Answer on Question #66366 - Physics / Molecular Physics | Thermodynamics |

Question:
Calculate the temperature at which the root mean square speed of hydrogen and oxygen molecules will be equal to their escape velocities from the earth's gravitational field. The radius of the earth is 6400 km.
Solution:

$$Escape\ velocity\ for\ Earth: \frac{11.18km}{s}$$

$$Root\ mean\ square\ speed: v = \sqrt{\frac{3RT}{\mu}};$$

$$(hydrogen)\ T = \frac{v^2\mu}{3R} = \frac{11180^2 * 0.002}{3 * 8.31} = 10027K$$

$$(oxygen)\ T = \frac{v^2\mu}{3R} = \frac{11180^2 * 0.032}{3 * 8.31} = 160439K$$

**Answer:** $T = 10027K.(Hydrogen)\ T = 160439K(Oxygen)$