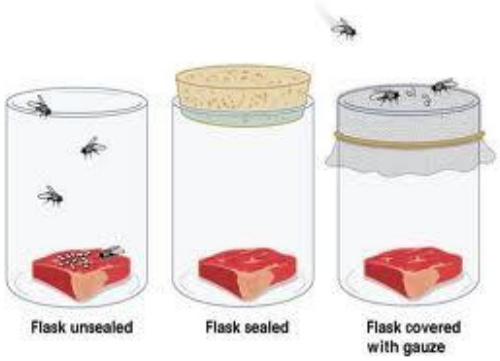
Name: _____ Date: _____ Period: ____

Redi's Experiment and Needham's Rebuttal

In 1668, Francesco Redi, an Italian scientist, designed a scientific experiment to test the spontaneous creation of maggots by placing fresh meat in each of two different jars. One jar was left open; the other was covered with a cloth. Days later, the open jar contained maggots, whereas the covered jar contained no maggots. He did note that maggots were found on the exterior surface of the cloth that covered the jar. Redi successfully demonstrated that the maggots came from fly eggs and thereby helped to disprove spontaneous generation. Or so he thought.

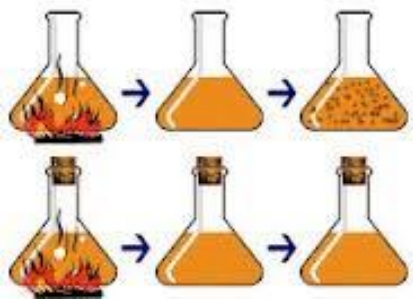


In England, John Needham challenged Redi's findings by conducting an experiment in which he placed a broth, or "gravy," into a bottle, heated the bottle to kill anything inside, then sealed it. Days later, he reported the presence of life in the broth and announced that life had been created from nonlife. In actuality, he did not heat it long enough to kill all the microbes.

	Name Redi's experiment. _____
Hypothesis	
Independent Variable (IV)	
Dependent Variable (DV)	
Describe the Control Group	
Constants	

Spallanzani's Experiment

Lazzaro Spallanzani, also an Italian scientist, reviewed both Redi's and Needham's data and experimental design and concluded that perhaps Needham's heating of the bottle did not kill everything inside. He constructed his own experiment by placing broth in each of two separate bottles, boiling the broth in both bottles, then sealing one bottle and leaving the other open. Days later, the unsealed bottle was teeming with small living things that he could observe more clearly with the newly invented microscope. The sealed bottle showed no signs of life.



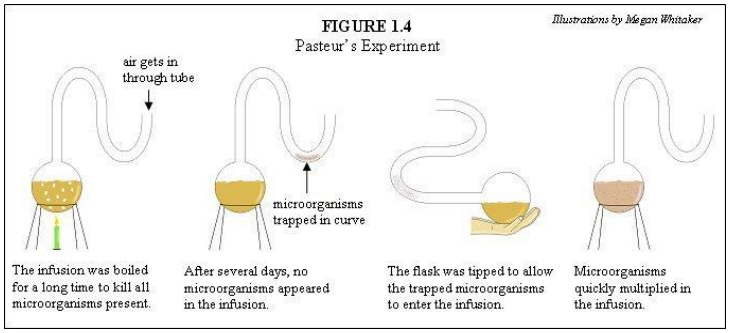
This certainly excluded spontaneous generation as a viable theory. However, it was noted by scientists of the day that Spallanzani had deprived the closed bottle of air, and it was thought that air was necessary for spontaneous generation. So although his experiment was successful, a strong rebuttal blunted his claims.

	Name Spallanzani's experiment.: _____
Hypothesis	
Independent Variable (IV)	
Dependent Variable (DV)	
Describe the Control Group	
Constants	

Name: _____ Date: _____ Period: ____

Pasteur's Experiment

Louis Pasteur, the notable French scientist, accepted the challenge to re-create the experiment and leave the system open to air. He subsequently designed several bottles with S-curved necks that were oriented downward so gravity would prevent access by airborne foreign materials. He placed a nutrient-enriched broth in one of the goose-neck bottles, boiled the broth inside the bottle, and observed no life in the jar for one year. He then tipped the bottle, exposing it more directly to the air and to the trap, and noted life-forms in the broth within days.



He noted that as long as dust and other airborne particles were trapped in the S-shaped neck of the bottle, no life was created until this obstacle was removed. He reasoned that the contamination came from life-forms in the air. Pasteur finally convinced the learned world that even if exposed to air, life did not arise from nonlife. **Pasteurization** originally was the process of heating foodstuffs to kill harmful microorganisms before human consumption; now ultraviolet light, steam, pressure, and other methods are available to purify foods—in the name of Pasteur.

	Name Pasteur's experiment. _____
Hypothesis	
Independent Variable (IV)	
Dependent Variable (DV)	
Describe the Control Group	
Constants	

<<OVER>>

1. What fundamental question are these three experiments designed to address?

2. Why were the three experiments presented to you in the order Redi, Spallanzani, and then Pasteur?

3. Why was Redi's experiment considered inconclusive and incomplete?

4. What criticism arose regarding Spallanzani's experiment?

5. What was the genius of Pasteur's experiment?

6. What are the three characteristics of a valid scientific hypothesis?

    a.

    b.

    c.

7. What term is often applied to the variable that the scientist is manipulating?

8. What term is often applied to the variable that the scientist records while conducting the experiment?

9. Label the x and y axes on the graph below. Indicate where you would expect to find the independent and dependent variables?

10. Name several elements included in a well-written conclusion.