Salt Lake Community College, Chemistry Department

Chem 1110 Workshop 12

Topic: Nuclear Chemistry

Objective:

- **To be able to write and balance equations for nuclear reactions**
- **To understand and be able to list the characteristics of the three common kinds of nuclear radiation**
- **To be able to explain half-life and calculate quantity of radioisotope remaining after a given number of half-lives**

Practice Problems:

1. The emission of a particle from an unstable nucleus is called _____.

2. The change of element into another by the process of nuclear decay is called _____.

3. The term nucleon refers to_____.

4. Radioactivity is generally associated with which part of the atom?
   A) nucleus
   B) electrons
   C) protons
   D) neutrons
   E) the entire atom

5. Which nuclear reaction is **not** balanced?
   A) ${}^{10}_{5}\mathrm{B} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{13}_{7}\mathrm{N} + {}^{1}_{0}\mathrm{n}$
   B) ${}^{238}_{92}\mathrm{U} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{241}_{95}\mathrm{Am} + {}^{1}_{0}\mathrm{n}$
   C) ${}^{40}_{18}\mathrm{Ar} + {}^{1}_{1}\mathrm{H} \rightarrow {}^{40}_{19}\mathrm{K} + {}^{1}_{0}\mathrm{n}$
   D) ${}^{14}_{7}\mathrm{N} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{17}_{8}\mathrm{O} + {}^{1}_{1}\mathrm{H}$

6. Which product is formed by beta emission from phosphorus -32? The atomic number of phosphorus is 15.

A) ${}^{28}_{13}\mathrm{Al}$

B) ${}^{30}_{13}\mathrm{Al}$

C) $^{32}_{16}S$

D) $^{32}_{15}P$

E) $^{33}_{15}P$

7. What is the missing reactant in the reaction shown?

$$^{27}_{13}Al + \_\_\_\_\_ \rightarrow {}^{30}_{15}P + {}^{1}_{0}n$$

A) $^{4}_{2}He$

B) $^{1}_{1}H$

C) $^{2}_{1}H$

D) $^{1}_{0}n$

E) $^{0}_{-1}\beta$

8. Which reaction is an example of a gamma emission?

A) $^{242}_{96}Cm \rightarrow {}^{238}_{94}Pu + {}^{4}_{2}He$

B) $^{10}_{5}B + {}^{1}_{0}n \rightarrow {}^{7}_{3}Li + {}^{4}_{2}He$

C) $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{138}_{52}Te + {}^{96}_{40}Zr + 2\ {}^{1}_{0}n$

D) $^{51}_{22}Ti \rightarrow {}^{51}_{23}V + {}^{0}_{-1}3$

E) $^{46}_{21}Sc \rightarrow {}^{46}_{21}Sc + energy$

9. Iodine-131 has a half-life of 8.0 days. If you originally have a 658 g sample of Iodine-131, how much will remain after 32 days?

10. Thalium- 208 has a half-life of 3.053 min. How long will it take for 120.0 g to decay to 7.50 g?