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# Basics of Humidification Process Formulas

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# List of 19 Basics of Humidification Process Formulas

## Basics of Humidification Process

### 1) Absolute Humidity based on Humid Heat

$$fx \quad AH = \frac{C_s - 1.006}{1.84}$$

[Open Calculator](#)

$$ex \quad 0.594565 \text{ kg/kg of air} = \frac{2.1 \text{ kJ/kg} \cdot \text{K} - 1.006}{1.84}$$

### 2) Absolute Humidity based on Humid Volume and Temperature

fx

[Open Calculator](#)

$$AH = 18.02 \cdot \left( \left( \frac{v_H}{22.4} \right) \cdot \left( \frac{273.15}{T_G + 273.15} \right) - \left( \frac{1}{28.97} \right) \right)$$

ex

$$0.610229 \text{ kg/kg of air} = 18.02 \cdot \left( \left( \frac{1.7 \text{ m}^3/\text{mol}}{22.4} \right) \cdot \left( \frac{273.15}{30^\circ \text{C} + 273.15} \right) - \left( \frac{1}{28.97} \right) \right)$$


### 3) Absolute Humidity based on Percentage and Saturation Humidity

$$fx \quad AH = \left( \frac{\%H}{100} \right) \cdot H_s$$

[Open Calculator](#)

$$ex \quad 0.6 \text{ kg/kg of air} = \left( \frac{12}{100} \right) \cdot 5$$



4) Absolute Humidity based on Weight of Air 

$$fx \quad AH = \left( \frac{W}{W_{Air}} \right)$$

Open Calculator 


$$ex \quad 0.681818 \text{ kg/kg of air} = \left( \frac{15 \text{ kg}}{22 \text{ kg}} \right)$$

5) Absolute Humidity on Basis of Molal Humidity 

$$fx \quad AH = 0.6207 \cdot H_m$$

Open Calculator 


$$ex \quad 0.403455 \text{ kg/kg of air} = 0.6207 \cdot 0.65$$

6) Humid Heat based on Absolute Humidity 

$$fx \quad C_s = 1.005 + 1.88 \cdot AH$$

Open Calculator 

$$ex \quad 2.133 \text{ kJ/kg} \cdot \text{K} = 1.005 + 1.88 \cdot 0.6 \text{ kg/kg of air}$$

7) Humid Volume based on Absolute Humidity and Temperature 


fx

Open Calculator 

$$v_H = \left( \left( \frac{1}{28.97} \right) + \left( \frac{AH}{18.02} \right) \right) \cdot 22.4 \cdot \left( \frac{T_G + 273.15}{273.15} \right)$$

ex

$$1.685889 \text{ m}^3/\text{mol} = \left( \left( \frac{1}{28.97} \right) + \left( \frac{0.6 \text{ kg/kg of air}}{18.02} \right) \right) \cdot 22.4 \cdot \left( \frac{30^\circ \text{C} + 273.15}{273.15} \right)$$


8) Mixing Ratio on Basis of Specific Humidity 

$$fx \quad MR = \frac{SH}{1 - SH}$$

Open Calculator 

$$ex \quad 2.333333 = \frac{0.7}{1 - 0.7}$$




9) Molal Humidity based on Absolute Humidity 

$$\text{fx } H_m = \frac{AH}{0.6207}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)

$$\text{ex } 0.966651 = \frac{0.6\text{kg/kg of air}}{0.6207}$$

10) Molal Humidity based on Moles of Air and Water 

$$\text{fx } H_m = \frac{n_{\text{Water}}}{n_{\text{Air}}}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)


$$\text{ex } 0.4 = \frac{10\text{kmol}}{25\text{kmol}}$$

11) Moles of Air based on Molal Humidity 

$$\text{fx } n_{\text{Air}} = \frac{n_{\text{Water}}}{H_m}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7\_img.jpg\)](#)

$$\text{ex } 15.38462\text{kmol} = \frac{10\text{kmol}}{0.65}$$

12) Moles of Water Vapour based on Molal Humidity 

$$\text{fx } n_{\text{Water}} = H_m \cdot n_{\text{Air}}$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b\_img.jpg\)](#)

$$\text{ex } 16.25\text{kmol} = 0.65 \cdot 25\text{kmol}$$

13) Percentage Humidity 

$$\text{fx } \%H = \left( \frac{AH}{H_s} \right) \cdot 100$$

[Open Calculator !\[\]\(40770d9ed6ed4f1222ebf89a1396e8b2\_img.jpg\)](#)

