

University Astronomy: Homework 6

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Question 1

Approximately what fraction of the total mass in the Solar System is in the Sun?

Planet	Mass (M_{\oplus})
Mercury	0.0553
Venus	0.8150
Earth	1.0000
Mars	0.1074
Jupiter	317.8
Saturn	95.16
Uranus	14.50
Neptune	17.20
Total	446.6377

$$\frac{446.6377M_{\oplus}}{M_{\odot}} = 0.0013$$

Question 2

How old are comets compared to the age of the Solar System?

Comets are about the same age as the solar system on the cosmic scale as they are formed from leftover material during the solar system formation event.

Question 3

What is the source of elements heavier than helium in the Sun?

The CNO fusion cycle in stars yields elements heavier than helium based on the temperature of the star.

Question 4

Calculate the approximate maximum distance from the Sun for a rapidly rotating planet to have liquid water, assuming the planet is a blackbody.

$$\begin{aligned}T_p &\approx 279K(1 - A)^{\frac{1}{4}} \left(\frac{r}{1AU}\right)^{-\frac{1}{2}} \\273K &\approx 279K(1 - 0)^{\frac{1}{4}} \left(\frac{r}{1AU}\right)^{-\frac{1}{2}} \\ \frac{273}{279} &\approx \sqrt{\frac{1AU}{r}} \\0.978^2 &\approx \frac{1}{r}AU \\r &\approx 1.045AU\end{aligned}$$

You can find all my notes at <http://omgimanerd.tech/notes>. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech