Chapter 9: Gaseous State

Nov 29, 2022

Chemistry Department, Cypress College

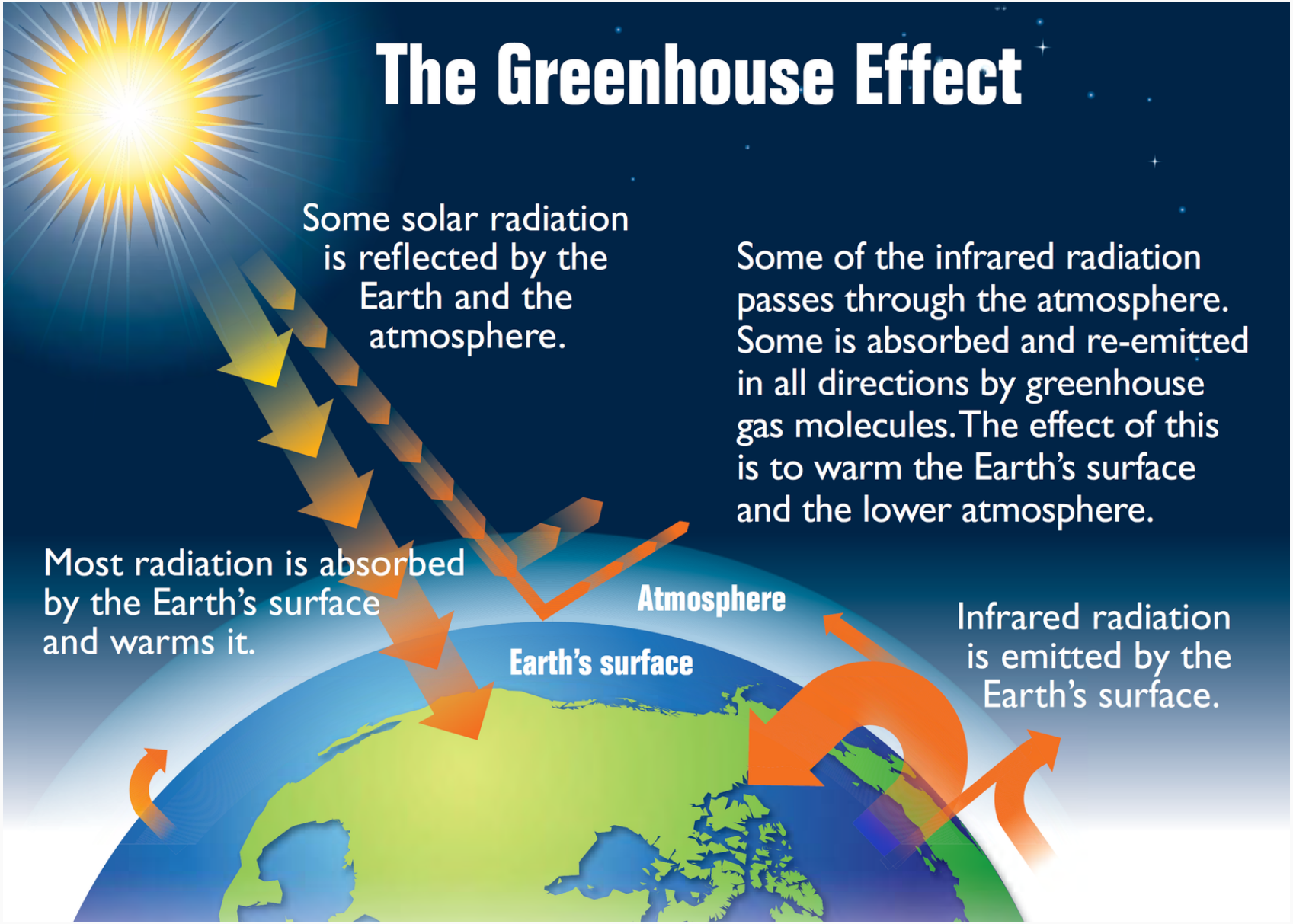
Class Announcements

Lecture

- Return exam 3 and go over answers
- Begin Ch 9 and 10
- Quiz and Homework assignment released Fri, Dec 2nd at 3pm

