

Name: _____

Class: _____

The Early Experiments To Characterize the Atom

Learn about **who**, **how**, and **when** performed experiments that determined a model of the atom that we use today.

- Go to the websites noted below and read about the experiments and the people who performed them. Also, use our class website to download additional information
- Answer the questions regarding these experiments
- **ENJOY**

The Cathode Ray Tube Experiment:

http://www.wwnorton.com/college/chemistry/gilbert2/tutorials/interface.asp?chapter=chapter_02&folder=cathode_ray

The Gold Foil Experiment:

http://www.wwnorton.com/college/chemistry/gilbert2/tutorials/interface.asp?chapter=chapter_02&folder=rutherford_experiment

The Oil Drop Experiment

http://www.wwnorton.com/college/chemistry/gilbert2/tutorials/interface.asp?chapter=chapter_02&folder=millikan

The Cathode Ray Tube Experiment

1. Who conducted investigations into "the nature of matter" in the late 19th century and what instrument did he use?
2. In everyday life, where could your parents use this instrument?
3. What does this instrument consist of? Draw a labeled diagram showing all the important parts
4. Describe in as much detail as you can, how is a cathode ray created and how is it made visible to a naked eye?

5. What happens to the cathode ray when the magnets are moved closer to it? Which pole of the magnet repels the cathode ray? What did this discovery suggested?

6. What else, beside the magnetic field, affected the cathode ray path? What did Thomson concluded based on this phenomenon?

7. Combining the phenomena of bending the cathode ray by the magnetic field and the electric current, what did Thomson do and what did he determine?

8. What is a formula for mass-to-charge ratio? What was the mass-to-charge ratio relative to the hydrogen ion?

9. What did this suggest to Thomson?

10. Answer QUESTION 1:

11. Answer QUESTION 2:

12. What did this experiment demonstrated and established?

13. Why do you think the cathode ray is under vacuum?

14. How did scientists demonstrate that electrons are found in ALL elements?

Download a PowerPoint presentation from the class website and learn about the "plum pudding" model of an atom. You will need this for the next part of this worksheet.

The Gold Foil Experiment

1. Who suggested the "plum pudding" model of an atom? Draw and describe it.

2. Who and when tested the plum pudding model of an atom? What is the nickname of this experiment?

3. What is the charge of alpha particles?

4. What was the set-up of the experiment and what was the expected result?

5. Draw the experimental set up for this experiment, labelling all important parts of it.

4. If the two plates were NOT charged, what was the rate of the falling of the oil droplets of the same size and different charge?

5. If the two plates were charged,
 - a) What was the rate of the falling of the oil droplets of the same size and different charge?

 - b) What forces are acting on the droplets? Draw a free body diagram for the oil droplet. What was the overall movement of the droplet?

6. How can you calculate the velocity of the droplet? Give a formula and describe all the quantities in it

7. Upon analysis, what did Millikan find out with regards to the differences between velocities of the drops of the same masses? How was the velocity related to charge?

8. So, if the velocities of the droplets are multiples of a discrete amount, then.....

9. Answer QUESTION 1:

10. Answer QUESTION 2:

11. What is the Millikan's contribution to the characterization of the current model of the atom? What is the percentage error between his experimental value (for the charge) and the "current" value?