Ideal vs. Real Gases

- ideal gases follow the gas laws
  > do not really exist

  > ideal at high temp and low pressure

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Ideal Gas Law

- The ideal gas law is the equation of state of a hypothetical ideal gas.
- Good way to predict the behavior of many gases.
- Has limitations.

EQUATION:

$$PV = nRT$$

P = pressure (atm)

V = volume (L)

n = number of moles

R = constant (0.0821 Latm/Kmol)

T = temperature (K)

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Ideal Gas Law Practice

What is the pressure of 1.93 moles of gas at 300 K in a 6.35 L container? (show all your work)

PV = nRT R = constant (0.0821 L*atm/K*mol)

P = ? atm
V = 6.35 L
n = 1.93 mol
R = 0.0821 $\frac{L \cdot atm}{K \cdot mol}$
T = 300 K

$P(6.35L) = 1.93mol \cdot 0.0821 \cdot 300K$

$\frac{P(6.35L)}{6.35} = \frac{47.54}{6.35}$

$= 7.49\ atm$

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Ideal Gas Law Practice

What is the mass of helium (g) in a 2.75 L container at 56 C and 1.5 atm? (show all your work)

PV = nRT R = constant (0.0821 L*atm/K*mol)

P = 1.5 atm
V = 2.75 L
n = ? mol → g He
R = 0.0821 $\frac{L \cdot atm}{mol \cdot K}$
T = 56°C + 273 = 329 K

$1.5 \cdot 2.75 = n \cdot 0.0821 \cdot 329$

$\frac{4.125}{27.0109} = \frac{n \cdot 27.0109}{27.0109}$

$n = 0.153\ mol\ He$

$0.153\ mol\ He \times \frac{4\ g\ He}{1\ mol\ He} = .611\ g\ He$

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Check for Understanding

What is the volume of 3.8 moles of gas at 750 K and 2.2 atm? (show all your work)

PV = nRT R = constant (0.0821 L*atm/K*mol)

P = 2.2 atm

V = ? L

n = 3.8 mol

R = 0.0821

T = 750k

$2.2 \cdot V = 3.8\,mol \cdot 0.0821 \cdot 750K$

$V = 106.3\,L$

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