1H

Hydrogen – 1 (Stable)

Half life: Infinite

Keep flipping a coin until you get “heads.” When you do, you absorb a proton (i.e. another 1H) and become 2He

2He

Helium – 2 (β+ decay to 2H)

Half life: ~ 9 x 109 years

Roll two dice a single time. If you get “snake eyes (two ones),” β+ decay to turn a proton into a neutron and become 2H. Otherwise, lose your proton and return to the starting point. The positron produced in the decay quickly meets an electron and they annihilate to make two photons.

2H

Hydrogen – 2 (Deuterium; Stable)

Half life: Infinite

Keep flipping a coin until you get “heads.” When you do, you absorb a proton from another 1H, become 3He, and emit a photon.

3He

Helium - 3 (Stable)

Half life: Infinite

Takes ~400 years to meet another He. Roll one die. If you get a one or two, collide with a 4He to make 7Be and a photon. Go to 7Be. If you get any other number, collide with another 3He to make 4He, emit two surplus protons (i.e. 1H), and go to 4He.

4He

Helium - 4 (Stable)

Half life: Infinite

Congratulations! You have reached the end of the proton-proton chain. If you came straight to 4He, you followed the p-p I branch. Otherwise, you followed the p-p II branch.

7Be

Beryllium - 7 (Electron capture)

Half life: 53 days

7Be is far more likely to capture an electron from the environment before it decays. Flip a coin until you get “heads.” Then capture an electron, changing a proton to a neutron, to become 7Li and a neutrino.

7Li

Lithium - 7 (Stable)

Half life: Infinite

Flip a coin until you get “heads.” Then absorb a proton (i.e. 1H) to become two 4He. Go to 4He.