



## Half-Life of Pennium Activity



**Purpose:** To simulate the transformation of a radioactive isotope over time and to graph the data and relate it to radioactive decay and half-lives. Time will be analogous to trials for our experiment.

### Pre-Lab Questions:

1. What are the three main forces that exist in the nucleus of an atom? Which is/are repulsive and which is/are attractive?
2. Why do atoms go through radioactive decay? (Why are nuclei unstable?)
3. What is half-life?

### Materials:

- 100 pennies (or M&Ms)
- cup
- graph paper
- 100 paper clips

### Procedure:

Pour 100 pennies from your cup onto the lab table. In your grid, record the total number of heads that result. These heads represent pennies that have decayed into daughter atoms. Place all of the "tails" pennies back in the cup, and replace the "heads" pennies (pennium decayed isotopes) with the same number of paper clips (Clipium daughter isotopes).<sup>1</sup> Pour the "tails" pennies and clips from your cup onto the lab table. Record the total number of heads that result. Continue this procedure until you obtain no more tails. (% pennies remaining should go from 100% to 0%. It may require more or less than 7 trials)

Trial #	Number of pennies	Number of heads	% pennies remaining
1	100	0	100%
2			
3			
4			
5			
6			
7			

### Analysis:

1. Use graph paper to plot the % pennies remaining (y-axis) versus the trial number (x-axis). Draw a smooth line or curve through the points.
2. Examine your graph. Is the rate of the number of heads produced over time linear or nonlinear? Is the rate constant over time or does it vary over time?
3. With another color pen, draw the % pennies that *are predicted* to remain after each half-life on your same graph.
4. A half-life is the time required for one-half of the atoms of a radioisotope to emit radiation and to decay to products. For the process of flipping pennies, what do the "heads" pennies and "tails" pennies represent respectively?

<sup>1</sup> In a sample the atoms don't leave a sample leaving space behind, they change into something else. Just as you saw with your alpha, beta decays.

# Half Life Of Pennyium Activity Answers

**Lei Shi**



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## **Table of Contents Half Life Of Pennyium Activity Answers**

1. Understanding the eBook Half Life Of Pennyium Activity Answers
  - The Rise of Digital Reading Half Life Of Pennyium Activity Answers
  - Advantages of eBooks Over Traditional Books
2. Identifying Half Life Of Pennyium Activity Answers
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Half Life Of Pennyium Activity Answers
  - User-Friendly Interface
4. Exploring eBook Recommendations from Half Life Of Pennyium Activity Answers

- Personalized Recommendations
  - Half Life Of Pennyium Activity Answers User Reviews and Ratings
  - Half Life Of Pennyium Activity Answers and Bestseller Lists
5. Accessing Half Life Of Pennyium Activity Answers Free and Paid eBooks
    - Half Life Of Pennyium Activity Answers Public Domain eBooks
    - Half Life Of Pennyium Activity Answers eBook Subscription Services
    - Half Life Of Pennyium Activity Answers Budget-Friendly Options
  6. Navigating Half Life Of Pennyium Activity Answers eBook Formats
    - ePub, PDF, MOBI, and More
    - Half Life Of Pennyium Activity Answers Compatibility with Devices
    - Half Life Of Pennyium Activity Answers Enhanced eBook Features
  7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Half Life Of Pennyium Activity Answers
    - Highlighting and Note-Taking Half Life Of Pennyium Activity Answers
    - Interactive Elements Half Life Of Pennyium Activity Answers
  8. Staying Engaged with Half Life Of Pennyium Activity Answers
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Half Life Of Pennyium Activity Answers
  9. Balancing eBooks and Physical Books Half Life Of Pennyium Activity Answers
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Half Life Of Pennyium Activity Answers
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Half Life Of Pennyium Activity Answers
    - Setting Reading Goals Half Life Of Pennyium Activity Answers
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Half Life Of Pennyium Activity Answers

- Fact-Checking eBook Content of Half Life Of Pennyium Activity Answers
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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