$$\text{ex } 12 = \left( \frac{0.6\text{kg/kg of air}}{5} \right) \cdot 100$$



14) Saturation Humidity based on Percentage and Absolute Humidity [Open Calculator](#) 

$$fx \quad H_s = AH \cdot \left( \frac{100}{\%H} \right)$$

$$ex \quad 5 = 0.6\text{kg/kg of air} \cdot \left( \frac{100}{12} \right)$$

15) Saturation Humidity based on Vapor Pressure [Open Calculator](#) 

$$fx \quad H_s = (0.6207) \cdot \left( \frac{P_{H_2O}}{1 - P_{H_2O}} \right)$$

$$ex \quad 5.126522 = (0.6207) \cdot \left( \frac{0.892\text{Pa}}{1 - 0.892\text{Pa}} \right)$$

16) Specific Humidity on Basis of Mixing Ratio [Open Calculator](#) 

$$fx \quad SH = \frac{MR}{1 + MR}$$


$$ex \quad 0.666667 = \frac{2}{1 + 2}$$

17) Temperature based on Absolute Humidity and Humid Volume [Open Calculator](#) 

$$fx \quad T_G = \left( \frac{273.15 \cdot \left( \frac{v_H}{22.4} \right)}{\left( \frac{1}{28.97} \right) + \left( \frac{AH}{18.02} \right)} \right) - 273.15$$

$$ex \quad 32.53744^\circ\text{C} = \left( \frac{273.15 \cdot \left( \frac{1.7\text{m}^3/\text{mol}}{22.4} \right)}{\left( \frac{1}{28.97} \right) + \left( \frac{0.6\text{kg/kg of air}}{18.02} \right)} \right) - 273.15$$




**18) Weight of Air based on Absolute Humidity** 

$$\text{fx } W_{\text{Air}} = \frac{W}{\text{AH}}$$

[Open Calculator](#) 

$$\text{ex } 25\text{kg} = \frac{15\text{kg}}{0.6\text{kg/kg of air}}$$

**19) Weight of Water Vapour based on Absolute Humidity** 

$$\text{fx } W = \text{AH} \cdot W_{\text{Air}}$$

[Open Calculator](#) 

$$\text{ex } 13.2\text{kg} = 0.6\text{kg/kg of air} \cdot 22\text{kg}$$










## Variables Used

- **%H** Percentage Humidity
- **AH** Absolute Humidity (*Kg of water vapour per Kg of air*)
- **C<sub>S</sub>** Humid Heat (*Kilojoule per Kilogram per K*)
- **H<sub>m</sub>** Molal Humidity
- **H<sub>S</sub>** Saturation Humidity
- **MR** Mixing Ratio
- **n<sub>Air</sub>** Moles of Bone Dry Air (*Kilomole*)
- **n<sub>Water</sub>** Moles of Water Vapour (*Kilomole*)
- **P<sub>H2O</sub>** Vapour Pressure of Water at DBT (*Pascal*)
- **SH** Specific Humidity
- **T<sub>G</sub>** Temperature of Air (*Celsius*)
- **W** Weight of Water Vapour (*Kilogram*)
- **W<sub>Air</sub>** Weight of Bone Dry Air (*Kilogram*)
- **v<sub>H</sub>** Humid Volume of Air (*Cubic Meter per Mole*)



## Constants, Functions, Measurements used

- **Measurement: Weight** in Kilogram (kg)  
*Weight Unit Conversion* 
- **Measurement: Temperature** in Celsius ( $^{\circ}\text{C}$ )  
*Temperature Unit Conversion* 
- **Measurement: Amount of Substance** in Kilomole (kmol)  
*Amount of Substance Unit Conversion* 
- **Measurement: Pressure** in Pascal (Pa)  
*Pressure Unit Conversion* 
- **Measurement: Specific Heat Capacity** in Kilojoule per Kilogram per K ( $\text{kJ/kg}\cdot\text{K}$ )  
*Specific Heat Capacity Unit Conversion* 
- **Measurement: Molar Volume** in Cubic Meter per Mole ( $\text{m}^3/\text{mol}$ )  
*Molar Volume Unit Conversion* 
- **Measurement: Specific Humidity** in Kg of water vapour per Kg of air ( $\text{kg/kg}$  of air)  
*Specific Humidity Unit Conversion* 





## Check other formula lists

- [Basics of Humidification Process Formulas](#) 

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