

Galaxies and Extragalactic Astronomy

Exercise 5: Suppose that we have a galaxy that forms its whole stellar population in a single burst of star formation with a Salpeter initial mass function: $N(m) = A m^{-2.35}$ (where A is a normalization depending on the total number of stars formed and $N(m)$ is the number of stars of mass m formed)

- 1) How many stars of 1 solar mass will form for each star of 10 solar masses formed?
- 2) If the star formation process allows stars to be formed in the range between 100 solar masses and 0.1 solar masses and if in our burst a total of 10^5 stars are formed, how many stars do we expect to be formed of mass larger than 95 solar masses? Will any be formed?
- 3) If we suppose that all stars with a mass larger than 8 solar masses explode like type II supernovae (and that all these massive stars have already exploded given the age of our galaxy) and that these supernovae enrich the interstellar medium with a Fe metallicity of 0.5 solar per unit of mass expelled and that they expel the 25% of their initial mass. If we further assume that there are 50% of stars in binary systems in the mass range 1-8 solar masses and that given the age of our galaxy all of them have exploded as supernovae of type Ia and that they enrich the interstellar medium with a Fe metallicity of 1.0 solar per unit of mass expelled and that they expel the 50% of their initial mass. Calculate what would be the Fe metallicity in solar units of the material expelled to the interstellar medium by supernovae.