

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.

Chapter 25 Nuclear Chemistry Worksheet Answers

Terry C. Jones



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