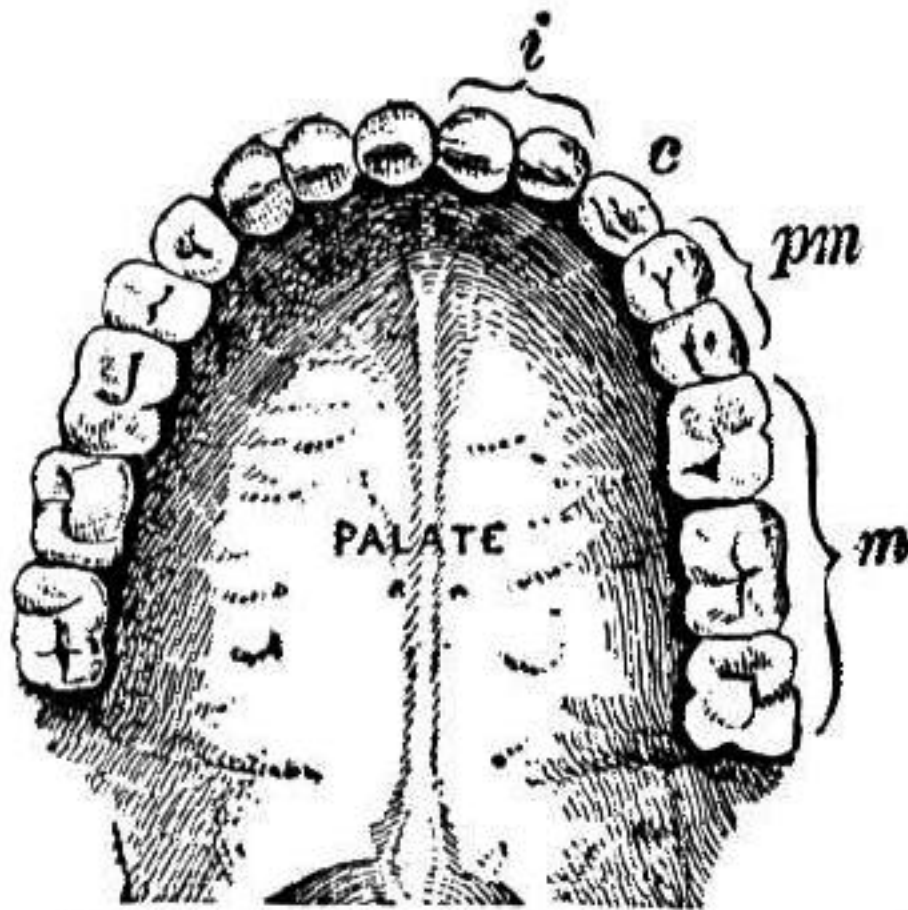
What is the most common number of teeth?

Why do you think some students have more/less teeth?

4. Have students read book *How Many Teeth?* by Paul Showers to confirm how many teeth children and adults have.
5. Ask students: Do humans have the same kinds of teeth as we studied in Activity One? Can you find any canine teeth? Why do you think they are canine? How about incisors? Why do you think some of your teeth are incisors? How about molars?

Students will need mirrors. They also will probably need assistance identifying the kinds of human teeth. High school students could be helpful here or the teacher could provide further information or diagrams about human teeth.

Have students label a diagram of their mouth showing which teeth are which.



Human Palate, with teeth of upper jaw. — *m*, molars; *pm*, premolars or bicuspids; *c*, canine; *i*, incisors.

6. Conclusion (and lead-in to next Activity) – When students have figured out what kinds of teeth they have, see if they can use that information to make an hypothesis as to what humans would eat and which teeth might be used for which foods.

How Many Teeth Do You Have?

Predict how many teeth you have: _____ teeth

Work with a partner.

How many teeth do you have in your lower jaw? _____

How many teeth do you have in your upper jaw? _____

Add those two numbers together. How many teeth do you have all together? _____

Listen carefully in class.

