

Thinking about Problems

Some thoughts about
Bennett and Shostak
Test Your Understanding
By Dr. H. Geller

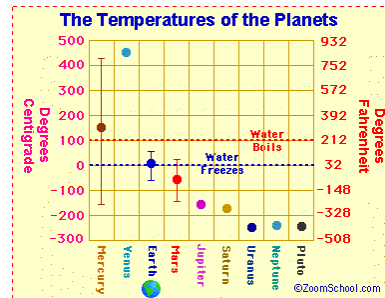
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- If Venus were just a little bit smaller, its climate would be Earth-like.
 - Consider the following
 - If Venus were smaller, what physical characteristics would change?
 - Gravity -> Escape Velocity -> Atmosphere Gases
 - » May change atmospheric pressure, but then if it were much smaller it would not be able to hold onto any atmosphere, like Mercury
 - » Less gravity would also mean the interior cooling off faster
 - What does “a little bit smaller” really mean?

Test Your Understanding Beyond Textbook Questions

- If the Sun were twice as bright as it actually is, life on Earth would not be possible.
 - Consider the following
 - If the Sun were twice as bright the temperatures on Earth would be much greater, but how do you calculate this?
 - $E \propto T^4$ therefore $T \propto E^{1/4}$
 - So if E doubles, then temperature increases by about 1.2 times, so the temperature on Earth would be about 360 Kelvin (boiling point is 373 Kelvin at 1000 millibar).

Something to Consider



Test Your Understanding Beyond Textbook Questions

- If the Sun were several times brighter than it actually is, the habitable zone would include Jupiter's orbit.
 - Consider the following
 - Jupiter's temperatures now are about 150 Kelvin. In order to double that to get within the liquid water range, the Sun's brightness would have to increase by 2 to the 4th power (in accordance with Stefan-Boltzmann Law), or 16 times the brightness that it is now.
 - What does “several times brighter” mean?

Test Your Understanding Page 356 #25

- While the habitable zone of the Sun migrates outward over time, the habitable zones of other Sun-like stars might instead migrate inward over time.
 - Consider the following
 - What constitutes Sun-like stars?
 - Our Sun is a G2 V (main sequence)
 - Assuming all F, G and K main sequence stars
 - All main sequence stars increase luminosity over time
 - » Increase in luminosity will push out the habitable zone

