Important Formulas of Clausius-Clapeyron Equation PDF

Formulas Examples with Units

List of 22 Important Formulas of Clausius-Clapeyron Equation

1) August Roche Magnus Formula Formula

Evaluate Formula

Formula

$$e_s = 6.1094 \cdot \exp\left(\frac{17.625 \cdot T}{T + 243.04}\right)$$

Example with Units

$$587.9994\,\text{Pa} = 6.1094 \cdot \exp\left(\frac{17.625 \cdot 85\,\text{K}}{85\,\text{K} + 243.04}\right)$$

2) Boiling Point given Enthalpy using Trouton's Rule Formula

Evaluate Formula

Formula

$$bp = \frac{H}{10.5 \cdot [R]}$$

Example with Units

$$559.5128\,\text{K} = \frac{25\,\text{KJ}}{10.5 \cdot 8.3145}$$

3) Boiling Point using Trouton's Rule given Latent Heat Formula

Evaluate Formula

Formula

$$bp = \frac{LH}{10.5 \cdot [R]}$$

Example with Units

$$286.5999\,\text{K} = \frac{25020.7\,\text{J}}{10.5 \cdot 8.3145}$$

4) Boiling Point using Trouton's Rule given Specific Latent Heat Formula

Evaluate Formula

Formula

$$bp = \frac{L \cdot MW}{10.5 \cdot [R]}$$

Example with Units

$$286.6\,\text{K} = \frac{208505.9\,\text{J/kg} \cdot 120\,\text{g}}{10.5 \cdot 8.3145}$$

5) Change in Pressure using Clausius Equation Formula

Evaluate Formula

Formula

$$\Delta P = \frac{\Delta T \cdot \Delta H_v}{\left(V_m - v\right) \cdot T_{abs}}$$

Example with Units

$$76.7849\,\text{Pa} = \frac{50.5\,\text{K} \cdot 11\,\text{KJ/mol}}{\left(32\,\text{m}^3\text{/mol} - 5.5\,\text{m}^3\right) \cdot 273}$$

6) Enthalpy of Vaporization using Trouton's Rule Formula

Evaluate Formula

Formula

$$H = bp \cdot 10.5 \cdot [R]$$

Example with Units

$$25.0207\,\text{KJ} = 286.6\,\text{K} \cdot 10.5 \cdot 8.3145$$

7) Enthalpy using Integrated Form of Clausius-Clapeyron Equation Formula

Evaluate Formula

Formula

$$\Delta H = \frac{-\ln\left(\frac{P_f}{P_i}\right) \cdot [R]}{\left(\frac{1}{T_f}\right) - \left(\frac{1}{T_i}\right)}$$

Example with Units

$$25020.2946\,\text{J/kg} = \frac{-\ln\left(\frac{133.07\,\text{Pa}}{65\,\text{Pa}}\right) \cdot 8.3145}{\left(\frac{1}{700\,\text{K}}\right) - \left(\frac{1}{600\,\text{K}}\right)}$$

8) Entropy of Vaporization using Trouton's Rule Formula

Evaluate Formula

Formula

$$S = (4.5 \cdot [R]) + ([R] \cdot \ln(T))$$

Example with Units

$$74.3533\,\text{J/K} = (4.5 \cdot 8.3145) + (8.3145 \cdot \ln(85\,\text{K}))$$

9) Final Pressure using Integrated Form of Clausius-Clapeyron Equation Formula

Evaluate Formula

Formula

$$P_f = \left(\exp\left(-\frac{LH \cdot \left(\left(\frac{1}{T_f}\right) - \left(\frac{1}{T_i}\right)\right)}{[R]}\right)\right) \cdot P_i$$

Example with Units

$$133.0715\,\text{Pa} = \left(\exp\left(-\frac{25020.7\,\text{J} \cdot \left(\left(\frac{1}{700\,\text{K}}\right) - \left(\frac{1}{600\,\text{K}}\right)\right)}{8.3145}\right)\right) \cdot 65\,\text{Pa}$$

10) Final Temperature using Integrated Form of Clausius-Clapeyron Equation Formula

Evaluate Formula

Formula

$$T_f = \frac{1}{\left(-\frac{\ln\left(\frac{P_f}{P_i}\right) \cdot [R]}{LH}\right) + \left(\frac{1}{T_i}\right)}$$

