

OUR CHEMICAL SENSES

TEST YOUR TASTE

STUDENT GUIDE

“How can you eat that?”

Laura, Emily and Jessica tromped toward the Food Court at the Mall, ready to celebrate their successful hunt for new track shoes at bargain prices. “Great timing—high noon and I’m starving!” exclaimed Emily. They fanned out, each to a different vendor, to find lunch. Back at the table, they began devouring plates of goodies. “Hey, what’s that, Laura? Looks interesting. Can I taste it?” questioned Jessica, looking up from her burger. “Sure, have some-- it’s good,” said Laura. “It’s black bean-garlic chicken.” “Yuck,” came the response after Jessica helped herself to a forkful. “How can you eat that? It’s kinda sour, or strong, or something!” “I dunno,” Laura replied. “My Mom and Dad lived in Hong Kong years ago and they like to make Oriental food. We have it at home pretty often. Guess I’m used to it.” “Hmm,” noted Emily. “I love bananas, but my brother can’t stand them. But hey, we grew up in the same house, and our parents fed both of us the same. I wonder why people don’t always like the same things. Do things actually taste different to different people?”

How do our bodies get information through the *sense of taste*?

Through our sense of taste, we detect an enormous variety of flavors. These tastes might signal something pleasant, or unusual, or spoiled and therefore dangerous to our health. Our ability to taste things and our responses to flavors are influenced by many things, including our genes, age, individual experiences, and current surroundings.

Your teacher will discuss the parts of the taste system and how they work. This system includes special **receptor cells** in the **taste buds** on the tongue and throat, and nerve cells and their extensions called **axons** that form pathways to the brain. Once the taste signals reach certain **areas of the brain**, these centers detect and interpret the flavor messages. After your class discussion and experiments, think of some reasons why Laura and Jessica felt so differently about eating the black bean garlic chicken dish, and why Emily and her brother had different ideas about bananas.

Name: _____ Date: _____

TEST YOUR TASTE

CLASS EXPERIMENT

LAB QUESTION

PREDICTIONS

SUPPLIES

cubes of food, supplied by your teacher
plastic forks for tasting food cubes
paper for recording results
blindfolds or glasses with opaque tape on the lenses

PROCEDURE

1. Write the **Lab Question** and then write your predictions in the boxes above.
2. Follow all **safety procedures** your teacher recommends.
3. Tell your teacher if you have any **food allergies or sensitivities**.

4. Do not share utensils.
5. Follow your teacher's instructions for choosing **data recorders and subjects** for your group. Let your teacher know if you do not want to be a subject.
6. Choose five food items, or a number your teacher suggests, and be sure the subject does not see them. Give the subject **opaque glasses or a blindfold**, and have the person hold his or her nose.
7. Give the subject one food cube on a plastic fork to eat while **holding his or her nose**, and ask for the name of the food. Record whether the answer was correct or incorrect alongside the name of the item. Continue with the remaining food items. The subject may want a small drink of water between tastes.
8. After this first experiment, repeat the food samples while the subject **does not hold his or her nose**, but **does** wear a blindfold. Write the names of the foods the subject gives you.
9. When you finish, be sure to clean up your lab area.

DATA AND OBSERVATIONS

- Your teacher will ask the data recorders to write your results in a class chart on the board.
- Use the class results to calculate the **percentage** of food items correctly identified in the two experiments: with and without the subject smelling. Make a chart in the following form:

Percent correct identifications

	<u>Without smell</u>	<u>With smell</u>
Food item	(___ %)	(___ %)
Food item	(___ %)	(___ %)

- Write down any other interesting things you noticed while doing this experiment.

ANALYSIS: THINK ABOUT IT!

1. In your group, did subjects identify more foods correctly with or without holding their noses? How can you explain this?

2. How do your group results compare with the results of the whole class?

3. Were there certain foods that were difficult for everyone to identify? If so, what could be some reasons for this?

4. How does information from taste receptors in the mouth get to the brain? Draw a simple diagram.

CONCLUSIONS

How was the Lab Question answered in your experiment?

List three findings you think are important from today's experiment. Were you surprised by anything you found?

How could you improve this experiment?

TEST YOUR TASTE

DESIGNING AN EXPERIMENT

WHAT ELSE CAN WE FIND OUT ABOUT THE SENSE OF TASTE?

You can use what you have learned about the sense of taste to develop your own experiment. Investigate the lab supplies your teacher has set out for this activity and brainstorm with the class or your group to think about what you can find out with these materials. For example, can you think of ways to **interfere** with the taste receptors or the nerves that send information to the taste centers in the brain? Are there some flavors you can identify whether or not you hold your nose? Memories are often associated with tastes. Can you think of a way to find out about different memories that people associate with flavors?

