Critical masses for single star evolution

$\frac{M}{M_\odot}$

remnants

0.05 — ↑ no D fusion / ↓ D fusion

brown dwarfs, planets

0.085 — ↑ no H fusion / ↓ H fusion (pp)

↑ supported by degeneracy pressure

↓ stars - MS supported by thermal pressure

0.3 — fully convective, complete mixing

radiative core, convective envelope

↳ unmixed, red giant state at end of core H burning

He WD ($<0.5 M_\odot$)

0.8 – 1.0 — MS lifetime = age of universe (12–15 Gyr)

$\ll Z_\odot$ $Z_\odot$

CO WDs ($0.5-1.1 M_\odot$)

1.5–1.8 — ↑ pp / ↓ CNO ; ↑ He flash / ↓ no He flash ; ↑ radiative core, convective envelope / ↓ convective core, radiative envelope

5 — ↑ core He burning ("clump") followed by AGB

↓ no clump or AGB, late evolution at $\approx L_\odot$ const

8 — ↑ Planetary nebulae, white dwarf end state ↑

? uncertain (degenerate C ignition - explosive?)

O Ne Mg WD ($1.2-1.4 M_\odot$)

~10? — ↓ Supernovae, Neutron star end state

↓ NS ($1.4-1.6 M_\odot$)

~25? — ↑ / ↓ black hole end state ; some supernovae

↓ BH ($3 \to \infty, M_\odot$)

100–200? — ↑ stable stars

↓ unstable stars