How many students have 20 teeth? _____

How many students have 19 teeth? _____

How many students have 18 teeth? _____

How many students have 17 teeth? _____

How many students have 16 teeth? _____

How many students have 15 teeth? _____

Use the following page to make a graph of this information.

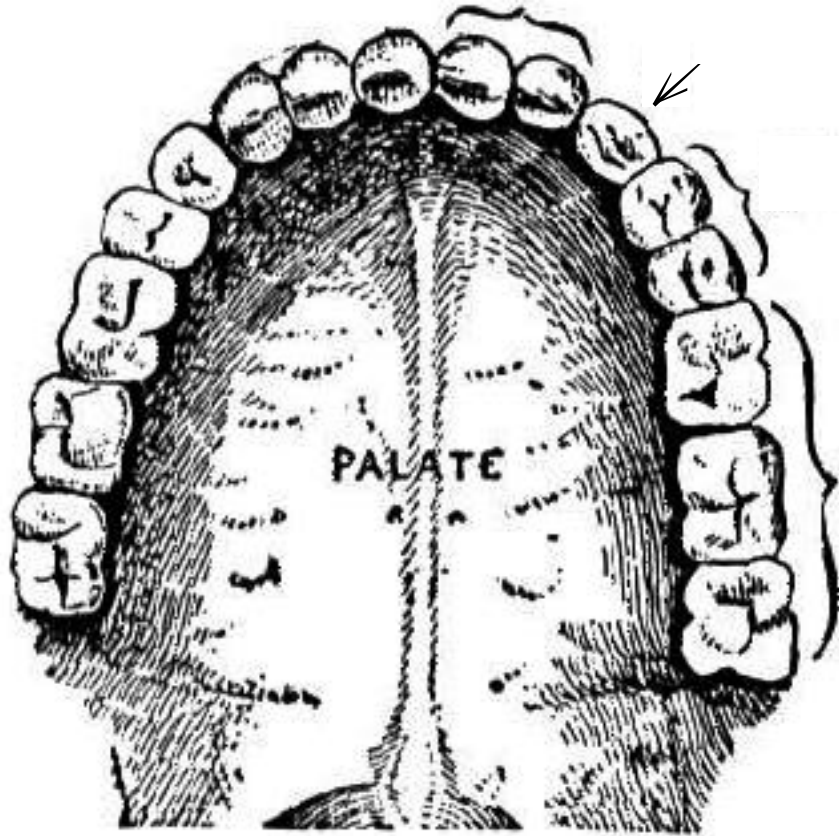
Name _____

Title of Graph _____

Number of Students

12						
11						
10						
9						
8						
7						
6						
5						
4						
3						
2						
1						
	Have 20 teeth	Have 19 teeth	Have 18 teeth	Have 17 teeth	Have 16 teeth	Have 15 teeth

Number of teeth



Activity Three: What Teeth Do You Use?

Purpose

Students will predict and investigate which kinds of teeth are used to eat different kinds of food.

Materials

- Food: bread, carrots, nuts, chocolate chip cookies, raisins, apples (enough for each student to try each food)
- Mirrors

Procedure

1. Students will review information from Activity Two about what kinds of teeth they have.
2. Have students predict which teeth they would use to eat bread, carrots and nuts. Have them give a reason why they chose a particular kind of teeth.
3. Then have students try eating each kind of food and figure out which teeth are being used. Are the same teeth used at the beginning, in the middle, or at the end of chewing? Having mirrors and a partner may help.
4. Record what food they ate and what teeth are used to begin/continue/finish breaking down the food into smaller pieces.
5. Have students describe what each of kind of tooth is used for:

canines – tearing and stabbing

incisors – cutting

molars – grinding and crushing
6. Have students predict what different kinds of teeth are used for the different kinds of food (cookie, raisins, apples).

Optional extension or homework: If students have a dog or cat, have them observe it eating. Try to describe what kind of teeth it has and its teeth and jaw movement.