Outline

Greenhouse Effect



Ideal Gas Model

$$PV = nRT \tag{1}$$

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Gas Constants - Use the appropriate once based on the units in the problem

$$\begin{aligned} R =& 8,314.46 \frac{\text{L Pa}}{\text{K mol}} = 0.082057 \frac{\text{L atm}}{\text{K mol}} \\ =& 62.3636 \frac{\text{L Torr}}{\text{K mol}} \end{aligned}$$

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Charles' Law - hold n and P constant

$$\begin{aligned} PV &= nRT \\ \frac{V}{T} &= \frac{nR}{P} = \text{constant} \\ \frac{V_1}{T_1} &= \frac{V_2}{T_2} \end{aligned} \tag{3}$$

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$$D = \frac{P\,MM}{RT}$$

where MM is the molar mass

Outline

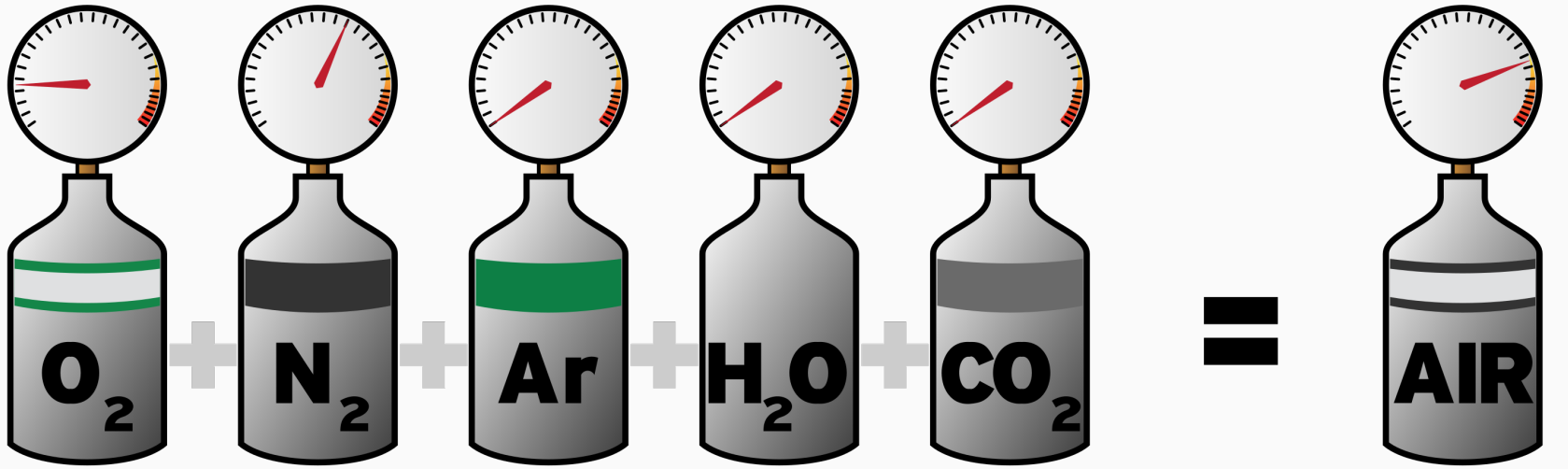
Dalton's Law of Partial Pressures

Gases in a mixture behave independently and exert the same pressure they would exert if they were in a container alone

$$P_{\text{Total}} = P_A + P_B + P_C + \cdots \tag{4}$$

where P_{Total} is the total pressure and $P_A, P_B, \cdots$ are the pressures of the components

Dalton's Law of Partial Pressures



$$P_{\text{Total}} = P_{\text{O2}} + P_{\text{N2}} + P_{\text{Ar}} + P_{\text{H2O}} + P_{\text{CO2}}$$

Practice: Dalton's Law of Partial Pressure

Suppose gaseous oxygen (O_2) is produced by:

$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$

If 1.50L of O_2 is collected over water at 300.K and 0.970atm, how many moles of O_2 is produced? The vapor pressure of water is 0.0351atm.

Outline

Practice: Moles-Volume

Assuming ideal gas conditions, the sample of $H_2(g)$ occupies a 8.00L container at 5.00 atm and 298.15K. What volume of $H_2O(g)$ is produced by the reaction at 423.15K and 0.947atm, if all $H_2(g)$ reacts with copper(II) oxide?

Practice: Mass-Volume

Assuming ideal gas conditions, how many moles $CaCO_3(s)$ form if 3.45L of $CO_2(g)$, measured at 318.15K and 1.37atm, react with excess CaO(s)? How many grams?