HOW CAN YOU DESIGN A GOOD EXPERIMENT?

In designing experiments to answer questions like these, keep in mind what a successful investigator must do:

- Ask a **very specific question**: not, for example, “Can I interfere with the sense of taste?” but rather, “If I mix two foods or liquids together, will a person be able to identify the components?” It’s good to have the general question in mind, but ask a narrow question for each experiment.
- Be sure you understand the **control condition** for your experiment, and then **change only one thing, or variable**, in the experiment.
 - For example, in your Class Experiment, the **control condition** was tasting food without smelling it, and the variable was smell, which was changed in the next experiment.
 - Some new experiments are control experiments, and you may not have time to change a variable for another experiment. For example, you may test a person’s ability to identify solutions of four of the basic tastes while not using the sense of smell. In the next experiment you would test the same materials on the same subjects (control conditions) but would not have them hold their noses, so smell would be the variable.

- Researchers try to change only one variable in an experiment after they define the control conditions. Sometimes this is difficult, but at least they must be aware of other variables and think about what effects they might have.
- Use the Worksheet (next page) to write down your new lab question, your predictions, and the steps in your procedure. Follow the general plan of the Class Experiment.

Name: _____ Date: _____

TEST YOUR TASTE

TRY YOUR OWN EXPERIMENT

LAB QUESTION

PREDICTIONS

PROCEDURE

1. After you brainstorm ideas for your experiment, each group should agree upon and write a Lab Question in the box above.
2. Write predictions for the answer to your question in the box above.
3. List the steps you will take to perform your experiment. (Use as many steps as you need) Include a list of supplies:
4. Figure out what the control conditions for your experiment will be, and whether your experiment is one that sets control conditions, one that tests a new variable, or both.
5. Try to change only one variable.
6. Design a data sheet or table to record your results.

7. Get your teacher's OK before beginning your experiment.
8. Clean up the lab when you finish.

DATA AND OBSERVATIONS

Your teacher will give you **supplies** for your new experiment.

In addition to recording taste data, write down other observations, such as what worked well and what didn't, problems with supplies, or whether people in the group had disagreements.

ANALYSIS: THINK ABOUT IT!

1. What is the control condition for your experiment?

2. What did you change or add for your new experiment? Did you change only one variable?

3. What tastes do not depend on the sense of smell; that is, they taste the same whether or not you hold your nose while tasting?

4. What are some reasons why the same flavor can mean different things and bring up contrasting memories for different people? Use your ideas to discuss the Scenario about Laura, Jessica, and Emily.

5. If your new experiment mixed two food materials together, do you think the taste messages interfered with each other in the mouth and nose, or in the brain? Why?

CONCLUSIONS

How did your results answer your Lab Question?

How certain are you of your conclusions? Would you need more evidence to convince yourself or others that your conclusions are right?

What are some other ideas for experiments on the sense of taste?

MORE *TASTE SENSE* ACTIVITIES

Do other animals sense the same flavors we do? Are there animals that are much more sensitive to tastes than we are? How do aquatic animals, such as fish, taste things? Can insects taste anything? Perhaps you could imagine yourself as another animal—a dog, a fly—and describe your day of tasting and smelling the world. What role does taste play in advertising? Have you ever gone into a grocery where employees are giving away small samples of food to eat? Do you think this encourages people to buy things? Have you received food samples in your mailbox or along with your newspaper at home? Do you think this is a more effective way of advertising than showing pictures of food in magazines? Why? Find out about abnormalities or diseases of the human taste system, using your library or the Web. Try finding these words: hypogeusia, ageusia. Do some library or World Wide Web research and report to your class.

Here are some Web sites to get you started:

Mayo Clinic: <http://www.mayohealth.org/mayo/9707/htm/taste.htm>

Monell Chemical Senses Center: <http://www.monell.org/sensation.htm>
<http://www.monell.org/neuroscience.htm>

Society for Neurosciences: <http://www.sfn.org/briefings/taste.html>

Neuroscience for Kids: <http://faculty.washington.edu/chudler/tasty.html>
<http://faculty.washington.edu/chudler/chtaste.html>

National Institutes of Health: http://www.nidcd.nih.gov/health/pubs_st/smltaste.htm

Howard Hughes Medical Institute: <http://www.hhmi.org/senses>

The Chemoreception Web: <http://www.csa.com/crw/websites.html>

Taste and Smell and Disorders Clinic: <http://blkbox.com/~rdevere/tsdc/index.html>

International Food Information Council: <http://ificinfo.health.org/insight/exper.htm>

Anatomy and physiology of taste:
<http://www.cf.ac.uk/biosi/staff/jacob/teaching/sensory/taste.html>

Stick out your tongue and say Aah!, from KidsHealth:
http://kidshealth.org/kid/body/tongue_LP.html