

Name: _____

Date: _____

Period: _____

Cellular Respiration Intro

Week # _____

Directions: Read p. 250 - 252. Then answer the questions below.

Question	Description
What do food molecules contain? (p.250)	
Where do organisms get energy? (p.250)	
What does a calorie refer to? (not the definition) (p.250)	
What do cells use the energy stored in food for? (p.250)	
What is cellular respiration? (p.251)	
What is the formula for cellular respiration? (p.251)	In symbols: In words:
What does the double meaning of respiration refer to? (p.252)	
What organelle does cellular respiration occur in? What does this organelle do? (p.252)	

Check for Understanding

1. In your own words, what is the goal of cellular respiration? _____

2. What types of organisms do cellular respiration?

a. Circle one: Autotrophs Heterotrophs All organisms

b. Explain your choice: _____

3. What does the cell produce from cellular respiration? _____, which is _____ the cell can use.

Name: _____ Date: _____ Period: _____

The Mystery of the Seven Deaths: A Case Study in Cellular Respiration

Directions: Read and annotate each section. Then answer the questions.

On September 29, 1982, 12-year-old Mary Kellerman of Elk Grove woke up feeling ill and complained of having a sore throat and a runny nose. To ease her pain, her parents gave her one Extra-Strength Tylenol capsule. At 7 a.m. they found Mary on the bathroom floor. She was immediately taken to the hospital where she was pronounced dead. On the same day, paramedics were called to the Arlington Heights home of 27-year-old Adam Janus. When they arrived, his breathing was labored, his blood pressure was dangerously low and his pupils were fixed and dilated. The paramedics rushed Adam to the hospital but it was too late. On the eve of Adam's death, his family gathered at his house. Adam's brother Stanley and his wife, Theresa, both suffered from headaches attributed to stress. Stanley found on Adam's kitchen counter a bottle of Extra Strength Tylenol. He took a capsule and then gave one to his wife. Shortly after taking the capsules, both Stanley and his wife collapsed onto the floor. Once again paramedics rushed to the home and attempted to resuscitate the young couple. However, they both died hours later.

1. What is the connection among each of these suspicious deaths? _____

Autopsies revealed that each of the Janus family members died of suffocation, or lack of oxygen. Tissue from the heart, lung, kidney, and liver all showed massive cell death. Analysis of cells showed major mitochondria damage within affected tissue and very low levels of ATP. Interestingly, oxygen levels in the patients' blood were normal.

2. Recall from earlier in this unit, what is the function of mitochondria? _____

3. Given the data in the autopsy, what finding seems inconsistent with the cause of death? _____

The coroner revealed that a poison, cyanide, was the culprit. Upon hearing these results, Elk Grove Village conducted an autopsy on Mary and determined she too died of cyanide poisoning. After linking these four suspicious deaths, Cook County's toxicologist examined the Tylenol collected from each of the victim's homes. He discovered that they were filled with lethal doses of cyanide. The maker of Tylenol, Johnson & Johnson, was immediately alerted to the deaths. The company began a massive recall of their product. However, by then it was too late for three more victims of the deadly poison-laced Tylenol capsules. These deaths brought the total count to seven, and a citywide hysteria ensued.

Johnson & Johnson determined that the cyanide was not introduced into the bottles at the factory, which left one other possibility. Chicago law enforcement and the FBI realized that someone had taken the Tylenol bottles off the shelves at the stores where they were sold, filled the capsules with cyanide, and returned them back to the stores.

So, why is cyanide lethal? Cyanide works by interfering with the chemical mechanisms of cells. In order to survive, cells need energy, and they get this energy, in part, from the sugars in the foods we eat. In cellular respiration, cells use oxygen molecules from the air we breathe to free up energy from sugar. Cyanide molecules act like a monkey wrench in a cell's mechanism of respiration. Cyanide looks like oxygen. In fact, if there are both oxygen and cyanide molecules present in the bloodstream, cells will grab onto the cyanide molecules first, and try to use these, instead of oxygen, to get energy out of sugar. However the cyanide won't work that way, and will clog the cell's energy delivery system. It's like trying to run a car on peanut butter instead of gasoline, the peanut butter only clogs the car's fuel system. With its respiration mechanism not working, the cell will eventually die. If enough cells die, then the victim dies as well.

4. Given what you now know about the action of cyanide on cellular respiration, explain why the patients died of suffocation, while their blood oxygen levels were normal.

5. Explain why the autopsy results indicate very low levels of ATP in the mitochondria.