Activity Three: What Teeth Do You Use?

Student worksheet

Name _____

What three kinds of teeth do you have?

Predictions

What teeth would you use to eat bread?

Why?

What teeth would you use to eat carrots?

Why?

What teeth would you use to eat nuts?

Why?

Now try eating the bread. Which teeth are used?

Are other teeth used as you continue or finish eating?

Now try eating the carrots. Which teeth are used?

Are other teeth used as you continue or finish eating?

Now try eating the nuts. Which teeth are used?

Are other teeth used as you continue or finish eating?

Think about what teeth were used to eat the different kinds of food. Don't just tell what kind of food. Tell what kind of action your teeth are taking.

What are canines used for?

What are incisors used for?

What are molars used for?

Use the information you have learned to make predictions about what teeth will be used to eat other foods.

What teeth would be used to eat a chocolate chip cookie? Why?

What teeth would be used to eat raisins? Why?

What teeth would be used to eat an apple? Why?

Now try the chocolate chip cookie. What teeth were used?

Were you correct?

Why or why not?

Now try the raisins. What teeth were used?

Were you correct?

Why or why not?

Now try the apple. What teeth were used?

Were you correct?

Why or why not?

Activity Four: Don't Forget to Brush Your Teeth!

Purpose

To show the effect brushing of teeth has on the number of bacteria in your mouth.

Materials

- Four nutrient agar petri plates per student (or two per student and two control plates for the class)
- Incubator set at 37 degrees Celsius if available
- Toothbrush/toothpaste per student
- Two sterile cotton swabs per student
- Scotch tape
- Waste containers
- cut paper to be used as bacterial counting aids (see below)
- Permanent markers

Procedure

Class demonstration:

1. Open a plate and discuss which is the top and which the bottom section.
2. Give students a chance to touch the agar with a finger so they know what it feels like and know that they don't have to press hard with the Q-tip later in the lab. (Put this plate in the incubator also to see what grows on it.)
3. Divide students into groups of four or five. Each student will have plates 1 and 2, but plates 3 and 4 are for the group. This reduces the number of plates required.

Group activities:

1. Students gather necessary materials for lab exercise. Caution students NOT to open plates and to leave them flat on surface of table or desk. Discuss importance of proper disposal.
2. Students write initials on plate bottom with permanent marker and number plates "1" and "2."
3. Students take a sterile cotton swab and rub it on their teeth. They will then rub the swab gently on nutrient agar media culture plate #1. Then they put pieces of scotch tape at four places around the plate to keep it closed.
4. Put used cotton swabs in waste containers.

5. Students brush their teeth for sixty seconds, rub another swab on their teeth and then on culture plate #2. Tape plate closed. Record the toothpaste used. Dispose of cotton swab.
6. The unstreaked plate #3 is used as a control. Tape plate closed without streaking it. Discuss with class why control plates are needed. Take plate #4, streak it with an unused cotton swab and tape it closed. This acts as a control to show that the swab is not introducing bacteria.
7. Place plates in the incubator* at 37 degrees Celsius. You may stack plates in incubator. Make sure plates are stacked bottom up. This reduces water from condensation falling on the media. Make sure to keep plates flat.

* If an incubator is not available, place the plates in a warm area of the room (not to exceed 37 degrees Celsius = 98 degrees Fahrenheit).

8. Have the students predict what will happen on each plate and write it down.
9. Observe plates twenty-four hours later for growth. Note: one microscopic bacterium can multiply into two in 20-30 minutes. The two become four in another 20-30 minutes, etc. So after 24 hours there is a macroscopic colony which contains about a billion cells descended from one cell. As an extension you could have students calculate how long it will take to go from one cell to a billion cells assuming a 30-minute division time.

