- ➢ Gas molecules attract one another and stick together, as the IMFs become significant, and there are fewer particles bouncing around and creating pressure, making the pressure of a nonideal gas smaller than the pressure predicted by the ideal gas equation

Stronger IMFs will lead to more deviations

- ➔ H_2O, with hydrogen bonding, is more likely to deviate from ideal behavior than CH_4, with only London dispersion forces

When gases have similar IMFs, gases with more electrons are more polarizable and more likely to deviate from ideal behavior

- ➔ For noble gases with only LDFs, argon is more likely to deviate than helium, but less likely to deviate than xenon

DENSITY

Measured in the same way of a liquid or solid, D = m/v

D = density, *m* = mass of gas (grams), *V* = volume occupied by gas (liters)

Determine density of a gas sample by combining density equation w/ Ideal Gas Law

- ➔ Substitute V = m/D and rearrange until D isolated
  - ◆ m/n determines mass per mole, or MM, and that can also be rearranged

$$PV = nRT$$

where $n = \frac{m\ (\text{mass})}{M\ (\text{molar mass})}$

Therefore, $PV = \frac{m}{M}RT$

- ➔ and $\rho = \frac{m}{V} = \frac{PM}{RT}$

SPECTROSCOPY AND THE EM SPECTRUM

Differences in absorption or emission of photons in different regions are related to different types of molecular motion or electronic transition:

- ➔ **Microwave radiation** - transitions in molecular rotational levels
- ➔ **Infrared radiation** - transitions in molecular vibrational levels
- ➔ **Ultraviolet and visible radiation** - transitions in electronic energy levels

PHOTOELECTRIC EFFECT

When an atom or molecule absorbs/emits a photon, the energy of the species is increased/decreased by an amount equal to the photon's energy

Equation relates wavelength of electromagnetic wave to its frequency and the speed of light