Example with Units

$$699.9981\,\text{K} = \frac{1}{\left(-\frac{\ln\left(\frac{133.07\,\text{Pa}}{65\,\text{Pa}}\right) \cdot 8.3145}{25020.7\,\text{J}}\right) + \left(\frac{1}{600\,\text{K}}\right)}$$

11) Latent Heat of Evaporation of Water near Standard Temperature and Pressure Formula

Evaluate Formula

Formula

$$LH = \left(\frac{dedT_{slope} \cdot [R] \cdot \left(T^2 \right)}{e_S} \right) \cdot MW$$

Example with Units

$$25029.9968\,\mathrm{J} = \left(\frac{25\,\mathrm{Pa/K} \cdot 8.3145 \cdot \left(85\,\mathrm{K}^2 \right)}{7.2\,\mathrm{Pa}} \right) \cdot 120\,\mathrm{g}$$

12) Latent Heat of Vaporization for Transitions Formula

Evaluate Formula

Formula

$$LH = -\left(\ln\left(P \right) - c \right) \cdot [R] \cdot T$$

Example with Units

$$29178.3292\,\mathrm{J} = -\left(\ln\left(41\,\mathrm{Pa} \right) - 45 \right) \cdot 8.3145 \cdot 85\,\mathrm{K}$$

13) Latent Heat using Integrated Form of Clausius-Clapeyron Equation Formula

Evaluate Formula

Formula

$$LH = \frac{-\ln\left(\frac{P_f}{P_i} \right) \cdot [R]}{\left(\frac{1}{T_f} \right) - \left(\frac{1}{T_i} \right)}$$

Example with Units

$$25020.2946\,\mathrm{J} = \frac{-\ln\left(\frac{133.07\,\mathrm{Pa}}{65\,\mathrm{Pa}} \right) \cdot 8.3145}{\left(\frac{1}{700\,\mathrm{K}} \right) - \left(\frac{1}{600\,\mathrm{K}} \right)}$$

14) Latent Heat using Trouton's Rule Formula

Evaluate Formula

Formula

$$LH = bp \cdot 10.5 \cdot [R]$$

Example with Units

$$25020.7124\,\mathrm{J} = 286.6\,\mathrm{K} \cdot 10.5 \cdot 8.3145$$

15) Saturation Vapor Pressure near Standard Temperature and Pressure Formula

Evaluate Formula

Formula

$$e_S = \frac{dedT_{slope} \cdot [R] \cdot \left(T^2 \right)}{L}$$

Example with Units

$$7.2027\,\mathrm{Pa} = \frac{25\,\mathrm{Pa/K} \cdot 8.3145 \cdot \left(85\,\mathrm{K}^2 \right)}{208505.9\,\mathrm{J/kg}}$$

16) Slope of Coexistence Curve given Pressure and Latent Heat Formula

Evaluate Formula

Formula

$$dPbydT = \frac{P \cdot LH}{\left(T^2 \right) \cdot [R]}$$

Example with Units

$$17.077\,\mathrm{Pa/K} = \frac{41\,\mathrm{Pa} \cdot 25020.7\,\mathrm{J}}{\left(85\,\mathrm{K}^2 \right) \cdot 8.3145}$$

17) Slope of Coexistence Curve of Water Vapor near Standard Temperature and Pressure Formula

Evaluate Formula

Formula

$$dedT_{slope} = \frac{L \cdot e_S}{[R] \cdot \left(T^2\right)}$$

Example with Units

$$24.9907\,\text{Pa/K} = \frac{208505.9\,\text{J/kg} \cdot 7.2\,\text{Pa}}{8.3145 \cdot \left(85\,\text{K}^2\right)}$$

18) Slope of Coexistence Curve using Enthalpy Formula

Evaluate Formula

Formula

$$dPbydT = \frac{\Delta H'}{T \cdot \Delta V}$$

Example with Units

$$17\,\text{Pa/K} = \frac{80920\,\text{J}}{85\,\text{K} \cdot 56\,\text{m}^3}$$

19) Slope of Coexistence Curve using Entropy Formula

Evaluate Formula

Formula

$$dPbydT = \frac{\Delta S}{\Delta V}$$

Example with Units

$$16.0714\,\text{Pa/K} = \frac{900\,\text{J/K}}{56\,\text{m}^3}$$

20) Specific Latent Heat of Evaporation of Water near Standard Temperature and Pressure Formula