Which plate has more bacteria growth? Describe the growth (color, shape, size and number) of the bacteria colonies. If students have difficulty counting colonies on the plates, have them use a template to cover three quarters of the plate. Ninety-millimeter filter paper can be folded in quarters, one quarter cut out and the remainder placed over each plate. Students count colonies in the uncovered quarter of the plate and then add their total four times to get number of colonies. It may help students count by actually marking the colonies with marker on the bottom of the plate. Have students draw pictures of the growth.

10. Observe plates forty-eight hours later for growth. Which plate has more bacteria growth? Describe the growth (color, shape, size and number) of the bacteria. Students could use a different color marker to mark any new colonies.
11. Discuss results with class and draw conclusions based on the experiment results.
12. To dispose of the petri plates, autoclave them. If you do not have access to an autoclave, prepare a solution of nine parts water and one part bleach. Open each plate, pour enough solution to cover the plate and then close it. Throw the plates in a plastic bag, tie it shut and discard in the garbage.

Optional extensions:

- Experiment with different lengths of brushing and the effect on bacterial growth.
- Try different kinds of toothpaste.
- Look at bacteria under a microscope. This has to have a high power objective.

Agar Plate Pouring: Using Dehydrated Nutrient Agar

Using a microwave and 1000 ml beaker

1. Take one of the approximately 11.5 grams of pre-measured, dehydrated nutrient agar out of the CIBT kit.
2. Take one of the 500-ml beaker and fill with 500 mL of water. Add 11.5 grams of nutrient agar to water-filled beaker and stir with glass stirring rod. (An Erlenmeyer flask is easier to pour from than a beaker but it will not fit in most microwaves.)
3. Cook in microwave oven for four minutes on high.
4. Stir with stirring rod.
5. Cook for another four minutes and stir. The solution should be butterscotch in color. Use a hot pad or cloth to remove the beaker from the microwave.
6. As agar solution is heating, prepare 40-45 petri plates by laying them flat on a table. Do not stack plates. Use size 100 x 15 mm plastic disposable petri plates (VWR Catalog #25384-208). Do not open petri plates until you are ready to pour the agar. This will keep the plates sterile.
7. Pouring of all the plates should be completed in a timely manner as too much time will cause the agar to begin to gel in the beaker. You can extend your time by using a water bath at 70 degrees Fahrenheit and setting the flask in it. If you let the media cool to 65 degrees Fahrenheit before you pour, this will reduce condensation in cured plates.

Have plates laid out on table. Take top cover off (petri plates have a top and a bottom, the top has a greater diameter so it covers the bottom half), pour the agar into the bottom half and replace cover.

Pour enough agar to cover the bottom of the petri plate. Do not fill the plate. For our exercise, just covering the bottom of the plate will work fine. Put cover on the plate and move onto the next plate. One liter of agar solution should cover between 40-45 plates depending on the thickness of each plate.

8. Allow plates to solidify, approximately 30-45 minutes. Solidified plates should be stored flat with the bottom up, in a refrigerator until use. Plates may be stacked but make sure they are laid flat.

Using a hot plate and Erlenmeyer flask

1. Follow steps 1 & 2 above. You may prefer to use a liter Erlenmeyer flask.
2. Heat on hot plate. You may set hot plate to high but you will need to stir with glass stirring rod. Heat agar solution until nutrient agar is dissolved. Don't let agar solution boil violently. When agar is in solution (it will look straw colored or like butterscotch dissolved in water) you are ready to pour the plates.
3. Follow steps 6-8 above to pour the plates. Use a hot pad to hold the neck of the Erlenmeyer flask.

NOTE – You will need 80-85 plates for a class so you will need to prepare the agar solution and pour plates twice.

Agar Plate Pouring: Purchased Bottles

1. Take 125 ml bottle of nutrient agar (Wards #88W1500), loosen top and place in a hot water bath.
2. As agar solution is dissolving, prepare seven or eight petri plates by laying them flat on a table. (Do not stack plates.) Use size 100 x 15 mm plastic disposable petri plates (VWR Catalog #25384-070). Do not open petri plates until you are ready to pour the agar. This will keep the plates sterile.
3. When agar is dissolved, you are ready to pour the plates. Pouring of all plates should be completed in a timely manner as too much time will cause the agar to begin to gel in the flask. You can extend your time by using a water bath at 70 degrees Fahrenheit and setting the flask in it. **If you let the media cool to 65 degrees Fahrenheit before you pour, this will reduce condensation in cured plates.**

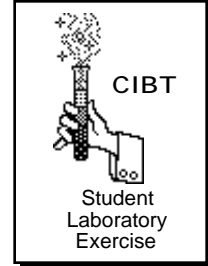
Have plates laid out on table. Take top off (petri plates have a top and a bottom, the top has a greater diameter so that it covers the bottom half), pour the agar into the bottom half and replace cover.

Pour enough agar to cover the bottom of the petri plate. One does not have to fill the plate. For our exercise, just covering the bottom of the plate will work fine. One bottle of pre-made agar can pour seven or eight plates.

4. Allow plates to solidify, approximately 30-45 minutes. Solidified plates should be stored flat, with the bottom up, in a refrigerator until use. Plates may be stacked but make sure they are laid flat.

Activity Four:

Don't Forget to Brush Your Teeth!



Questions –

What happens to the bacteria in your mouth when you brush your teeth?
How does brushing your teeth affect the growth of bacteria on your teeth?

Agar is a Jell-O-like material used to grow bacteria.

1. Take four plates with agar on them. Don't open the plates until you need to. Use a marker and write your initials on the bottom of each plate. Then number them 1, 2, 3 and 4. Do not write too large so you can still see what might happen on the plate.
2. Take a cotton swab and rub it all over your teeth.
3. Rub the swab back and forth gently on the agar on plate #1. Cover the plate. Then take four pieces of scotch tape and tape the plate closed at four places around the plate.
4. Brush your teeth with a toothbrush and toothpaste for one minute. Have the teacher time you. Rinse your mouth with water.
5. After you brushed your teeth, take another cotton swab and rub it all over your teeth.
6. Rub the second swab back and forth gently on the agar on plate #2. Cover the plate. Then tape the plate closed.
7. Take plate #3 that you have not touched. Do not open it so air does not touch the agar. Tape the plate closed.
8. Take plate #4. Rub an unused cotton swab gently on the agar. Then tape the plate closed.
9. Put all the plates in an incubator to stay warm. Leave for 24 hours.

Predict what you will see in twenty-four hours.

Give as many details as possible.

On plate 1, I will see _____

On plate 2, I will see _____

On plate 3, I will see _____

On plate 4, I will see _____

After twenty-four hours:

Look at the three plates. Is anything growing on them? _____

Look carefully at the plates.

Fill in the chart below about what you see. Do not fill in the last row yet.

	Plate 1	Plate 2	Plate 3	Plate 4
Color				
Shape				
Size				
How many				

Listen to your teacher tell you a way to count how many groups of bacteria are on the plate. Then carefully count them. Fill in the bottom row of the chart.

Draw pictures of the four plates on the next page.

