Ch 18 Kinetic Theory

Season 1 Episode 4 - VELOCITY & HUMIDITY

In this episode of LARC Physics 3B, we're going to . . .

- Evaluate ideal gases by looking at them in the molecular level.
- Create a connection between ideal gases and humidity.

Guided Practice

At 800 °C, Find the rms speed of the following:

(a) an Argon atom

(b) a Hydrogen molecule

NOTE: Here is a link to an online Periodic Table

Answer: (a) $v_{rms} = 820\,\text{m/s}$, (b) $v_{rms} = 3650\,\text{m/s}$

What is the mass of water (vapor) within a closed room with a $30\,\text{m}^2$ floor and 2.4 m tall ceiling when the temperature is 24 °C and the relative humidity is 0.65%?

Useful info: The Saturated (vapor) Pressure of H2O at 24 degrees Celsius is 3000 Pa

Answer: $m = 1\,\text{kg}$

Breakout-Room Activity

What is the rms speed of a nitrogen molecule N_2 contained in an $8.5\,\mathrm{m}^3$ volume at $3.1\,\mathrm{atm}$ if the total amount of nitrogen is $1800\,\mathrm{mol}$?

Answer: $v_{rms} = 400\,\mathrm{m/s}$

In humid climates, people constantly dehumidify their cellars to prevent rot and mildew. If a $322\,\mathrm{m}^3$ house cellar is kept at $20\,^\circ\mathrm{C}$, what is the mass of water (vapor) must be removed from the cellar in order to drop the humidity from 95% to a more natural 40%?

Useful info: The Saturated (vapor) Pressure of H2O at 20 degrees Celsius is $2330\,\mathrm{Pa}$

Answer: $m = 3\,\mathrm{kg}$