Integrated Science
Unit 5: Matter, Energy, & the Geosphere

Name: _____
Date: _____ Period: _____

Decay Practice Worksheet #1

Types of Decay Reactions

State whether each of the following decay reactions is alpha, beta, or gamma decay.

1. $^{232}_{92}U \rightarrow ^{4}_{2}He + ^{228}_{90}Th$

2. $^{130}_{52}Te \rightarrow ^{0}_{-1}e + ^{130}_{53}I$

3. $^{3}_{1}H \rightarrow ^{0}_{-1}e + ^{3}_{2}He$

Balancing Decay Reactions

Fill in the blank in each of the following decay reactions with the correct decay particle or decayed nucleus that will balance the decay reaction, and also state whether it is alpha or beta decay.

4. $^{184}_{74}W \rightarrow ^{4}_{2}He + $ _____

5. $^{210}_{82}Pb \rightarrow$ _____ $+ ^{206}_{80}Hg$

6. _____ $\rightarrow ^{4}_{2}He + ^{207}_{81}Tl$

7. $^{14}_{6}C \rightarrow ^{0}_{-1}e +$ _____

8. $^{35}_{16}S \rightarrow$ _____ $+ ^{35}_{17}Cl$

9. _____ $\rightarrow ^{0}_{-1}e + ^{60}_{28}Ni$

Writing Balanced Decay Reactions

Write the balanced decay reaction formula when each of the following radioactive isotopes decays in the manner stated.

10. $^{45}_{20}Ca$ (beta)

11. $^{234}_{94}Pu$ (alpha)

12. $^{210}_{84}Po$ (alpha)

13. $^{24}_{11}Na$ (beta)

Predicting Decay Products

14. What is the name of the product isotope formed when Radon-222 decays by alpha decay?

15. What is the name of the product isotope formed when Thorium-234 decays by beta decay?

Writing Nuclear Equations

Chem Worksheet 4-4

Name _____

In the early 1900s scientists discovered that various isotopes will undergo nuclear decay. During this process the unstable nucleus of an atom gives off radiation. When scientists studied this radiation they discovered three types of particles: alpha, beta, and gamma. The **alpha particle** is composed of two protons and two neutrons, so it has a mass of 4 amu and a charge of 2+. A **beta particle** is a high energy electron emitted from the nucleus. A **gamma ray** often accompanies the other decay processes. Gamma radiation has no charge and no mass.

Radiation Type	Symbol	Mass (amu)	Charge
Alpha	$^{4}_{2}\mathrm{He}$ or $^{4}_{2}\alpha$	4	2+
Beta	$^{0}_{-1}\mathrm{e}$ or $^{0}_{-1}\beta$	$\frac{1}{1840}$	1–
Gamma	$^{0}_{0}\gamma$	0	0

Equations can be written to show how a nucleus changes during a nuclear decay process. With these nuclear equations we track the atomic number and the mass number. For this reason it is important to correctly write the symbols for each particle involved. A nuclear equation is written for an alpha decay and a beta decay below. Notice that the sum of the atomic numbers is equal on both sides of the arrow. The sum of the mass numbers is also the same on both sides.

$^{206}_{84}\mathrm{Po} \rightarrow {}^{202}_{82}\mathrm{Pb} + {}^{4}_{2}\alpha$ **alpha decay**

$^{124}_{51}\mathrm{Sb} \rightarrow {}^{124}_{52}\mathrm{Te} + {}^{0}_{-1}\beta$ **beta decay**

Rewrite the following equations. Fill in all the missing information.

1. $^{129}_{53}\mathrm{I} \rightarrow {}^{0}_{-1}\mathrm{e} + \underline{?}$
2. $^{216}_{86}\mathrm{Rn} \rightarrow {}^{4}_{2}\alpha + \underline{?}$
3. $\underline{?} \rightarrow {}^{4}_{2}\alpha + {}^{239}_{97}\mathrm{Bk}$
4. $\underline{?} \rightarrow {}^{0}_{-1}\mathrm{e} + {}^{52}_{23}\mathrm{V}$
5. $^{255}_{?}\mathrm{Rf} \rightarrow {}^{4}_{2}\alpha + \underline{?}$
6. $^{85}_{?}\mathrm{Br} \rightarrow \underline{?} + {}^{85}_{?}\mathrm{Kr} + {}^{0}_{0}\gamma$
7. $\underline{?} \rightarrow {}^{0}_{-1}\mathrm{e} + {}^{32}_{?}\mathrm{S} + {}^{0}_{0}\gamma$
8. $^{257}_{101}\mathrm{Md} \rightarrow {}^{4}_{2}\alpha + {}^{4}_{2}\alpha + \underline{?}$

Write nuclear equations that describe the following processes.

9. Uranium-235 undergoes an alpha decay to produce thorium-231.
10. Lanthanum -144 becomes cerium-144 when it undergoes a beta decay.
11. Neptunium-233 is formed when americium-237 undergoes a nuclear decay process.
12. When protactinium-229 goes through two alpha decays, francium-221 is formed.
13. Uranium-238 undergoes an alpha decay and produces two gamma rays.
14. The neon-22 nucleus is formed when an element undergoes a beta decay.
15. Samarium-146 is produced when an element undergoes an alpha decay.
16. The beta decay of dysprosium-165 creates a new element.

Answer the following questions. Include the mass number when naming isotopes.

17. What atom produces scandium-47 when it goes through a beta decay?
18. What new element is formed when curium-244 emits two alpha particles and three gamma rays?