**Name** _____ **Natural Decay**

1. Which nuclear emission has the greatest mass and the *least* penetrating power?

   A) an alpha particle C) a neutron
   B) a beta particle D) a positron

2. The nucleus of a radium-226 atom is unstable, which causes the nucleus to spontaneously

   A) absorb electrons C) decay
   B) absorb protons D) oxidize

3. Which list of nuclear emissions is arranged in order from the *least* penetrating power to the greatest penetrating power?

   A) alpha particle, beta particle, gamma ray
   B) alpha particle, gamma ray, beta particle
   C) gamma ray, beta particle, alpha particle
   D) beta particle, alpha particle, gamma ray

4. Alpha particles are emitted during the radioactive decay of

   A) carbon-14 C) calcium-37
   B) neon-19 D) radon-222

5. Given the reaction:

   $$^{226}_{88}\mathrm{Ra} \rightarrow {}^{222}_{86}\mathrm{Rn} + X$$

   Which type of emanation is represented by *X*?

   A) alpha particle C) proton
   B) beta particle D) positron

6. Which radioisotope has an atom that emits a particle with a mass number of 0 and a charge of +1?

   A) $^{3}$H B) $^{16}$N C) $^{19}$Ne D) $^{239}$Pu

7. A beta particle may be spontaneously emitted from

   A) a ground-state electron
   B) a stable nucleus
   C) an excited electron
   D) an unstable nucleus

8. Which notation of a radioisotope is correctly paired with the notation of its emission particle?

   A) $^{37}\mathrm{Ca}$ and $^{4}_{2}\mathrm{He}$ C) $^{16}\mathrm{N}$ and $^{1}_{1}\mathrm{p}$
   B) $^{235}\mathrm{U}$ and $^{0}_{+1}\mathrm{e}$ D) $^{3}\mathrm{H}$ and $^{0}_{-1}\mathrm{e}$

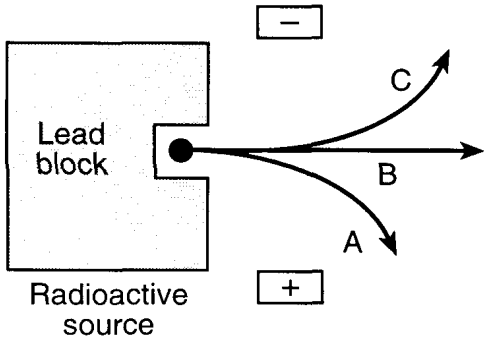
9. Given the nuclear reaction:

   $$^{60}_{27}\mathrm{Co} \rightarrow {}^{0}_{-1}\mathrm{e} + {}^{60}_{28}\mathrm{Ni}$$

   This reaction is an example of

   A) fission
   B) fusion
   C) artificial transmutation
   D) natural transmutation

10. The diagram below represents radiation passing through an electric field.




    The arrow labeled *A* most likely represents

    A) a positron C) alpha radiation
    B) an electron D) gamma radiation

11. Given the equation:

    $$^{14}_{6}\mathrm{C} \rightarrow {}^{14}_{7}\mathrm{N} + X$$

    Which particle is represented by the letter *X*?

    A) an alpha particle C) a neutron
    B) a beta particle D) a proton

12. Which of the following particles has the *least* mass?

    A) alpha particle C) proton
    B) beta particle D) neutron

13. Which statement best describes gamma radiation?

    A) It has a mass of 1 and a charge of 1.
    B) It has a mass of 0 and a charge of –1.
    C) It has a mass of 0 and a charge of 0.
    D) It has a mass of 4 and a charge of +2.

14. Which type of radiation is most similar to high- energy x-rays?

    A) alpha C) neutron
    B) beta D) gamma