ATOMIC TRANSITIONS IN THE NATURAL RADIOACTIVE DECAY SERIES

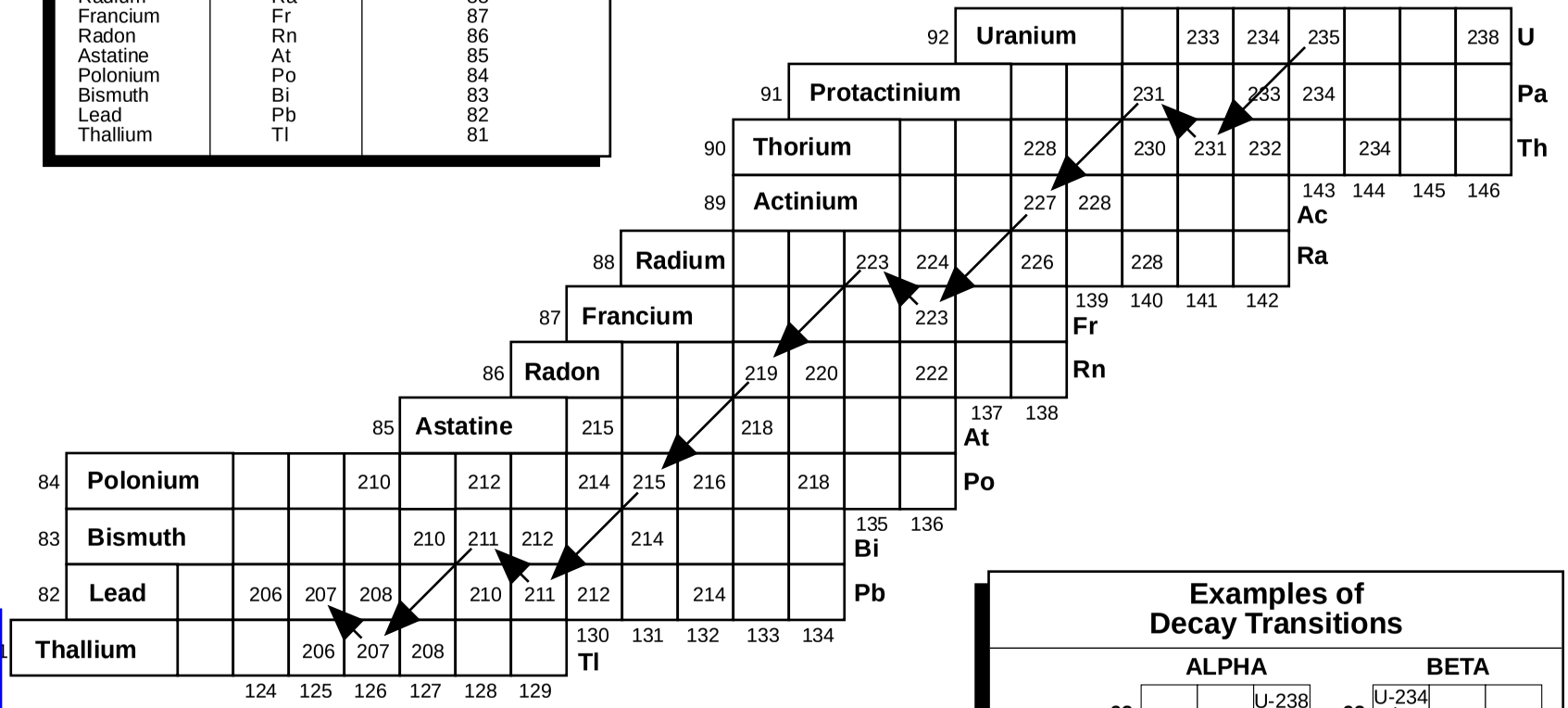
Thorium-232			Uranium-235			Uranium-238		
Number of Protons in Nucleus (Atomic Number)	**Isotope**	**Decay**	**Number of Protons in Nucleus (Atomic Number)**	**Isotope**	**Decay**	**Number of Protons in Nucleus (Atomic Number)**	**Isotope**	**Decay**
90	Th-232	Alpha	92	U-235	Alpha	92	U-238	Alpha
88	Ra-228	Beta	90	Th-231	Beta	*90*	*Th-234*	*Beta*
89	Ac-228	Beta	91	Pa-231	Alpha	*91*	*Pa-234*	*Beta*
90	Th-228	Alpha	89	Ac-227	Alpha	*92*	*U-234*	*Alpha*
88	Ra-224	Alpha	87	Fr-223	Beta	*90*	*Th-230*	*Alpha*
86	Rn-220	Alpha	88	Ra-223	Alpha	*88*	*Ra-226*	*Alpha*
84	Po-216	Alpha	86	Rn-219	Alpha	*86*	*Rn-222*	*Alpha*
82	Pb-212	Beta	84	Po-215	Alpha	*84*	*Po-218*	*Alpha*
83	Bi-212	{ 33.7% Alpha	82	Pb-211	Beta	*82*	*Pb-214*	*Beta*
		{ 66.3% Beta	83	Bi-211	Alpha	*83*	*Bi-214*	*Beta*
84	Po-212	Alpha	81	Tl-207	Beta	*84*	*Po-214*	*Alpha*
81	Tl-208	Beta	82	Pb-207	Stable	*82*	*Pb-210*	*Beta*
82	Pb-208	Stable				*83*	*Bi-210*	*Beta*
						84	*Po-210*	*Alpha*
						82	Pb-206	Stable

Previous Section
Table of Contents
Next Section

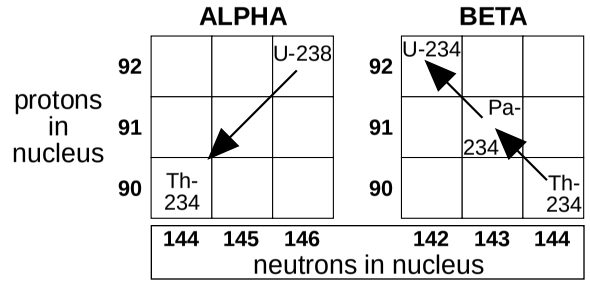
CHART OF THE ISOTOPES IN THE U-238, U-235, and Th-232 DECAY SERIES ANSWERS

Element	Symbol	Number of Protons in Nucleus (Atomic Number)
Uranium	U	92
Protactinium	Pa	91
Thorium	Th	90
Actinium	Ac	89
Radium	Ra	88
Francium	Fr	87
Radon	Rn	86
Astatine	At	85
Polonium	Po	84
Bismuth	Bi	83
Lead	Pb	82
Thallium	Tl	81

Uranium-235 Series



Examples of Decay Transitions



INTRODUCTION

Radiation

Radiation is perhaps easiest to understand when you remember that it is energy moving through space in the form of waves and particles. Radiation is everywhere — in, around, and above the world we live in. We could think of it as a natural energy force that surrounds us. We are generally not very aware of it until we are reminded of it by someone or something, like a reflector on a bicycle, a full moon, or listening to a favorite radio program.

Types of Radiation

Depending on how much energy it has, radiation can be described as either *non-ionizing* (low energy) or *ionizing* (high energy).

Non-Ionizing Radiation

All our lives, perhaps without knowing it, we have reaped the benefits associated with non-ionizing radiation. For example, radio and television waves provide news and entertainment in the home, microwaves ease some cooking tasks, the light from electric light bulbs takes away the night, and the ultraviolet light from grow lights brings an artificial sun indoors for our flowering plants. These are some forms of non-ionizing radiation.

Ionizing Radiation

High-energy ionizing radiation is called ionizing because it can knock electrons out of atoms and molecules, creating electrically charged particles called *ions*. Material that ionizing radiation passes through absorbs energy from the radiation mainly through this process of *ionization*.

Ionizing radiation can be used for many beneficial purposes, but it also can cause serious, negative health effects. That is why it is one of the most thoroughly studied subjects in modern science. Most of our attention in this section will be focused on ionizing radiation — what is it, where it comes from, and some of its properties.