

Lesson 167: Nuclear Decay **ANSWERS**

Chemistry with Lab

- Fill in the table below and then use it to figure out what is happening during each type of decay – alpha, beta, and gamma.

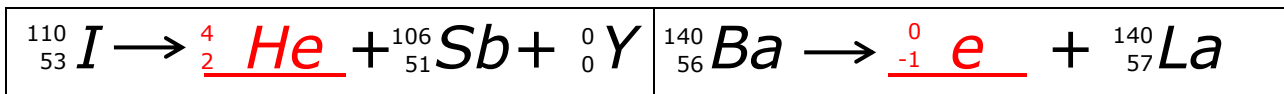
Parent Isotope	Particle Emitted	New, Daughter Isotope	Alpha, Beta, or Gamma Decay?	# of protons lost or gained by "parent"	Change in mass number
$^{226}_{88}\text{Ra} \rightarrow$	$^4_2\text{He} +$	$^{222}_{86}\text{Rn}$	Alpha	Lost 2	Minus 4
$^{214}_{84}\text{Po} \rightarrow$	$^4_2\text{He} +$	$^{210}_{82}\text{Pb}$	Alpha	Lost 2	Minus 4
$^{47}_{20}\text{Ca} \rightarrow$	$^0_{-1}\text{e}^- +$	$^{47}_{21}\text{Sc}$	Beta	Gained 1	None
$^{148}_{64}\text{Ra} \rightarrow$	$^4_2\text{He} +$	$^{144}_{62}\text{Sm}$	Alpha	Lost 2	Minus 4
$^{14}_6\text{C} \rightarrow$	$^0_{-1}\text{e}^- +$	$^{14}_7\text{N}$	Beta	Gained 1	None
$^{148}_{64}\text{Gd} \rightarrow$	$^0_0\gamma +$	$^{148}_{64}\text{Gd}$	Gamma	None	None

- What changes take place in the nucleus when an alpha particle is emitted?
2 protons and 2 neutrons are lost.
- What is the identity of an alpha particle?
Helium nucleus
- 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.
- Which particle is associated with beta decay?
Electron
- Fill in the missing numbers and elements from these nuclear reactions:

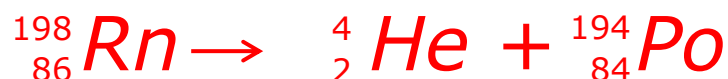
$^{40}_{19}\underline{\text{K}} \rightarrow$	$^0_{-1}\text{e}^- +$	$^{40}_{20}\text{Ca}$	$^{230}_{90}\underline{\text{Th}} \rightarrow$	$^4_2\text{He} +$	$^{226}_{88}\text{Ra}$
$^{35}_{14}\text{Si} \rightarrow$	$^0_{-1}\text{e}^- +$	$^{35}_{15}\underline{\text{P}}$	$^{238}_{92}\text{U} \rightarrow$	$^4_2\text{He} +$	$^{234}_{90}\underline{\text{Th}}$

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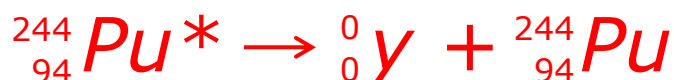
7. a) Show the alpha decay of radon-198



b) Show the beta decay of uranium-237



8. Plutonium-244 undergoes gamma decay. What are the products of this reaction?



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. List the 3 types of radiation (alpha, beta, gamma) in order from least penetrating to most penetrating.

Alpha – least; Beta – middle; Gamma - most

11. What is the difference between nuclear fusion and nuclear fission?

Fission splits a heavy element (with a high atomic mass number) into fragments; while fusion joins two light elements (with a low atomic mass number), forming a heavier element.