

Name:

Astronomy 3 - Problem Set 9

1. Based on the information given in Figure 12.25, can you estimate the probability of any individual person being killed by a mass extinction event in his/her life time. How does that probability compare with the probability of a fatal airline accident ?
2. how are continents built up? describe a few of the processes that have shaped North America.
3. If life is based on information, what is that information?
4. What is the difference between chemical evolution and biological evolution?
5. Based on the information given in Figure 9.45, ie South American and African continents started to drift apart 120 million years ago, can you estimate the speed at which they are separating. How does it compare with the crawling speed of a banana slug?
6. As the Sun gradually brightens in the future, how can the CO₂ cycle respond to reduce the warming effect? Which parts of the cycle will be affected? Is this an example of a positive or negative feedback?
7. why does the energy produced by fusion in the solar core take so long to reach the solar surface? Describe the processes of radiative diffusion and convection in the solar interior.
8. Use the fact that each cycle of the proton-proton chain converts 4.7×10^{-29} kg of mass into energy, along with the fact that the Sun loses a total of about 4.2×10^9 kg of mass each second, calculate the total number of times the proton-proton chain occurs each second in the Sun. Compare quantitatively the amount of mass loss during the entire life of the Sun with its present total mass.
9. The star 51 Pegasi has about the same mass as our Sun. A planet discovered around it has an orbital period of 4.23 days. The mass of the planet is estimated to be 0.6 times the mass of Jupiter. Use Kepler's third law to find the planet's average distance from the star. What is the orbital speed of this planet? What is the speed of 51 Pegasi's reflex motion?
10. Based on the Drake equation on p725 of the textbook, estimate the number of communicative civilizations per galaxy from your own estimates of the factors.