

Q5. A roughly spherical, homogeneous dense cloud has a mass equal to 95% of its Jeans mass, and it is not contracting or expanding. It is then compressed by a shock wave that *decreases* its *Jeans* mass (not its actual mass) everywhere by 10%. Which *one* of the statements in the key is the best one, regarding the immediate future of the cloud? Pencil across *one* cell in row 5.

KEY for Q5

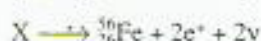
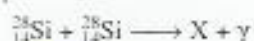
- A The cloud will expand. ~~X~~
- B The cloud will remain the same size. ~~X~~
- C The cloud will contract. ☒
- D The cloud will expand only if it is *not* rotating, and contains *no* strong magnetic fields. ~~X~~
- E The cloud will expand only if it *is* rotating, and contains strong magnetic fields. ~~X~~
- F The cloud will contract only if it is *not* rotating, and contains *no* strong magnetic fields. ~~X~~
- G The cloud will contract only if it *is* rotating, and contains strong magnetic fields. ~~X~~

Q6 Which *two* of the statements in the key about a main sequence star of $0.6M_{\odot}$ are *true*? Pencil across *two* cells in row 6.

KEY for Q6

- A Convection is confined to the core, which contains about 3% of the star's mass. ~~X~~
- B Convection is confined to an outer shell, which contains about 3% of the star's mass. ☒
- C The pressure gradient that supports the star against gravitational contraction is supplied almost entirely by gas pressure. ☒
- D The pressure gradient that supports the star against gravitational contraction is supplied almost entirely by radiation pressure. ~~X~~
- E The main sequence lifetime will be less than 10^{10} years. ~~X~~
- F The star is likely to become a red giant when it leaves the main sequence. ☒

Q7 In supergiants the following reaction sequence is important, where X is a nuclide that you have to identify

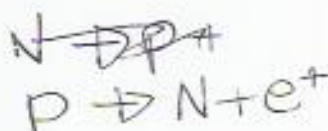


56
28

Select from the key the nuclide represented by X, and pencil across *one* of the A to E cells in row 7. (The table in the Appendix of Book 1 Chapter 2 will help.) Is the first reaction exothermic or endothermic? Pencil across *one* of the F and G cells in row 7.

KEY for Q7

- A $^{56}_{28}\text{Fe}$ ~~X~~
- B $^{56}_{28}\text{Ni}$ ☒
- C $^{56}_{26}\text{Ni}$ ~~X~~
- D $^{56}_{28}\text{Si}$ ~~X~~
- E $^{58}_{28}\text{Ni}$ ~~X~~
- F Exothermic ☒
- G Endothermic ~~X~~



Q8 The key contains statements about nucleosynthesis. Which *two* statements are *false*? Pencil across *two* cells in row 8.

KEY for Q8

- A The s-process builds no elements beyond iron. ~~X~~
- B The break-up of iron in the cores of supergiants has been one of the essential prerequisites for the creation of most of the plutonium in the cosmos. ~~X~~
- C Hydrogen fusion and helium fusion occur in the outer layers of a supernova. ☒
- D The r-process can build a stable nuclide from an unstable nuclide. ☒
- E In exceptionally massive stars the core reaches a point where it consists mainly of elements more massive than the iron group. ~~X~~
- F Much of the iron in the interstellar medium was created in supernova explosions. ☒
- G The remnant of a Type II supernova can consist largely of neutrons. ☒