Name _____ Date _____ Class _____

CHAPTER 25 STUDY GUIDE FOR CONTENT MASTERY

Nuclear Chemistry

Section 25.1 Nuclear Radiation

In your textbook, read about the terms used to describe nuclear changes.

Use each of the terms below just once to complete the passage.

alpha particle	radioactivity	gamma ray	radioisotope
beta particles	radiation	X ray	radioactive decay

The discovery of the **(1)** X ray in 1895 by Wilhelm Roentgen opened a whole new field of research. Among those who worked in this new field were Pierre and Marie Curie. The Curies discovered that some forms of matter give off **(2)** radiation, a combination of particles and energy. Marie Curie named this process **(3)** radioactivity. Another term used to describe the process by which one element spontaneously changes into another element is **(4)** radioactive decay. Any isotope that undergoes such changes is called a(n) **(5)** radioisotope.

There are three common forms of radiation. One type is a form of energy known as **(6)** gamma rays. The other types of radiation consist of particles. The form of radiation containing the heavier particle is made up of helium nuclei called **(7)** alpha particles. The form of radiation containing the lighter particle consists of electrons called **(8)** beta particles.

In your textbook, read about the discovery of radioactivity.

Complete each statement.

9. Wilhelm Roentgen discovered the form of energy known as X rays.
10. The form of nuclear radiation that has the greatest penetrating power is the gamma ray.
11. When a radioactive nucleus gives off a gamma ray, its atomic number increases by 0.
12. The three types of radiation were first identified by Ernest Rutherford.
13. Each alpha particle carries an electric charge of 2+.
14. Each beta particle carries an electric charge of 1−.
15. Each gamma ray carries an electric charge of 0.

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CHAPTER 25 STUDY GUIDE FOR CONTENT MASTERY

Section 25.2 Radioactive Decay

In your textbook, read about the changes that take place in an atomic nucleus when it decays.

Circle the letter of the choice that best completes the statement.

1. The number of stable isotopes that exist compared to the number of unstable isotopes is
   a. much less. **b.** much more. **c.** slightly more. **d.** about the same.
2. A lightweight isotope is likely to be stable if the ratio of protons to neutrons in its nucleus is
   a. 1:2. **b.** 1:1. **c.** 2:1. **d.** 5:1.
3. The only nucleon among the following is the
   a. electron. **b.** positron. **c.** beta particle. **d.** neutron.
4. The isotope least likely to be found in the band of stability among the following is
   a. $^{13}_{6}C$. **b.** $^{17}_{8}O$. **c.** $^{32}_{13}Al$. **d.** $^{29}_{14}Si$.
5. The isotope formed by the beta decay of $^{40}_{19}K$ has an atomic number of
   a. 18. **b.** 39. **c.** 20. **d.** 21.
6. The isotope formed by the alpha decay of $^{238}_{92}U$ has a mass number of
   a. 234. **b.** 236. **c.** 238. **d.** 240.
7. The positron produced during positron emission comes from a(n)
   a. neutron. **b.** proton. **c.** electron. **d.** positron.
8. During electron capture, a proton in the nucleus of an atom is converted into a(n)
   a. neutron. **b.** positron. **c.** electron. **d.** another proton.
9. When the isotope $^{238}_{91}Pa$ decays by beta emission, the isotope formed is
   a. $^{234}_{89}Ac$. **b.** $^{238}_{90}Th$. **c.** $^{237}_{92}U$. **d.** $^{238}_{92}U$.
10. The isotope formed by the alpha decay of $^{154}_{66}Dy$ is
    a. $^{150}_{66}Dy$. **b.** $^{150}_{67}Ho$. **c.** $^{150}_{64}Gd$. **d.** $^{154}_{67}Ho$.
11. The neutron-to-proton ratio for the isotope sodium-23 is
    a. 1 : 1.1. **b.** 1.1 : 1. **c.** 2.1 : 1. **d.** 1 : 2.1.
12. The decay of $^{162}_{69}Tm$ yields $^{162}_{68}Er$ and
    a. $^{4}_{2}He$. **b.** $^{0}_{-1}e$. **c.** γ. **d.** $^{0}_{+1}\beta$.
13. Atoms located above the band of stability on a graph of numbers of neutrons versus number of protons are usually unstable because they contain too many
    a. protons. **b.** neutrons. **c.** electrons. **d.** nucleons.