After twenty-four hours

Name _____

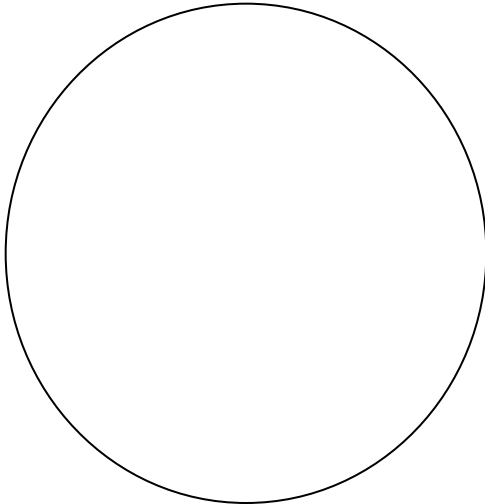


Plate 1

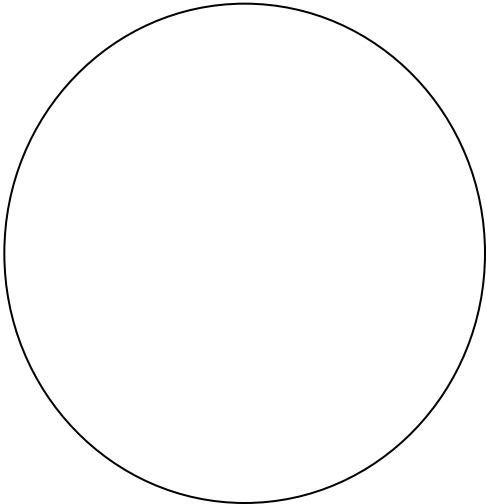


Plate 2

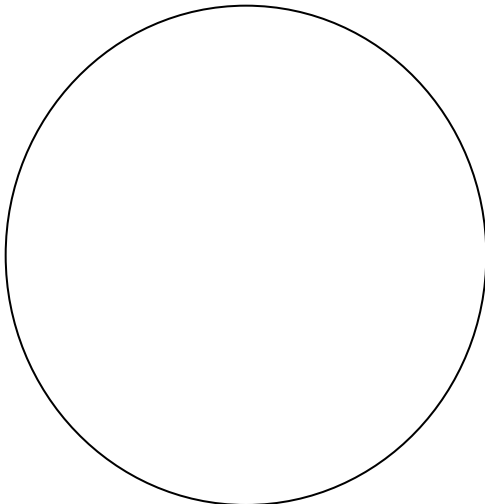


Plate 3

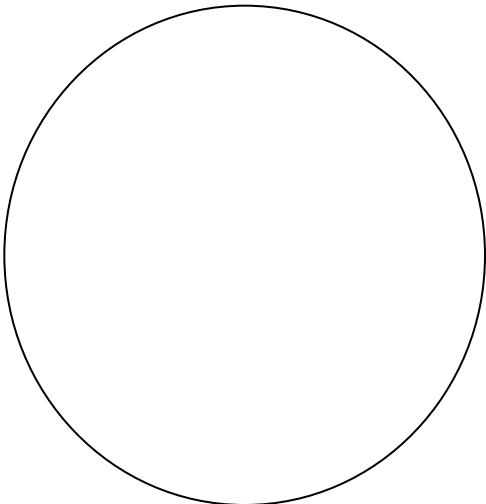


Plate 4

After forty-eight hours –

Look at the four plates. Is anything growing on them? _____

Look carefully at the plates.

Fill in the chart below about what you see.

	Plate 1	Plate 2	Plate 3	Plate 4
Color				
Shape				
Size				
How many				

Draw pictures of the four plates on the next page.

