Marine Science "radioactivity & age dating" Name_____per___

Radioactive atoms: atoms with an unstable nucleus that will eventually emit a particle and some energy. The original radioactive atom is the "parent isotope" and the product of decay is the "daughter isotope."

Half-life: the amount of time it takes for one half of a sample of a radioactive substance to decay to the daughter isotope. The time may be in years (y) or days (d) or hours (h) or seconds (s).

atomic components:	symbol	name	mass	charge	location
	p^+	proton	1	+	nucleus
	n^0	neutron	1	none	nucleus
	e^-	electron	.0005	-	outside the nucleus

particles or energy emitted from a radioactive atom:	symbol	name	mass	charge	
	α	alpha particle	4	++	(stopped by sheets of paper)
	β	beta particle	.0005	-	(stopped by .1 in. of lead)
	β^+	positron	.0005	+	(stopped by .1 in. of lead)
	γ	gamma radiation	none	none	(like x-rays, it is dangerous)

Decay Problems: example:

$^{50}Sn_{120}$ ------α------> $^{48}Cd_{116}$

note:		
α emission	a. lose 2 protons	
	b. lose 4 units of mass	
β emission	a. gain 1 proton	
	b. mass stays the same	
β^+ emission	a. lose 1 proton	
	b. mass stays the same	
γ emission	a. no gain or loss	

1. $^{95}Am_{243}$ ------α------>
2. $^{57}La_{140}$ ------β------>
3. $^{27}Co_{56}$ ------β------>
4. $^{38}Sr_{90}$ ------β^+------>
5. $^{44}Ru_{103}$ ------β------>
6. $^{53}I_{128}$ ------β------->
7. $^{6}C_{14}$ ------β------->
8. $^{62}Sm_{148}$ ------β^+------->
9. $^{58}Ce_{144}$ ------β------->
10. $^{57}La_{136}$ ------β------->
11. $^{19}K_{40}$ ------β^+------->

Radioactive Dating & Half Lives:

The age of a material can be determined if the ratio of parent isotope to daughter isotope can be measured. The assumption is that there was no daughter isotope to begin with and that daughter isotope formed did not escape.

AGE = (#half lives past) x (the half life of the element)

Given: the half-life of $^{6}C_{14}$ (also C-14) is 5600 years.

the half-life of $^{19}K_{40}$ (also K-40) is 1.3 x 10^9 years (1300000000).

PROBLEMS:

1) How long would it take for a 100g sample of $^{6}C_{14}$ to decay so that there were 25 g of $^{6}C_{14}$ and 75 g of $^{7}N_{14}$? Show your work!:

2) A 100 g sample of $^{19}K_{40}$ decays through 4 half lives...how much $^{19}K_{40}$ is still left? Show your work!: