

# 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%)