Atomic Physics | Review Guide Name: _____ Period: ___

Radioactive Decay

The following nuclides were all formed during atomic weapons testing. State the number of neutrons, protons and electrons, and nucleons in the atoms of these nuclides:

	# of Protons	# of Neutrons	# of Electrons	# of Nucleons
$53129I$				
$55137Cs$				
$3890Sr$				

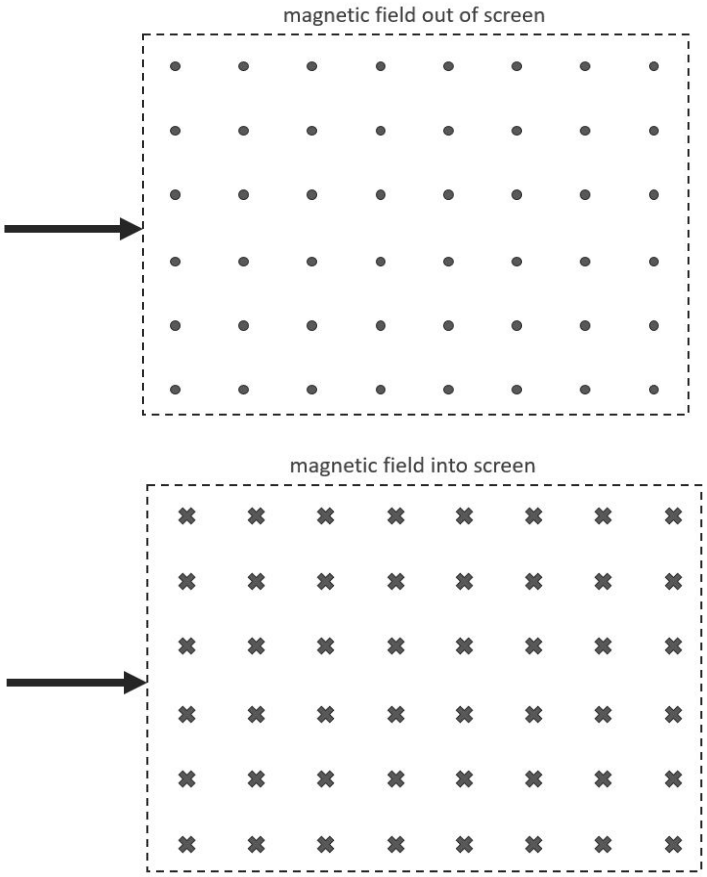
Complete the following nuclear equation and the name the decay process involved

	Type of Decay
$53131I \rightarrow \quad Xe + -10e + \overline{\nu}_e$	
$95241Am \rightarrow \quad Np + 24He$	

Write out the alpha decay formula for Thorium-234 $(90234Th)$ into Radium (Ra)

Write out the beta-negative decay formula for Potassium-42 $(1942K)$ into Calcium (Ca)

Draw the path for alpha, beta, and gamma particles when they travel through a magnetic field



Half Life

The half-life of francium-221 is 4.8 minutes. Calculate the percent of pure francium-221 remaining undecayed after a time of 14.4 minutes

After 24.0 days, 2.00 milligrams of an original 128.0 milligram sample remain. What is the half-life of the sample?

Energy and Mass Defects

An atom loses a mass of 2.2×10^{-30} kg after a nuclear reaction. Determine the energy obtained in joules due to this loss of nuclear mass

The binding energy of a carbon-14 nucleus is 102 MeV. Calculate the binding energy per nucleon.

Nuclide	# of p	# of n	# of e	Atomic Mass
$2862Ni$				61.928348 u

Mass Defect	
Binding Energy	
Binding Energy per Nucleon	

Mass of Thorium-227	227.0280 u
Mass of Radium-223	223.0190 u
Mass of Helium-4	4.0026 u

Thorium-227 $(90227Th)$ decays by alpha emission to radium-223

Write a nuclear equation for this decay

Calculate the energy MeV released in this decay

Fission and Fusion

Know the difference between fission and fusion and what elements are most likely to undergo which process...

Subatomic Particles

Group and organize the following terms into a chart:

Baryon	Neutrino
Bottom	Neutron
Boson (Force Particle)	Photon
Charm	Pion
Down	Proton
Electron	Quark
Gluon	Strange
Hadron	Tau
Kaon	Top
Lepton	Up
Meson	W-Boson
Muon	Z-Boson

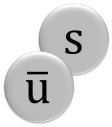
Charge	Quarks			Baryon number
$\frac{2}{3}e$	u	c	t	$\frac{1}{3}$
$-\frac{1}{3}e$	d	s	b	$\frac{1}{3}$
All quarks have a strangeness number of 0 except the strange quark that has a strangeness number of −1				

Charge	Leptons		
−1	e	μ	τ
0	υ_e	υ_μ	υ_τ
All leptons have a lepton number of 1 and antileptons have a lepton number of −1			

Using the tables from the data booklet (above) complete the tables below:

Symbol	Name	Charge	Baryon #
u			
$\overline{c}$			
s			
$\overline{s}$			

Symbol	Name	Charge	Lepton #
e^-			
e^+			
ν_e			
$\overline{\nu}_e$			

Hadron Name	Lambda	Kaon	Sigma	Proton	Neutron
Baryon or Meson	Baryon				
Quarks					
Charge				+1	0

Which of these does not satisfy the law of conservation?

$p \rightarrow n + e^{+} + \nu_e$ $\qquad$ $n + p \rightarrow e^{+} + \bar{\nu}_e$ $\qquad$ $n \rightarrow p + e^{-} + e^{+}$

Draw a Feynman diagram representing an electron and positron annihilating to form a photon: