Quiz E25

Nuclear fusion

1. Two conditions for fusion to occur are high temperature and high density. What are the reasons for this?

	High temperature	**High density**
A	To eject the electrons from the atoms	To maximize the energy produced per reaction
B	To eject the electrons from the atoms	To increase the probability of a collision between nuclei
C	To overcome the electrical repulsion of the nuclei	To maximize the energy produced per reaction
D	To overcome the electrical repulsion of the nuclei	To increase the probability of a collision between nuclei

2. Which of the following reactions is **not** a fusion reaction?

A ${}^{4}_{2}\mathrm{He} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{8}_{4}\mathrm{Be} + \gamma$

B ${}^{15}_{8}\mathrm{O} \rightarrow {}^{15}_{7}\mathrm{N} + {}^{0}_{1}\overline{e}^{+} + \nu$

C ${}^{1}_{1}\mathrm{H} + {}^{1}_{1}\mathrm{H} \rightarrow {}^{2}_{1}\mathrm{H} + {}^{0}_{1}\overline{\mathrm{e}}^{+} + \nu$

D ${}^{1}_{1}\mathrm{H} + {}^{15}_{7}\mathrm{N} \rightarrow {}^{12}_{6}\mathrm{C} + {}^{4}_{2}\mathrm{He}$

3. What is a common characteristic of main sequence stars?

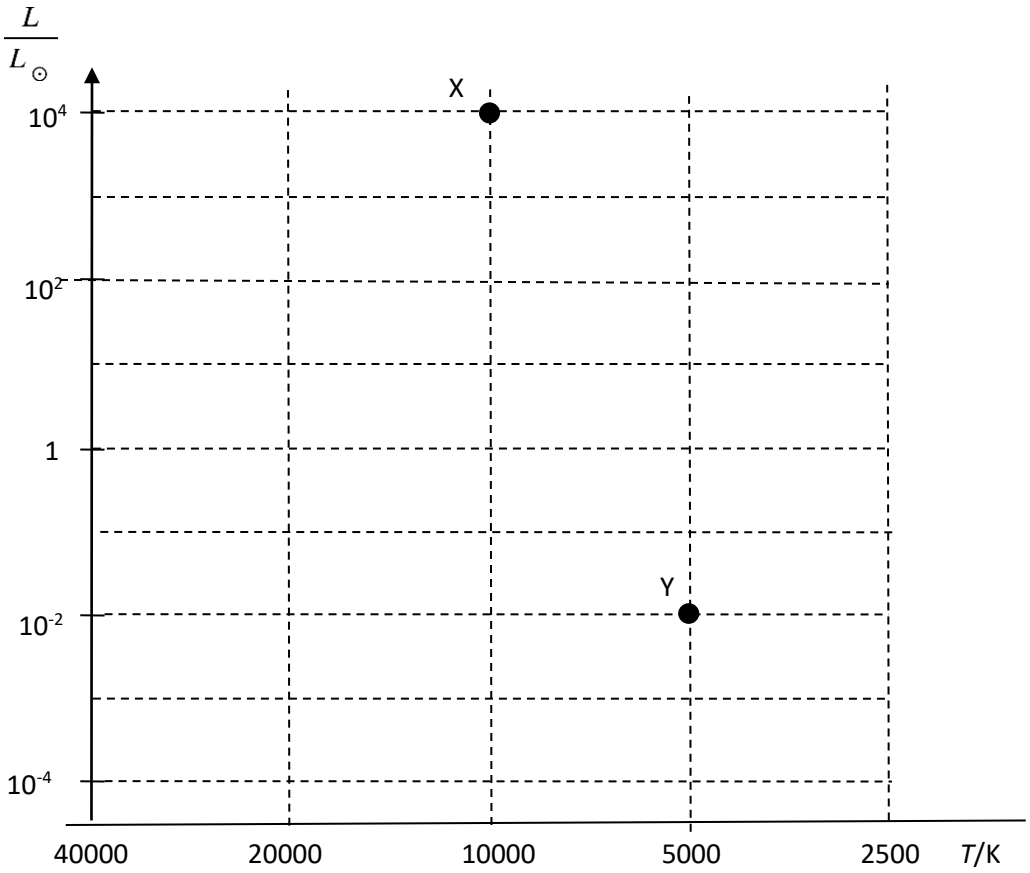
A High luminosity

B Fusion of hydrogen into helium

C High density

D Fusion of helium into carbon

4. Two stars, X and Y, have been marked on a Hertzsprung-Russel diagram.



What is the ratio $\frac{R_X}{R_Y}$ of the radius of X to that of Y?

A 62500
B 1000
C 500
D 250

5. Three statements are made about the instability region of the Hertzsprung-Russel diagram.

I It is an almost vertical narrow strip above the main sequence
II It consists of stars which are variable in luminosity
III All main sequence stars will go through this region at some time

Which statements are correct?

A I and II
B I and III
C II and III
D I, II and III

6. What is the main characteristic of a main sequence star that determines the evolution of the star beyond the main sequence?

A The surface temperature
B The core density
C The mass
D The radius

7. What is the parallax angle of a star?

A The angle at which the star subtends a distance equal to the radius of the Earth's orbit around the Sun.
B The angle at which the star subtends a distance equal to the diameter of the Earth's orbit around the Sun.
C The angle at which the star subtends a distance equal to 1 parsec.
D The angle at which the star subtends a distance equal to 1 light year.

8. A star has 10^{30} kg and may be assumed to be all hydrogen. The luminosity of the star is 10^{26} W and fusion reactions produce 10^{-12} J per reaction in the proton-proton chain. What is an estimate of the time it will take the star to fuse 10% of its hydrogen?

A 10^{13} s **B** 10^{15} s **C** 10^{17} s **D** 10^{19} s

9. What is the evolutionary path of a one solar mass main sequence star?

A Red giant → Supernova → White dwarf
B Red supergiant → Supernova → Neutron star
C Red giant → Planetary nebula → White dwarf
D Red supergiant → Planetary nebula → Neutron star

10. A white dwarf star, once formed, will

A cool down by radiating away thermal energy.
B cool down by conducting thermal energy into the surrounding space.
C maintain a constant temperature due to fusion reactions in the core.
D maintain a constant temperature due to fission reactions in the core.

Quiz E25 Answers	
1	D
2	B
3	B
4	D
5	A
6	C
7	A
8	C
9	C
10	A