Name: _____ Date: _____

Why Chopping an Onion Brings Tears

Circle group

Chopping an onion can make you cry. The onion is not sad. You are not sad. The tears come from a chemical trick the onion uses to protect itself.

Inside a whole onion, two kinds of things are kept apart in the cells. One kind is sulfur compounds. The other kind is enzymes. They never touch while the onion is whole.

When you cut the onion, the cell walls break. The two kinds of things mix. The enzymes change the sulfur compounds. One new thing is a gas. It floats up from the cutting board.

The gas reaches your eyes. It dissolves in the thin wet layer on your eye. This makes a mild irritant. Your eye nerves feel it and tell your brain. Your brain tells your tear glands to wash it away. So your eyes water and sting.

Cooks have some tricks. A sharp knife breaks fewer cells, so less gas escapes. A cold onion makes less gas. A fan can blow the gas away. Cooking the onion stops the problem, because heat harms the enzymes.

Questions

1. Where are the sulfur compounds and enzymes kept in a whole onion?

_____

_____

2. What happens when you cut the onion?

_____

_____

3. What does the gas do when it reaches your eyes?

_____

_____

4. Why does a sharp knife cause fewer tears?

_____

_____

5. Why do your tear glands make tears?

_____

_____

6. Why does a whole onion not make anyone cry?

_____

_____

Words to know

enzymes: natural substances that cause chemical changes
irritant: something that makes a body part sting or hurt
sulfur: a yellow element found in many onion chemicals

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Why Chopping an Onion Brings Tears

Triangle group

Few kitchen jobs bring tears as quickly as chopping an onion. The onion is not sad, and neither is the cook. The tears come from a chemical defense that the plant developed over a very long time, probably to discourage animals from eating it.

Inside an intact onion, two kinds of substances are kept in separate compartments of its cells. One group is made of sulfur compounds. The other is a set of enzymes. While the onion is whole, they never meet. When a knife slices through the cells, the walls break and the contents mix. The enzymes quickly change the sulfur compounds into new ones, and one of them is a gas that drifts upward from the cutting board.

When the gas reaches your eyes, it dissolves in the thin layer of moisture covering them and forms a mild irritant. Nerves on the surface of the eye sense it and warn the brain. The brain answers by telling your tear glands to wash the irritant away. That is why your eyes water and sting.

Cooks have found a few ways to reduce the effect. A very sharp knife crushes fewer cells than a dull one, so less gas escapes. Chilling the onion in the refrigerator first slows the reactions. Cutting near a fan or an open window can blow the gas away from your face. Cooking the onion also ends the problem, because heat damages the enzymes.

Questions

1. Where are the sulfur compounds and enzymes kept inside a whole onion?

_____

_____

2. What happens when a knife cuts through the onion cells?

_____

_____

3. What does the gas do when it reaches your eyes?

_____

_____

4. Why does a sharp knife cause fewer tears than a dull one?

_____

_____

5. Why do your tear glands make tears when you chop an onion?

_____

_____

6. Why does a whole onion not make anyone cry?

_____

_____

Words to know

defense: a way a living thing protects itself
compartments: small separate spaces inside something
enzymes: natural substances that cause chemical changes
irritant: something that makes a body part sting or hurt
sulfur: a yellow element found in many onion chemicals

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Why Chopping an Onion Brings Tears

Square group

Few kitchen tasks bring tears as reliably as chopping an onion. Neither the onion nor the cook is sad; the tears are the result of a chemical defense that the plant developed over an extraordinarily long period, most likely to discourage animals from eating it.

Within an intact onion, two kinds of substances are held in separate compartments of its cells. One group consists of sulfur compounds, and the other is a set of enzymes. As long as the onion stays whole, the two groups never meet. When a knife slices through the cells, however, their walls rupture and the contents mingle. The enzymes rapidly convert the sulfur compounds into new ones, and one of these is a gas that drifts upward from the cutting board.

When that gas reaches your eyes, it dissolves in the thin layer of moisture that covers them and forms a mild irritant. Nerves on the surface of the eye detect it and alert the brain, which responds by instructing the tear glands to flush the irritant away. That is precisely why your eyes water and sting.

Cooks have discovered several ways to lessen the effect. A very sharp knife crushes fewer cells than a dull one, so less gas escapes. Chilling the onion in the refrigerator beforehand slows the chemical reactions. Cutting near a fan or an open window can carry the gas away from your face. Cooking the onion eliminates the problem entirely, since heat damages the enzymes.

Questions

1. Where are the sulfur compounds and the enzymes kept inside an intact onion?

_____

_____

2. What happens to the cells when a knife slices through them?

_____

_____

3. What does the gas do once it reaches the eyes?

_____

_____

4. Why does a very sharp knife lead to fewer tears than a dull one?

_____

_____

5. What purpose do the tears serve when you chop an onion?

_____

_____

6. Why can a whole onion sit on the counter without making anyone cry?

_____

_____

Words to know

defense: a way a living thing protects itself
compartments: small separate spaces inside something
enzymes: natural substances that cause chemical changes
irritant: something that makes a body part sting or hurt
sulfur: a yellow element found in many onion chemicals

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Why Chopping an Onion Brings Tears

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Why Chopping an Onion Brings Tears

Easier · 178 words · Flesch-Kincaid grade 2.4

1. They are kept apart inside the cells.
2. The cell walls break and the two kinds of things mix.
3. It dissolves in the wet layer on the eye and makes a mild irritant.
4. It breaks fewer cells, so less gas escapes.
5. The tears wash the irritant away from your eye.
6. The chemicals stay apart, so no gas is made until it is cut.

Triangle: Why Chopping an Onion Brings Tears

This passage · 238 words · Flesch-Kincaid grade 5.9

1. In separate compartments of its cells.
2. The cell walls break and the contents mix together.
3. It dissolves in the moisture on the eye and forms a mild irritant.
4. A sharp knife crushes fewer cells, so less gas escapes.
5. The tears wash the irritant away from the eye.
6. Its chemicals stay in separate compartments, so no gas forms until it is cut.

Square: Why Chopping an Onion Brings Tears

Harder · 245 words · Flesch-Kincaid grade 8.6

1. In separate compartments of its cells.
2. Their walls rupture and the contents mingle.
3. It dissolves in the moisture covering the eye and forms a mild irritant.
4. A sharp knife crushes fewer cells, so less gas escapes.
5. They flush the irritant away from the eye.
6. Its chemicals remain in separate compartments, so no gas forms until it is cut.