Evaluate Formula

Formula

$$L = \frac{dedT_{slope} \cdot [R] \cdot \left(T^2\right)}{e_S}$$

Example with Units

$$208583.307\,\text{J/kg} = \frac{25\,\text{Pa/K} \cdot 8.3145 \cdot \left(85\,\text{K}^2\right)}{7.2\,\text{Pa}}$$

21) Specific Latent Heat using Integrated Form of Clausius-Clapeyron Equation Formula

Evaluate Formula

Formula

$$L = \frac{-\ln\left(\frac{P_f}{P_i}\right) \cdot [R]}{\left(\left(\frac{1}{T_f}\right) - \left(\frac{1}{T_i}\right)\right) \cdot MW}$$

Example with Units

$$208502.4546\,\text{J/kg} = \frac{-\ln\left(\frac{133.07\,\text{Pa}}{65\,\text{Pa}}\right) \cdot 8.3145}{\left(\left(\frac{1}{700\,\text{K}}\right) - \left(\frac{1}{600\,\text{K}}\right)\right) \cdot 120\,\text{g}}$$

22) Specific Latent Heat using Trouton's Rule Formula

Evaluate Formula

Formula

$$L = \frac{bp \cdot 10.5 \cdot [R]}{MW}$$

Example with Units

$$208505.9363\,\text{J/kg} = \frac{286.6\,\text{K} \cdot 10.5 \cdot 8.3145}{120\,\text{g}}$$

Variables used in list of Important Formulas of Clausius-Clapeyron Equation above

- **ΔT** Change in Temperature *(Kelvin)*
- **ΔV** Change in Volume *(Cubic Meter)*
- **bp** Boiling Point *(Kelvin)*
- **c** Integration Constant
- **$dedT_{slope}$** Slope of Co-existence Curve of Water Vapor *(Pascal per Kelvin)*
- **dPbydT** Slope of Coexistence Curve *(Pascal per Kelvin)*
- **e_s** Saturation Vapour Pressure *(Pascal)*
- **e_S** Saturation Vapor Pressure *(Pascal)*
- **H** Enthalpy *(Kilojoule)*
- **L** Specific Latent Heat *(Joule per Kilogram)*
- **LH** Latent Heat *(Joule)*
- **MW** Molecular Weight *(Gram)*
- **P** Pressure *(Pascal)*
- **P_f** Final Pressure of System *(Pascal)*
- **P_i** Initial Pressure of System *(Pascal)*
- **S** Entropy *(Joule per Kelvin)*
- **T** Temperature *(Kelvin)*
- **T_{abs}** Absolute Temperature
- **T_f** Final Temperature *(Kelvin)*
- **T_i** Initial Temperature *(Kelvin)*
- **v** Molal Liquid Volume *(Cubic Meter)*
- **V_m** Molar Volume *(Cubic Meter per Mole)*
- **ΔH** Change in Enthalpy *(Joule per Kilogram)*
- **ΔH'** Enthalpy Change *(Joule)*
- **$ΔH_v$** Molal Heat of Vaporization *(KiloJoule Per Mole)*
- **ΔP** Change in Pressure *(Pascal)*
- **ΔS** Change in Entropy *(Joule per Kelvin)*

Constants, Functions, Measurements used in list of Important Formulas of Clausius-Clapeyron Equation above

- constant(s): **[R]**, 8.31446261815324
  Universal gas constant
- Functions: **exp**, exp(Number)
  n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- Functions: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Measurement: **Weight** in Gram (g)
  Weight Unit Conversion
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Volume** in Cubic Meter (m³)
  Volume Unit Conversion
- Measurement: **Pressure** in Pascal (Pa)
  Pressure Unit Conversion
- Measurement: **Energy** in Kilojoule (KJ), Joule (J)
  Energy Unit Conversion
- Measurement: **Heat of Combustion (per Mass)** in Joule per Kilogram (J/kg)
  Heat of Combustion (per Mass) Unit Conversion
- Measurement: **Latent Heat** in Joule per Kilogram (J/kg)
  Latent Heat Unit Conversion
- Measurement: **Molar Magnetic Susceptibility** in Cubic Meter per Mole (m³/mol)
  Molar Magnetic Susceptibility Unit Conversion
- Measurement: **Energy Per Mole** in KiloJoule Per Mole (KJ/mol)
  Energy Per Mole Unit Conversion
- Measurement: **Slope of Coexistence Curve** in Pascal per Kelvin (Pa/K)
  Slope of Coexistence Curve Unit Conversion
- Measurement: **Entropy** in Joule per Kelvin (J/K)
  Entropy Unit Conversion

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