

NUCLEAR CHEMISTRY

PRACTICE EXERCISES

1. Given: Iodine-131

$$t_{1/2} = 8 \text{ days}$$

$$N_0 = 12.0 \text{ g}$$

$$t = 32.0 \text{ days}$$

Req'd: N_t

Solution: First, solve for k - radioactive decay constant

$$t_{1/2} = \frac{0.693}{k}$$

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{8 \text{ days}}$$

$$k = 0.0866 \text{ day}^{-1} \text{ or } 0.0866 / \text{day}$$

Then, solve for N_t :

$$\ln \frac{N_t}{N_0} = -kt$$

* use natural log or ln Properties

$$e^{\ln(x)} = x$$

$$e^{\ln \frac{N_t}{N_0}} = e^{-kt}$$

$$\frac{N_t}{N_0} = e^{-kt}$$

$$N_t = N_0(e^{-kt}) = 12.0 \text{ g} [e^{-(0.0866/\text{day})(32.0 \text{ days})}]$$

$$N_t = 0.7510 \text{ g} \text{ will remain after 32 days}$$

2. Given: Strontium-90

$$N_0 = 1.00 \text{ g}$$

$$N_t = 0.953 \text{ g}$$

$$t = 2.0 \text{ years}$$

Req'd: a) $t_{1/2}$, half-life

b) N_t after $t = 5.0 \text{ yr}$

Solution:

a) First, solve for k

$$\ln \frac{N_t}{N_0} = -kt$$

$$\ln \frac{0.953 \text{ g}}{1.0 \text{ g}} = -k(2 \text{ yr})$$

$$k = 0.0241 \text{ yr}^{-1} \text{ or } 0.0241 / \text{yr}$$

Then, solve for $t_{1/2}$

$$t_{1/2} = \frac{0.693}{k} = \frac{0.693}{0.0241 \text{ yr}^{-1}}$$

$$t_{1/2} = 28.7552 \text{ yr} \text{ half-life}$$

$$b) \ln \frac{N_t}{N_0} = -kt$$

↓

$$e^{\ln \frac{N_t}{N_0}} = e^{-kt}$$

$$\frac{N_t}{N_0} = e^{-kt}$$

$$N_t = N_0 e^{-kt} = (1.00 \text{ g})(e^{-(0.0241/\text{yr})(5 \text{ yr})})$$

$$N_t = 0.8869 \text{ g} \text{ will remain after 5 yrs.}$$

Notes On Nuclear Chemistry Solved Problems

Patrick Vollmar



Notes On Nuclear Chemistry Solved Problems:

The Top Books of the Year Notes On Nuclear Chemistry Solved Problems The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous captivating novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the engaging narratives that have captivated audiences this year. Notes On Nuclear Chemistry Solved Problems : Colleen Hoover "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover masterfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can prevail. Notes On Nuclear Chemistry Solved Problems : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids compelling storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, captivating readers with its evocative prose and mesmerizing setting. These popular novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a masterful and gripping novel that will keep you speculating until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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Table of Contents Notes On Nuclear Chemistry Solved Problems

1. Understanding the eBook Notes On Nuclear Chemistry Solved Problems
 - The Rise of Digital Reading Notes On Nuclear Chemistry Solved Problems
 - Advantages of eBooks Over Traditional Books
2. Identifying Notes On Nuclear Chemistry Solved Problems
 - 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 Notes On Nuclear Chemistry Solved Problems
 - User-Friendly Interface
4. Exploring eBook Recommendations from Notes On Nuclear Chemistry Solved Problems
 - Personalized Recommendations
 - Notes On Nuclear Chemistry Solved Problems User Reviews and Ratings
 - Notes On Nuclear Chemistry Solved Problems and Bestseller Lists
5. Accessing Notes On Nuclear Chemistry Solved Problems Free and Paid eBooks
 - Notes On Nuclear Chemistry Solved Problems Public Domain eBooks
 - Notes On Nuclear Chemistry Solved Problems eBook Subscription Services
 - Notes On Nuclear Chemistry Solved Problems Budget-Friendly Options
6. Navigating Notes On Nuclear Chemistry Solved Problems eBook Formats
 - ePub, PDF, MOBI, and More
 - Notes On Nuclear Chemistry Solved Problems Compatibility with Devices
 - Notes On Nuclear Chemistry Solved Problems Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Notes On Nuclear Chemistry Solved Problems
 - Highlighting and Note-Taking Notes On Nuclear Chemistry Solved Problems
 - Interactive Elements Notes On Nuclear Chemistry Solved Problems
8. Staying Engaged with Notes On Nuclear Chemistry Solved Problems

- Joining Online Reading Communities
- Participating in Virtual Book Clubs
- Following Authors and Publishers Notes On Nuclear Chemistry Solved Problems
- 9. Balancing eBooks and Physical Books Notes On Nuclear Chemistry Solved Problems
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Notes On Nuclear Chemistry Solved Problems
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Notes On Nuclear Chemistry Solved Problems
 - Setting Reading Goals Notes On Nuclear Chemistry Solved Problems
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Notes On Nuclear Chemistry Solved Problems
 - Fact-Checking eBook Content of Notes On Nuclear Chemistry Solved Problems
 - 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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