***1. Bacteria and viruses***

Bacteria are microscopic one-celled organisms. Thousands of types of bacteria live almost everywhere. Bacteria can reproduce themselves (multiply). Some bacteria are helpful, while others can make us sick.

Viruses, another major cause of illness, are smaller than bacteria and may have a spiny outside layer. Viruses can’t reproduce on their own, so they infect cells and take them over in order to multiply.

**Questions:**

1. What are bacteria?
2. What are viruses?
3. What are some differences between bacteria and viruses?

 ***2. Epidemic vs. pandemic***

While disease has affected humans since the beginning of time, it wasn’t until people began gathering in larger populations that infections began to reach epidemic levels. An epidemic happens when an infection (caused by a bacteria or virus) affects a large number of people within a given population, such as a city or geographic area. If it affects even greater numbers and a wider area, these outbreaks become pandemics.

**List of pandemics throughout history.**

**1300s - The Black Death**
Brought to Europe from the Far East via infected fleas that were riding on the backs of ship rats, the [Black Death](http://www.history.com/topics/black-death) (also known as the Bubonic Plague) would go on to wipe out over 20 million people. That figure represents one-third of the population. Fear gripped the continent as people began falling victim to the disease in increasing numbers. People did not understand how the disease was spread or how to treat it. To make matters worse, the gruesome nature of the illness added to the hysteria—the infected displayed the disease’s trademark black boils, which oozed blood and pus.

Symptoms:  Chills, fever, vomiting, aches and pains, along with hard, painful, burning lumps on the body that turn black, split open and ooze pus and blood.
Caused by:  Yersinia pestis bacteria
Does it still exist?  There are 1,000 to 3,000 cases worldwide each year, including 10 to 15 cases in the United States. Due to improved sanitation, the disease is not likely to spread the way it did in the 1300s. The Bubonic Plague is now treatable with antibiotics, and a vaccine is also available.

**Ancient time through 1970s – Smallpox**
An astounding [300 million](http://www.historyofvaccines.org/content/articles/history-smallpox) deaths were attributed to smallpox outbreaks during the 20th century alone. That figure certainly would have been greater were it not for the revolutionary work of a physician named [Edward Jenner](http://www.bbc.co.uk/history/historic_figures/jenner_edward.shtml). Jenner realized that people who had already contracted cow pox did not contract smallpox. In 1796, he injected cow pox into an eight-year-old boy to test his theory. When the boy was proven to have been successfully inoculated, Jenner had created the world’s first vaccine. After successful vaccination campaigns throughout the 19th and 20th centuries, in 1979 the World Health Organization certified that smallpox had been eliminated.

Symptoms: Fever, fatigue, aches and pains, along with red lesions (sores) that become filled with pus, then crust and scab.
Caused by: The variola virus
Does it still exist?  Due to the success of vaccination campaigns, the disease was wiped out.

**1918-1919 – Spanish (Avian) Flu**
It may be hard to believe, but the [flu](http://virus.stanford.edu/uda/) killed nearly 40 million people at one point in history. In that 12-month period, more people succumbed to the flu than lost their lives in World War I, leading many to consider it the most devastating pandemics in all of recorded history.

Symptoms: Fever, nausea, aches, diarrhea and sometimes severe pneumonia. Victims show dark spots on the cheeks and turn blue, suffocating as their lungs fill with a frothy, bloody substance.
Caused by: A virus in the H1N1 family
Does it still exist?  Different forms of the virus still exist, but scientists are not worried that this particular version will make a comeback.

**Questions:**

1. What’s the difference between an epidemic and a pandemic?
2. Name a pandemic from history. What caused (causes) it, and what are its symptoms?
3. What medical knowledge and science do we have now (that we didn’t have at the time when these pandemics began) that can help prevent these serious diseases?