Lesson 167: Nuclear Decay

Chemistry with Lab

1. 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
$^{226}_{88}Ra \longrightarrow {}^{4}_{2}He + {}^{222}_{86}Rn$			*Alpha*	*Lost 2*	*Minus 4*
$^{214}_{84}Po \longrightarrow {}^{4}_{2}He + {}^{210}_{82}Pb$					
$^{47}_{20}Ca \longrightarrow {}^{0}_{-1}e^{-} + {}^{47}_{21}Sc$					
$^{148}_{64}Ra \longrightarrow {}^{4}_{2}He + {}^{144}_{62}Sm$					
$^{14}_{6}C \longrightarrow {}^{0}_{-1}e^{-} + {}^{14}_{7}N$					
$^{148}_{64}Gd \longrightarrow {}^{0}_{0}Y + {}^{148}_{64}Gd$					

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

3. What is the identity of an alpha particle?

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

5. Which particle is associated with beta decay?

6. Fill in the missing numbers and elements from these nuclear reactions:

$^{40}\_\_\_\_\_ \longrightarrow {}^{0}_{-1}e + {}^{40}_{20}Ca$	$\_\_\_\_\_ \longrightarrow {}^{4}_{2}He + {}^{226}_{88}Ra$
$^{35}_{14}Si \longrightarrow {}^{0}_{-1}e + \_\_\_\_\_$	$^{238}_{92}U \longrightarrow + {}^{4}_{2}He + \_\_\_\_\_$

$^{110}_{53}I \rightarrow$ _____ $+ ^{106}_{51}Sb + ^{0}_{0}Y$	$^{140}_{56}Ba \rightarrow$ _____ $+ ^{140}_{57}La$

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?

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

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