

Name: _____

1. General Definitions:

- (a) Radioactive elements are those that undergo spontaneous nuclear decay.
- (b) Nucleons: the number of protons and neutrons in a nucleus.
- (c) Nuclide: the specific isotope of an element.
- (d) In a nuclear reaction: the makeup of a nucleus changes.
- (e) The half-life of a substance is the time required for half of a sample to decay.

2. Types of nuclear decay:

- (a) **Alpha emission:** loss of an $\frac{4}{2}\alpha$ (or $\frac{4}{2}\text{He}$) particle. ex: ${}_{92}^{238}\text{U} \rightarrow {}_2^4\text{He} + {}_{90}^{234}\text{Th}$
- (b) **Beta emission:** loss of a ${}_{-1}^0\beta$ particle. ex: ${}_{53}^{131}\text{I} \rightarrow {}_{54}^{131}\text{Xe} + {}_{-1}^0\beta$
- (c) **Gamma ray emission:** loss of a ${}^0_0\gamma$ ray. γ rays are high energy photons and have no mass - gamma ray emission accompanies other types of emission.
- (d) **Positron emission:** loss of a ${}_{+1}^0\beta$ (or ${}_{+1}^0\text{e}$) ex: ${}_{19}^{40}\text{K} \rightarrow {}_{18}^{40}\text{Ar} + {}_{+1}^0\beta$
- (e) **Electron capture:** an electron gets captured by the nucleus changing a proton into a neutron. ex: ${}_{80}^{197}\text{Hg} + {}_{-1}^0\beta \rightarrow {}_{79}^{197}\text{Au}$

3. Common uses for nuclear chemistry: irradiating food, radiation therapy, imaging, and energy production.

Chapter 11 textbook problems: 26, 28, 30, 38, 40, 44, 46, 48, 50, 52, 54, 56