After forty-eight hours Name _____

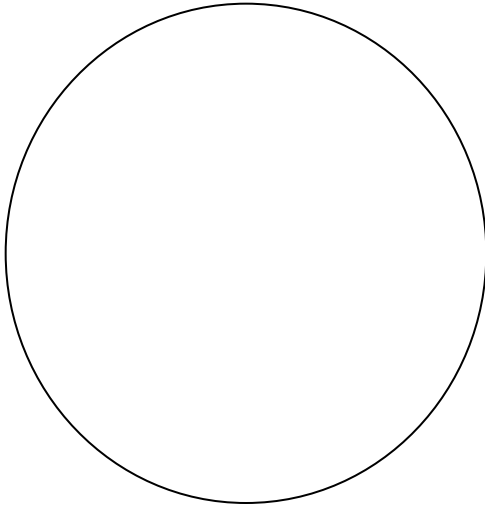


Plate 1

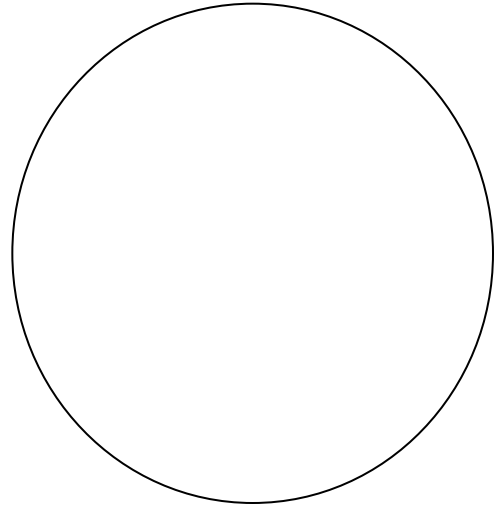


Plate 2

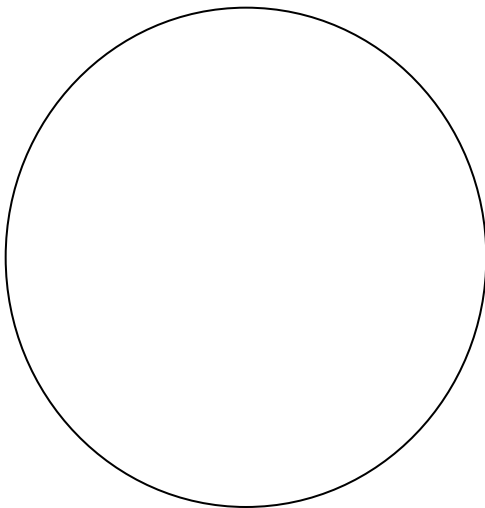


Plate 3

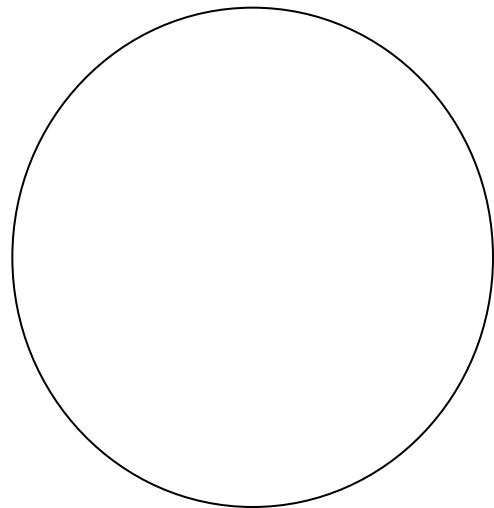


Plate 4

What can you learn?

1. Did you predict correctly?

2. Which plate had the most growth? _____

3. What does this tell you about brushing your teeth?

Activity Five: What Did It Eat for Dinner?

Purpose

Students will determine if a given jaw (or part of a jaw) is from a carnivore, herbivore or omnivore.

Procedure

1. Jaws should be labeled by letter. Make sure students have one worksheet for each jaw.
2. Students are divided into groups of about four.
3. Each group is given a jaw. They should study it and try to identify common characteristics. Then they should state the dentition (types of teeth – incisors, molars, canines). Next each group should record whether the animal is a carnivore, herbivore or omnivore and give their reasons for their choice.
4. After each group has made a decision, they pass their jaw to the next group.
5. After all groups have examined the jaws, have a class discussion saying which jaws were which and the reasons why.

Activity Five: What Did It Eat for Dinner?

Student worksheet

Name _____

Which jaw are you studying? _____

Study it carefully. Describe it below giving as many details as possible.

How long is it in cm? _____

How big is the largest tooth? _____

How big is the smallest tooth? _____

How many teeth are molars? _____

How do you know?

How many teeth are canines? _____

How do you know?

How many teeth are incisors? _____

How do you know?

What does an herbivore eat? _____

What does a carnivore eat? _____

What does an omnivore eat? _____

Do you think this jaw came from a herbivore, carnivore or omnivore?

Why? Give as many reasons as you can.
