

## PreLab and Discussion: Measuring Half-Life of a Radioisotope

Name: \_\_\_\_\_ Teacher: \_\_\_\_\_ Date: \_\_\_\_\_

### Pre-Lab Questions

1. In the transformation of Cs-137 to the metastable state of the Ba-137m nuclide, the atomic number increases by one while the mass number remains unchanged. In this process, a neutron in the nucleus is converted into a proton, emitting both an electron ( ${}^0_{-1}\text{e}$  or  $\beta^-$ ) and an electron antineutrino ( $\bar{\nu}_e$ ). **Write the nuclear equation for the transformation of Cs-137 to Ba-137m.**
2. The isotope Barium-137m is a metastable nuclear isomer. In nuclear physics, the “m” signifies that the nucleus is in an excited, high-energy state rather than its stable ground state. When a nuclear isomer transitions to a more stable state without changing its number of protons or neutrons, it undergoes isomeric transition. During this process, the nucleus releases its excess energy by emitting a high-energy photon known as a gamma ray ( $\gamma$ ). Because a gamma ray has no mass and no charge, the identity of the element remains unchanged. **Write the nuclear equation for the transformation of Ba-137m to Ba-137.**
3. What trend in the data obtained from the nuclear scaler do you expect to observe?

### Discussion Questions

1. What did you find to be the half-life value of Ba-137m?
2. Using the half-life value of Ba-137m, how much time would pass in a total of three half-lives of this radioisotope?
3. In a sample of 3,000 Ba-137m nuclides (atoms), how many would remain at the end of three half-lives?