

恆星天文物理 資格考 2017

(可用中文作答；題號須標示清楚)

1. For a spherical star of total mass M and radius R , consider its interior structure in the following two different models separately: (20%)
 - (a) a constant-density model (i.e. $\rho = \text{constant}$)
 - (b) a linear-density model (i.e. $\rho(r) \propto 1 - r/R$)where r is the distance to the center.
Assume the zero-outer boundary condition, i.e. $P(R) = T(R) = 0$ and that the star is composed of an ideal monatomic gas. In the above, P and T are the pressure and temperature respectively. In the above two models, determine separately the range of r for the convection zone of the star.
2. Write down the equations that are commonly needed in order to determine the stellar structure. Explain the physics for each equation. (30%)
3. Write down the thermonuclear reactions during pre-main sequence phase. (20%)
4. About the Saha equation, answer the following: (20%)
 - (a) write down the Saha equation;
 - (b) explain how it is obtained from the fundamental physics laws;
 - (c) illustrate its role and usage in stellar physics.
5. Explain the system of classification for supernova. (10%)