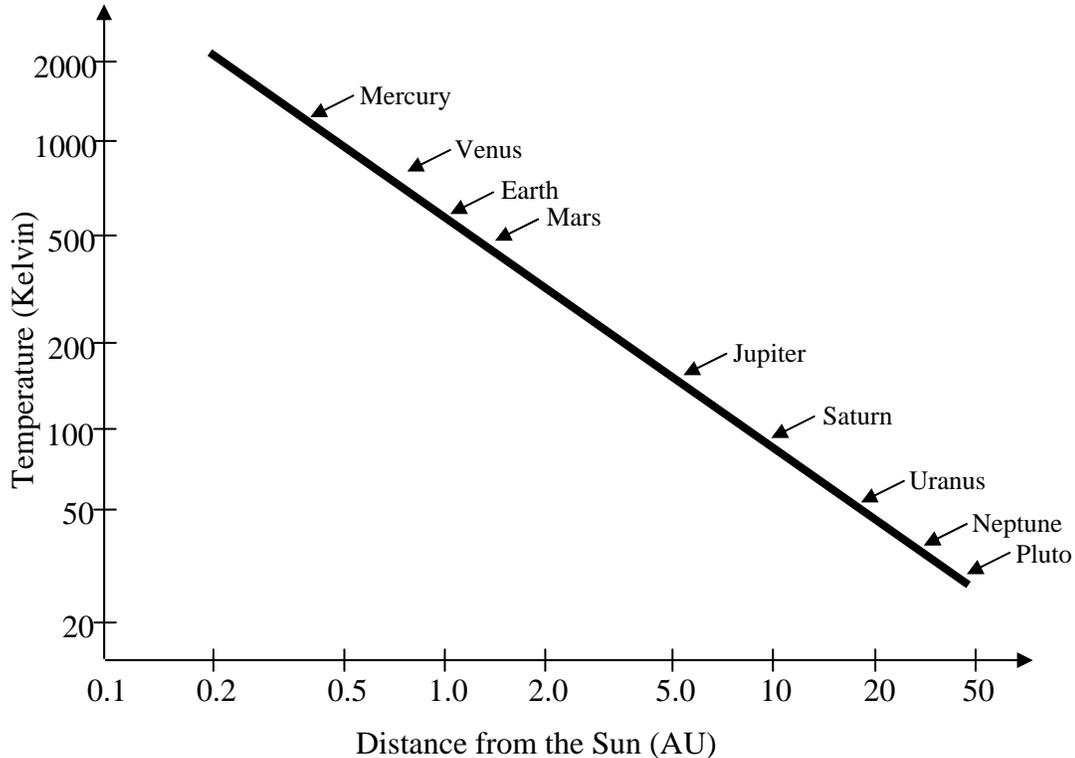


## Temperature and Formation of Our Solar System

Consider the information provided in the graph and table below. The graph shows the temperature (expressed in Kelvin) at different distances from the Sun (expressed in Astronomical Units, AU) in the solar system during the time when the planets were originally forming. The table provides some common temperatures to use for comparison.



Condition	Temp. Fahrenheit	Temp. Celsius	Temp. Kelvin
Severe Earth Cold	-100	- 73	199
Water Freezes	32	0	273
Room Temp	72	22	296
Human Body	98.6	37	310
Water Boils	212	100	373

- 1) What was the temperature at the location of Earth?  
**About 600K.**
- 2) What was the temperature at the location of Mars?  
**About 500K**
- 3) Which planets formed at temperatures hotter than the boiling point of water?  
**Boiling point of water = 373K. Mercury, Venus, Earth and Mars all formed at temperatures warmer than this.**
- 4) Which planets formed at temperatures cooler than the freezing point of water?  
**Freezing point of water = 273K. Jupiter, Saturn, Uranus, Neptune, and Pluto all formed at temperatures colder than this.**

At temperatures hotter than the freezing point of water, light gases, like hydrogen and helium, likely had too much energy to condense together to form the large, gas-giant, Jovian planets.

- 5) Over what range of distances from the Sun would you expect to find light gases, like hydrogen and helium, collecting together to form a Jovian planet? Explain your reasoning.

**Jovian planets are most likely form a distances from 2AU out to 50AU or greater. This is the region where the temperature in the early Solar System was below 273K, the freezing point of water.**

- 6) Over what range of distances from the Sun would you expect to find solid, rocky material collecting together to form a terrestrial planet? Explain your reasoning.

**Terrestrial planets could form over the entire ranges of distances from the Sun as rocky and metallic materials could have condensed but only over the range from 2AU and inwards would *only* the rocky material have collected. Further from the Sun than 2AU, H and He could also have been captured by the planet making it a Jovian or gas giant planet.**

- 7) Is it likely that a large, Jovian planet would have formed at the location of Mercury? Explain your reasoning.

**It would seem very unlikely that a Jovian planet would form as close to the Sun as Mercury since the temperature would have been over 1000K and it would have been very difficult to capture and collect gas.**

**Surprisingly, a number of the planets recently discovered around other stars have masses like Jovian planets but lie at a distance from their stars like Mercury's distance from the Sun. This has led to the speculation that such planets must have formed at a greater distance and then migrated inwards towards the star.**