Chapter 21: Nuclear Chemistry

21.1: The Nature of Nuclear Reactions

<u>Nucleons</u>: - the particles that make up a nucleus of an atom (protons, (!p" or !H) and neutrons, (!n)).

Isotopes: - atoms that have different mass number but the same atomic number or number of protons.

Nuclide: a particular atom or isotope containing specific numbers of protons and neutrons

Mass Number (# of p^* and #) $\longrightarrow A$ Element Symbol (based on Atomic #)

Radioactivity: - the particles and/or electromagnetic radiation that are emitted due to unstable nuclei.
- all elements having atomic number 84 (Polonium) and greater are radioactive.

Nuclear Transmutation: - a process where radioactivity is resulted from the bombardment of nuclei by neutrons, protons or other nuclei.

- in most cases, heavier elements are synthesized from lighter elements.

History of Radioactivity

- In 1896, Wilhelm Roentgen discovered X-ray by examining ray emitting from the outside of the
 cathode ray glass tube. It has the capability of passing through solid materials, but can be blocked by
 denser matters. It can also be exposed to photographic plate, resulting from an image of "seeing
 through" an container made of less dense material.
- In the same year, Antoine Becquerel discovered that uranium emits a ray onto a photographic plate in the absence of sunlight or other forms of energy.
- A few years later, <u>Marie and Pierre Curie</u> demonstrated that radiation can be emitted by other elements. They discovered two new elements (polonium and radium) based on their tendency to emit radiation (<u>radioactivity</u>).

Types of Radioactive Particle and Decay

Alpha Particle (α particle): - basically a helium nucleus (He), commonly found during radioactive decay from heavier nuclide (the net result is to increase the neutron to proton ratio – more explanation in the next section).

Example: 218 Po -> 214 Pb + 4 He

Beta Particle (β particle): - basically an electron ("e or "β) that is emitted when the neutron to proton ratio is higher than the zone of stability (a neutron is transformed to a proton and an electron as a result — more explanation in the next section).
 - electrons have a mass number of 0 and an atomic number assignment of -1, due to its charge.

Example: $^{214}_{62} Pb \rightarrow ^{214}_{63} Bi + ^{8}_{-1} e$ $(^{1}_{6} n \rightarrow ^{1}_{1} p + ^{8}_{-1} e)$

Chapter 21 Chemistry

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Chapter 21 Chemistry:

Chemistry Therald Moeller,2012-12-02 Chemistry with Inorganic Qualitative Analysis is a textbook that describes the application of the principles of equilibrium represented in qualitative analysis and the properties of ions arising from the reactions of the analysis This book reviews the chemistry of inorganic substances as the science of matter the units of measure used atoms atomic structure thermochemistry nuclear chemistry molecules and ions in action This text also describes the chemical bonds the representative elements the changes of state water and the hydrosphere which also covers water pollution and water purification Water purification occurs in nature through the usual water cycle and by the action of microorganisms The air flushes dissolved gases and volatile pollutants when water seeps through the soil it filters solids as they settle in the bottom of placid lakes Microorganisms break down large organic molecules containing mostly carbon hydrogen nitrogen oxygen sulfur or phosphorus into harmless molecules and ions This text notes that natural purification occurs if the level of contaminants is not so excessive This textbook is suitable for both chemistry teachers and students

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