

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

### **Simulating the Transmission of Disease**

**Background:** The rapid spread of a disease is known as an epidemic and is of great concern to public health officials, who must learn how a disease is transmitted and then attempt to control it. Epidemiologists are scientists who study the cause and spread of diseases through populations. By doing this, they can help prevent or control the spread of diseases.

AIDS is a condition caused by the Human Immunodeficiency Virus or HIV. HIV can be contracted through an exchange of contaminated body fluids (blood, semen, needles). Hepatitis strands A, B, and C are also spread through fluids; according to the CDC, the Hepatitis B virus can survive up to 7 days outside the body and still cause infection! Syphilis is caused by a bacterium and is spread through direct contact with a sore during sexual activity or from mother to child.

HIV/AIDS, hepatitis, and syphilis are all deadly pathogens. Many other types of pathogens, though not deadly, cause health complications and financial stress. Governmental reports show in 2007, 46,277 cases of HIV/AIDS reported, 8,347 cases in 2007 of hepatitis, and in 2008, 46,277 cases of syphilis. These individuals actually tested positive for infection in a lab.

In today's world, it is important for people and doctors to keep track of sexual partners and other dangerous activities to attempt to stop the spread of dangerous diseases.

**Objective:** This lab is to understand the transmission of disease caused by certain bacteria and viruses and analyze how quickly persons can become infected. During this lab, you will use a chemically contaminated liquid to observe how quickly a pathogen (disease causing agent) spreads in a population.

**Problem:** How quickly can a disease be spread between people?

**Hypothesis:** In our class, let's imagine that one of our classmates is "infected" with a disease. If our class exchanges fluids representing the disease, how quickly will the "disease" spread? Write a hypothesis predicting how many people will be infected by the end of the class period. "If one person is infected, after the exchange, then..."

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**Procedure:**

1. Everyone choose a sample from the table.
2. Most of these solutions are neutral, representing healthy persons in the population. One unknown person in the class will be given a contaminated solution, representing an infected person in the population.
3. When your teacher gives the signal, begin round one of the transfers. Choose a classmate at random for the exchange. Exchange fluid by pouring half of your solution into theirs and then vice-versa (reversed).
4. Record the name of the classmate you exchanged fluid with in Table 1.
5. When your teacher gives you the signal, carry out a second round of transfers, with a different classmate. Record the name of the 2<sup>nd</sup> classmate you exchanged fluid with in Table 1.
6. Repeat the steps above for the 3<sup>rd</sup> classmate and record the data.
7. Obtain the indicator solution from the teacher and watch for a reaction in your solution. A color change indicates infection.
8. In Table 2 – record the names of all of the students who are “infected”.
9. After you have completed Table 2 you must work backwards to deduce (or figure out) the identity of the first “infected” person.
10. To deduce the identity, begin by crossing off all of the names of uninfected people from Table 2. (Cross their names off the list in a color to identify them as “uninfected”.)
11. You should then be able to identify the students who were infected in each round. This is much like the process that epidemiologists use to trace the outbreak of a disease.

Table 1:

	ROUND ONE	ROUND TWO	ROUND THREE
PERSON CONTACTED			

Table 2:

INFECTED PEOPLE	WHO DID THEY CONTACT IN ROUND ONE?	WHO DID THEY CONTACT IN ROUND TWO?	WHO DID THEY CONTACT IN ROUND THREE?

**Infection Analysis:** Who do you think was the “first infected” person in our class? Why? Back up your opinion with evidence from your data table.

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**Further Analysis:**

- How many students were in the class at the beginning of the activity? \_\_\_\_\_  
 How many students were “infected” by the end of the activity? \_\_\_\_\_

- Calculate the percentage of people who became infected (Table 3).
- Create a circle graph representing the percentage infected after our activity.

