white dwarfs

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In the most massive stars, $M \geqslant 8M_\odot$, it is likely that the nuclear burning can proceed all the way through to iron whereas in less massive stars, the oxygen flash, which occurs when core burning of oxygen begins, may be sufficient to disrupt the star. In any case, at the end of these phases of stellar evolution, the core of the star runs out of nuclear fuel and collapses until some other form of pressure support enables a new equilibrium configuration to be attained.

In white dwarfs and neutron stars, the star is supported by degeneracy pressure associated with the fact that electrons, protons and neutrons are fermions and so only one particle can occupy any single quantum mechanical state. White dwarfs are held up by electron degeneracy pressure and can have masses up to about $1.4M_\odot$. In neutron stars, neutron degeneracy pressure is responsible for the pressure support and they can have masses up to about $1.4M_\odot$, possibly slightly higher if the neutron star is rapidly rotating. More massive dead stars must be black holes.

This knowledge does not help us decide which types of star become white dwarfs, neutron stars or black holes. For example, low mass stars with $M < 2M_\odot$, can in principle end up in any of the three forms. Even stars with masses very much greater than $2M_\odot$ can form white dwarfs or neutron stars if they lose mass sufficiently rapidly. Computations of mass loss during the late stages of stellar evolution have shown that even $10M_\odot$ stars can lose mass very effectively towards the ends of their lifetimes and form non-black hole remnants.