

# Important Basics of Humidification Process Formulas PDF



**Formulas**  
**Examples**  
**with Units**

## List of 19 Important Basics of Humidification Process Formulas

### 1) Absolute Humidity based on Humid Heat Formula ↻

Formula

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

Example with Units

$$0.5946 \text{ kg/kg of air} = \frac{2.1 \text{ kJ/kg}^{\circ}\text{K} - 1.006}{1.84}$$

Evaluate Formula ↻

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

Formula

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

Example with Units

$$0.6102 \text{ kg/kg of air} = 18.02 \cdot \left( \left( \frac{1.7 \text{ m}^3/\text{mol}}{22.4} \right) \cdot \left( \frac{273.15}{30^{\circ}\text{C} + 273.15} \right) - \left( \frac{1}{28.97} \right) \right)$$

Evaluate Formula ↻

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

Formula

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

Example with Units

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

Evaluate Formula ↻

### 4) Absolute Humidity based on Weight of Air Formula ↻

Formula

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

Example with Units

$$0.6818 \text{ kg/kg of air} = \left( \frac{15 \text{ kg}}{22 \text{ kg}} \right)$$

Evaluate Formula ↻

### 5) Absolute Humidity on Basis of Molal Humidity Formula ↻

Formula

$$AH = 0.6207 \cdot H_m$$

Example with Units

$$0.4035 \text{ kg/kg of air} = 0.6207 \cdot 0.65$$

Evaluate Formula ↻



## 6) Humid Heat based on Absolute Humidity Formula ↻

Formula

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

Example with Units

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

Evaluate Formula ↻

## 7) Humid Volume based on Absolute Humidity and Temperature Formula ↻

Formula

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

Example with Units

$$1.6859 \text{ m}^3/\text{mol} = \left( \left( \frac{1}{28.97} \right) + \left( \frac{0.6 \text{ kg/kg of air}}{18.02} \right) \right) \cdot 22.4 \cdot \left( \frac{30^\circ\text{C} + 273.15}{273.15} \right)$$

Evaluate Formula ↻

## 8) Mixing Ratio on Basis of Specific Humidity Formula ↻

Formula

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

Example

$$2.3333 = \frac{0.7}{1 - 0.7}$$

Evaluate Formula ↻

## 9) Molal Humidity based on Absolute Humidity Formula ↻

Formula

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

Example with Units

$$0.9667 = \frac{0.6 \text{ kg/kg of air}}{0.6207}$$

Evaluate Formula ↻

## 10) Molal Humidity based on Moles of Air and Water Formula ↻

Formula

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

Example with Units

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

Evaluate Formula ↻

## 11) Moles of Air based on Molal Humidity Formula ↻

Formula

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

Example with Units

$$15.3846 \text{ kmol} = \frac{10 \text{ kmol}}{0.65}$$

Evaluate Formula ↻

## 12) Moles of Water Vapour based on Molal Humidity Formula ↻

Formula

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

Example with Units

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

Evaluate Formula ↻



### 13) Percentage Humidity Formula

Formula

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

Example with Units

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

Evaluate Formula 

### 14) Saturation Humidity based on Percentage and Absolute Humidity Formula

Formula

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

Example with Units

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

Evaluate Formula 

### 15) Saturation Humidity based on Vapor Pressure Formula

Formula

$$H_s = (0.6207) \cdot \left( \frac{P_{H2O}}{1 - P_{H2O}} \right)$$

Example with Units

$$5.1265 = (0.6207) \cdot \left( \frac{0.892 \text{ Pa}}{1 - 0.892 \text{ Pa}} \right)$$

Evaluate Formula 

### 16) Specific Humidity on Basis of Mixing Ratio Formula

Formula

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

Example

$$0.6667 = \frac{2}{1 + 2}$$

Evaluate Formula 

### 17) Temperature based on Absolute Humidity and Humid Volume Formula

Formula

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

Example with Units

$$32.5374^\circ\text{C} = \left( \frac{273.15 \cdot \left( \frac{1.7 \text{ m}^3/\text{mol}}{22.4} \right)}{\left( \frac{1}{28.97} \right) + \left( \frac{0.6 \text{ kg/kg of air}}{18.02} \right)} \right) - 273.15$$

Evaluate Formula 

### 18) Weight of Air based on Absolute Humidity Formula

Formula

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

Example with Units

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

Evaluate Formula 



## 19) Weight of Water Vapour based on Absolute Humidity Formula

Formula

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

Example with Units

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

Evaluate Formula 



## Variables used in list of Basics of Humidification Process Formulas above


- **%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 in list of Basics of Humidification Process Formulas above

- **Measurement: Weight** in Kilogram (kg)  
*Weight Unit Conversion* ↻
- **Measurement: Temperature** in Celsius (°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 (kJ/kg\*K)  
*Specific Heat Capacity Unit Conversion* ↻
- **Measurement: Molar Volume** in Cubic Meter per Mole (m<sup>3</sup>/mol)  
*Molar Volume Unit Conversion* ↻
- **Measurement: Specific Humidity** in Kg of water vapour per Kg of air (kg/kg of air)  
*Specific Humidity Unit Conversion* ↻



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