

Worksheet- Nuclear Decay

Instructions: Fill in the table below and then use it to figure out what is happening during each type of decay- - alpha (α), beta (β), and gamma (γ)

Parent Isotope	Particle emitted	New, Daughter isotope	Alpha, Beta, or gamma Decay?	# of protons lost or gained by "parent"	Change in mass number
a. ${}_{88}^{226}\text{Ra}$	$\rightarrow {}_2^4\text{He} +$	${}_{86}^{222}\text{Rn}$	Alpha	Lost 2	minus 4
b. ${}_{84}^{214}\text{Po}$	$\rightarrow {}_2^4\text{He} +$	${}_{82}^{210}\text{Pb}$	Alpha	Lost 2	Minus 4
c. ${}_{20}^{47}\text{Ca}$	$\rightarrow {}_{-1}^0\text{e}^- +$	${}_{21}^{47}\text{Sc}$	Beta	Gained 1	None
d. ${}_{64}^{148}\text{Gd}$	$\rightarrow {}_2^4\text{He} +$	${}_{62}^{144}\text{Sm}$	Alpha	Lost 2	Minus 4
e. ${}_{6}^{14}\text{C}$	$\rightarrow {}_{-1}^0\text{e}^- +$	${}_{7}^{14}\text{N}$	Beta	Gained 1	None
f. ${}_{64}^{148}\text{Gd}$	$\rightarrow {}_0^0\gamma +$	${}_{64}^{148}\text{Gd}$	Gamma	None	None

2. What changes take place in the nucleus when an alpha particle is emitted?

2 Protons and 2 Neutrons are lost.

3. What is the identity of an alpha particle?

Helium Nucleus

4. What changes take place in the nucleus when a beta particle is emitted?

Neutron is broken into electron and proton. Proton kept and electron released.

5. Which particle is associated with beta decay?

Electron

6. Fill in the missing parts of these nuclear reactions: (numbers & elements)

a) ${}_{19}^{40}\text{K} \rightarrow {}_{-1}^0\text{e}^- + {}_{20}^{40}\text{Ca}$	b) ${}_{90}^{230}\text{Th} \rightarrow {}_2^4\text{He} + {}_{88}^{226}\text{Ra}$	c) ${}_{14}^{35}\text{Si} \rightarrow {}_{-1}^0\text{e}^- + {}_{15}^{35}\text{P}$
d) ${}_{92}^{238}\text{U} \rightarrow {}_2^4\text{He} + {}_{90}^{234}\text{Th}$	e) ${}_{53}^{110}\text{I} \rightarrow {}_2^4\text{He} + {}_{51}^{106}\text{Sb} + {}_0^0\gamma$	f) ${}_{56}^{140}\text{Ba} \rightarrow {}_{-1}^0\text{e}^- + {}_{57}^{140}\text{La}$

7. Write equations for: a) The alpha (α) decay of radon- 198



b) The beta (β) decay of uranium-237



c) Plutonium- 244 undergoes gamma decay



9. Does the identity of an atom change during radioactive decay? Why or why not?

For alpha and beta decay it does because the proton number changes.

During gamma, there is no change of identity, just energy.

10. How does the "Law of Conservation of Matter" explain how you write nuclear equations?

The Law of Conservation of Matter states that matter cannot be created or destroyed. This is why the mass numbers and atomic numbers of the products must add up to equal the mass number and atomic number of the parent isotope.

11. List the 3 types of radiation (α, β, γ) in order from least penetrating to most penetrating.

Alpha= least

Beta= middle

Gamma= mos

12. Why would you expect alpha particles to be less able to penetrate materials than beta?

The alpha particle is the largest of the three decay particles, so it will not be able to pass through materials as easily.

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Table of Contents Chapter 25 Nuclear Chemistry Worksheet Answers

1. Understanding the eBook Chapter 25 Nuclear Chemistry Worksheet Answers
 - The Rise of Digital Reading Chapter 25 Nuclear Chemistry Worksheet Answers
 - Advantages of eBooks Over Traditional Books
2. Identifying Chapter 25 Nuclear Chemistry Worksheet 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 Chapter 25 Nuclear Chemistry Worksheet Answers
 - User-Friendly Interface
4. Exploring eBook Recommendations from Chapter 25 Nuclear Chemistry Worksheet Answers
 - Personalized Recommendations

- Chapter 25 Nuclear Chemistry Worksheet Answers User Reviews and Ratings
- Chapter 25 Nuclear Chemistry Worksheet Answers and Bestseller Lists
- 5. Accessing Chapter 25 Nuclear Chemistry Worksheet Answers Free and Paid eBooks
 - Chapter 25 Nuclear Chemistry Worksheet Answers Public Domain eBooks
 - Chapter 25 Nuclear Chemistry Worksheet Answers eBook Subscription Services
 - Chapter 25 Nuclear Chemistry Worksheet Answers Budget-Friendly Options
- 6. Navigating Chapter 25 Nuclear Chemistry Worksheet Answers eBook Formats
 - ePub, PDF, MOBI, and More
 - Chapter 25 Nuclear Chemistry Worksheet Answers Compatibility with Devices
 - Chapter 25 Nuclear Chemistry Worksheet Answers Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Chapter 25 Nuclear Chemistry Worksheet Answers
 - Highlighting and Note-Taking Chapter 25 Nuclear Chemistry Worksheet Answers
 - Interactive Elements Chapter 25 Nuclear Chemistry Worksheet Answers
- 8. Staying Engaged with Chapter 25 Nuclear Chemistry Worksheet Answers
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Chapter 25 Nuclear Chemistry Worksheet Answers
- 9. Balancing eBooks and Physical Books Chapter 25 Nuclear Chemistry Worksheet Answers
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Chapter 25 Nuclear Chemistry Worksheet Answers
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Chapter 25 Nuclear Chemistry Worksheet Answers
 - Setting Reading Goals Chapter 25 Nuclear Chemistry Worksheet Answers
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Chapter 25 Nuclear Chemistry Worksheet Answers
 - Fact-Checking eBook Content of Chapter 25 Nuclear Chemistry Worksheet 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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