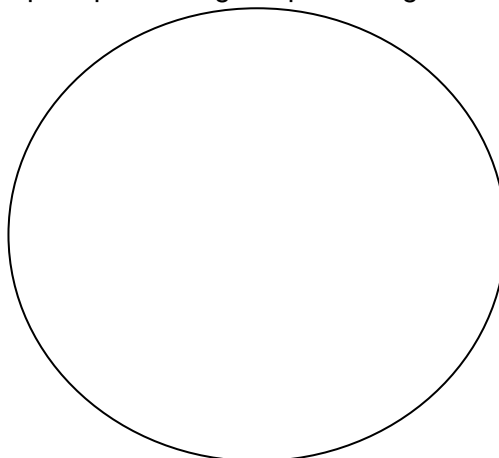


Table 3:	
Total # Infected	
/Starting Pop	
X 100 =	%

3. What percentage of classmates ended up infected versus uninfected? Explain how one carrier can infect so many people in the population?

4. What are four methods of transmission discussed in the introduction?

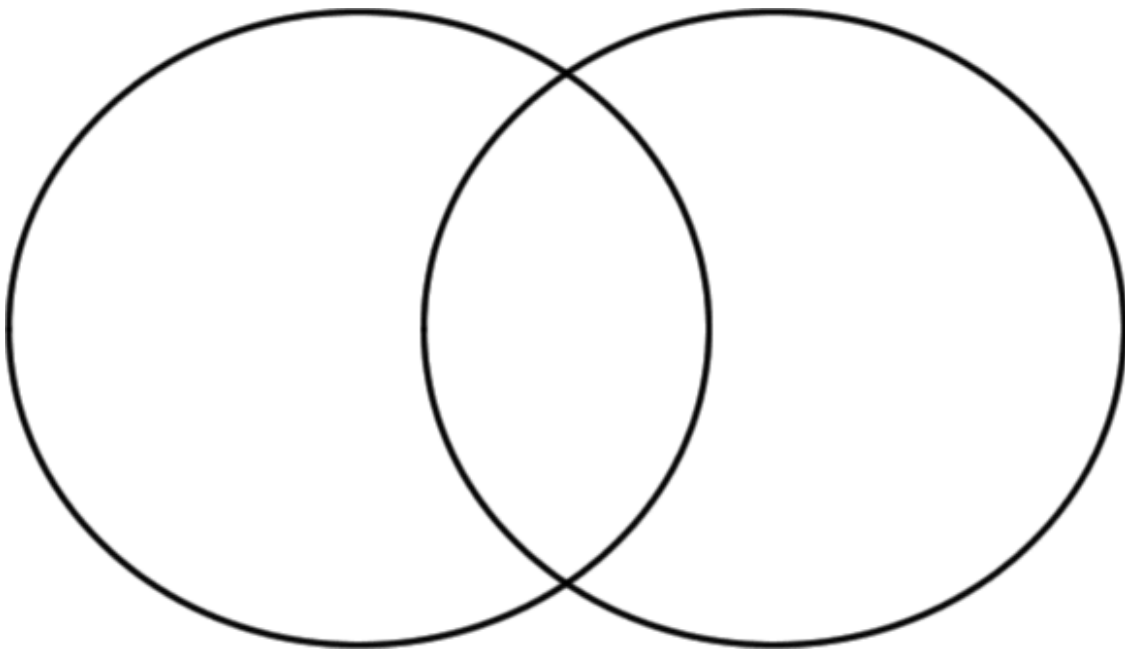
a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

5. HIV/AIDS, hepatitis, and syphilis are caused by viruses and a bacterium. What is the difference between a bacterium and a virus? Fill in the Venn diagram below with at least one item for each section. (2 pts)



6. If you wanted to be 100% sure that your cup (which represents your body) would NOT be infected, with a deadly pathogen what would be your best course of action?
  
7. How/what are other ways OTHER DISEASES can be spread between persons?
  
8. Review ways that individuals can protect themselves from ALL types of disease (HIV/AIDS, flu, chickenpox, etc.)? List at least three ways to stay safe.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

**Conclusions:** Read and answer the problem for this laboratory investigation. How quickly can a disease spread between people? How did the laboratory activity demonstrate this concept? Was your hypothesis correct or incorrect? Use specific examples from the lab. In what way(s) is our lab different in reference to the means of transmission (fluid)? Can other diseases be spread in different ways? Write your answer in complete sentences.