ME 405 Fall 2006 Professor John M. Cimbala Lecture 04 09/13/2006

Today, we will:

- Finish Section 1.5 Fundamentals
- Do some example problems
- Begin overview of Chapter 2 The Respiratory System

Example

Given: A hot summer day:

- $T = 95.0^{\circ} \text{F} (35.0^{\circ} \text{C})$
- P = 99.6 kPa
- $\Phi = 90.0\%$ (90% relative humidity) •

Calculate the mole fraction of water vapor in the air (in units of PPM). To do:

Solution:

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At
$$T = 35.0^{\circ}C \rightarrow 1_{00}k \ up Table A.17$$

 $P_{fat} = P_{v} \in T = 35.0^{\circ}C \ v \quad 5.628 \ kPa}$
Reall, $\overline{\Phi} = \frac{P_{u00}}{P_{v}_{u00}} \rightarrow \frac{P_{u0}}{P_{u00}} = \frac{P_{u00}}{P_{v}_{u00}}$
 $Reall, \underline{Y} = \frac{P_{i}}{P} \rightarrow \frac{Y_{u00}}{P_{atm}} + \frac{P_{u00}}{P_{atm}}$
 $\frac{Y_{u00}}{P_{atm}} = \frac{\Phi \cdot P_{v}_{u00}}{P_{atm}} + \frac{P_{u00}}{P_{atm}} + \frac{P_{u00}}{P_{atm}} + \frac{P_{u00}}{P_{atm}} + \frac{P_{u00}}{P_{u00}} + \frac{P_{u00}}{P_{u$

Example

Given: The same hot summer day as in the previous example:

- $T = 95.0^{\circ} \text{F} (35.0^{\circ} \text{C})$
- P = 99.6 kPa
- $\Phi = 90.0\%$ (90% relative humidity)
- Now the temperature drops rapidly to <u>86.0°F</u> (30.0°C) (cold fort)
- At the same time, the pressure drops to 98.5 kPa

To do: Calculate the new relative humidity of water vapor in the air and discuss.

Solution:



Fig. 2.14
$$\rightarrow$$
 The Bohr model
 $F_{J} = deal space volume$
 $f_{J} = deal$