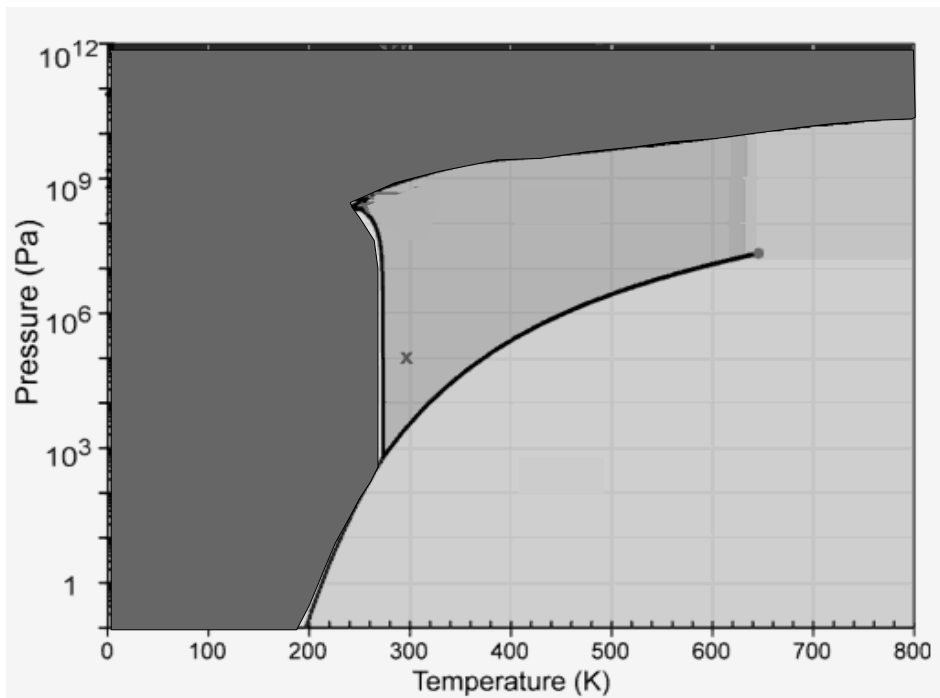


Your team of scientists & engineers has been hired by NASA to help determine which, among some newly-discovered extra-solar planets (that is, planets around nearby stars other than the sun) might have the right conditions for life to exist. NASA astronomers provide you with a list of the planets and their characteristics. To have the right conditions for life to exist, the planet should have oxygen in its atmosphere, but no hydrogen because the combustibility of hydrogen would deter the favorable chemical reactions needed for things like respiration. Also, the planet should have liquid water needed for the emergence and sustainability of organisms. Consider only atomic O and H. The mass of atomic H is 1.6×10^{-27} kg and atomic Oxygen is 32 times this mass.

On which planets would you suggest scientists focus their search for living organisms?

System & Planet	Planet diameter (km)	Planet Mass (kg)	Surface Temp (K)	Surface Pressure (atm)
β Pictoris A	12000	6×10^{25}	400	10
51 Pegasi B	40000	6×10^{25}	270	0.001
ρ Ophiuchus A	140,000	6×10^{24}	290	0.1
α Canis Majoris A	22,000	1×10^{24}	600	20,000

Hint: begin by comparing the rms speeds of the atoms to the escape speeds from the planets.



Phase diagram of water

- b) If the atomic mass of the gas is doubles, how does its rms speed change? Tripled? Quadrupled?
- c) If the temperature of the planet is doubled, how does the rms speed of the gas change? Tripled? Quadrupled?