Ay 7A – Fall 2009
Section Worksheet 11
Birth, Life, and Death: The Life Cycle of Stars[1]

Using the following stages of stellar evolution, construct flow charts for each of the three ranges of initial (i.e., zero-age main sequence, or ZAMS) mass: $\lesssim 0.08 M_\odot$, $\sim 0.08 M_\odot$–$8 M_\odot$, and $\gtrsim 8 M_\odot$
In the flow charts be sure to indicate where evolutionary paths split and specify the criteria that determines which stars follow which paths.

black hole (BH) | brown dwarf (BD) | carbon & oxygen (CO) fusion
core-collapse supernova (CC-SN) | CNO cycle dominates fusion
gamma-ray burst (GRB) | helium (He) fusion | horizontal branch (HB)
hydrogen (H) shell burning | Kelvin-Helmholtz (KH) gravitational contraction
main sequence (MS) | neutron star (NS) | nova | p-p chain dominates fusion
planetary nebula (PN) | pulsar (PSR) | red giant (RG) | red supergiant (RSG)
type Ia supernova (SN Ia) | white dwarf (WD) | X-ray burst (XRB)

$\lesssim 0.08 M_\odot$:

$\sim 0.08 M_\odot$–$8 M_\odot$:

$\gtrsim 8 M_\odot$:

[1] Thanks to former BADGrad Katie Peek for inspiring this worksheet with her version for Ay 10.

Why Does the Sun Shine?
(The Sun Is a Mass of Incandescent Gas)
by They Might Be Giants[2]

What's wrong with this song? Comment on which lines are accurate and which are not so accurate.

Chorus:
The Sun is a mass of incandescent gas[3]
A gigantic nuclear furnace
Where hydrogen is built into helium
At a temperature of millions of degrees

Yo ho, it's hot
The Sun is not
A place where we could live
But here on Earth there'd be no life
Without the light it gives

We need its light
We need its heat
We need its energy
Without the Sun,
Without a doubt,
There'd be no you and me

<Chorus>

The Sun is hot
It is so hot that everything on it is a gas.
Iron, copper, aluminum, and many others.
The sun is large.
If the sun were hollow, a million Earths could fit inside,
and yet, the Sun is only a middle-sized star.
The Sun is far away
About ninety-three million miles away!
And that's why it looks so small.
And even when it's out of sight, the Sun shines night and day.

The Sun gives heat
The Sun gives light
The sunlight that we see
The sunlight comes from our own Sun's atomic energy

Scientists have found that
the Sun is a huge atom-smashing machine.
The heat and light of the Sun come from
the nuclear reactions of
hydrogen, carbon, nitrogen, and helium.

<Chorus>

[2]The music video can be found at `http://www.youtube.com/watch?v=Zbgul1NpEA8`
[3]© J. Linnell and J. Flansburgh, 1987.