Adiabatic Saturation Temperature

The **adiabatic saturation temperature** is a useful property of moist air that is solely a function of humidity ratio, total pressure, and dry-bulb temperature. That is

$T_{as} = T_{as}(\_\_\_, \_\_\_, \_\_\_)$

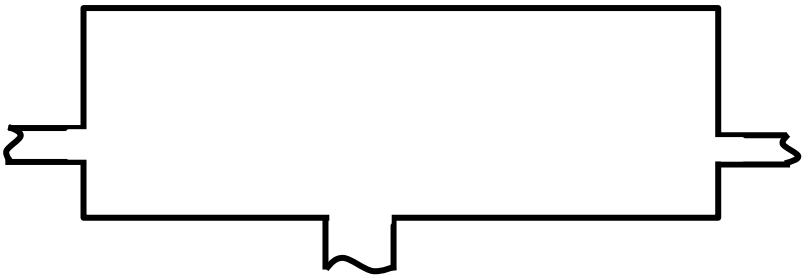
or if you solve for ω,

$\omega = \omega(\_\_\_, \_\_\_, \_\_\_)$

Its utility comes from the fact that adiabatic saturation temperature is well-approximated by ___ ____ _____. That is

$T_{as} \approx \_\_\_\_\_$

Let's find $\omega = \omega(T_{db}, T_{as}, P)$.



Write *Conservation of Mass* for the system.

For the *air* (*dry air*) *only*

(1)

And now for the *water only*

In terms of ω

(2)

Write *Conservation of Energy* for the system.

In terms of ω

(3)

Substitute (1) and (2) into (3)

Solve for ω_1.

Assume that the (dry) air is an ideal gas with _____ _____ _____.

> The adiabatic saturation temperature of state (1) is the unique temperature for which ___ = ___ = _____ with φ_2 = ____%.

Write a sentence that defines adiabatic saturation temperature:

For these conditions

$h_{v,2}$ = _____

$h_{w,3}$ = _____ = _____

$h_{v,1} \approx$ _____

so

ω_1 = _____

ω_1 = _____

where

ω_2 = _____ = _____