

## Chapter 13 HW Answers

### Review Questions:

1. **Gamma rays** have the greatest penetrating power.
6. The electric force is balanced by the inward pull of the nuclear force.
12. Alpha particle emitted: atomic number is decreased by 2  
Beta particle is emitted: atomic number is increased by 1

### Exercises:

2. No. A regular hydrogen atom only has 1 proton, so it could not emit an alpha particle.
5. The opposite charges of alpha and beta particles interact oppositely with the magnetic field. Gamma rays have no charge, so they do not interact with a magnetic field.
10. Atomic Mass = 261  
Element = Rf
12. bismuth-213 =  $^{213}_{83}\text{Bi}$   
  
Alpha particle emitted  $\rightarrow$  result is  $^{211}_{81}\text{Tl}$  (Thallium)  
  
Beta particle emitted  $\rightarrow$  result is  $^{213}_{84}\text{Po}$  (Polonium)
13. Atomic number = 86  
Atomic mass = 222
14. Decay of  $^{218}_{84}\text{Po}$   
  
Beta particle emitted  $\rightarrow$   $^{218}_{85}\text{At}$  (Astatine)      Atomic mass = 210  
  
Alpha particle emitted  $\rightarrow$   $^{216}_{82}\text{Pb}$  (Lead)      Atomic Mass = 207.2
37. What does  $^{232}_{90}\text{Th}$  become?
  - a) Absorbs a neutron  $\rightarrow$   $^{233}_{90}\text{Th}$
  - b) Undergoes 2 beta decays  $\rightarrow$   $^{233}_{92}\text{U}$

### Problems:

1. half-life = 30 years	<u>Number of years</u>	<u>Fraction remaining</u>
	30 years	1/2
	60 years	1/4
	90 years	1/8
	<b>120 years</b>	<b>1/16</b>

2.	<u>time</u>	<u>grams remaining</u>
	12:00	1
	1:00 p.m.	0.5
	2:00 p.m.	0.25
	<b>3:00 p.m.</b>	<b>0.125</b>
	4:00 p.m.	0.0625
	5:00 p.m.	0.03125
	<b>6:00 p.m.</b>	<b>0.015625</b>
	7:00 p.m.	0.0078125
	8:00 p.m.	0.0039063
	9:00 p.m.	0.0019531
	<b>10:00 p.m.</b>	<b>0.0009766</b>

Additional:

- 1a. **Potassium-40**  
**Radon**
- 1b. **Bananas**  
**Carrots**  
**White potatoes**

2. New Isotope

- a.  ${}_{83}\text{Bi}$
- b.  ${}_{102}\text{No}$
- c.  ${}_{85}\text{At}$
- d.  ${}_{39}\text{Y}$
- e.  ${}_{47}\text{Ag}$
- f.  ${}_{83}\text{Bi}$
- g.  ${}_{92}\text{U}$