calculatoratoz.com

unitsconverters.com

Advanced Illumination Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 16 Advanced Illumination Formulas

Advanced Illumination

1) Beer-Lambert Law

Open Calculator

fx $$I_t = I_o \cdot \exp(-\beta \cdot c \cdot x)$$

ex $$21.72319\text{cd} = 700\text{cd} \cdot \exp(-1.21 \cdot 0.41 \cdot 7\text{m})$$

2) Fresnel's Law of Reflection

Open Calculator

fx $$r_\lambda = \frac{(n_2 - n_1)^2}{(n_2 + n_1)^2}$$

ex $$0.043199 = \frac{(1.54 - 1.01)^2}{(1.54 + 1.01)^2}$$

3) Illumination by Lambert Cosine Law

Open Calculator

fx $$E_v = \frac{I_v \cdot \cos(\theta)}{L^2}$$

ex $$0.442743\text{lx} = \frac{4.62\text{cd} \cdot \cos(65^\circ)}{(2.1\text{m})^2}$$

4) Incident Angle using Snell's Law

Open Calculator

fx $$\theta_i = \arcsin h\left(\frac{n_2 \cdot \sin(\theta_r)}{n_1}\right)$$

ex $$30.66133^\circ = \arcsin h\left(\frac{1.54 \cdot \sin(21.59^\circ)}{1.01}\right)$$

5) Intensity of Light Transmitted

Open Calculator

fx $$I_t = I_o \cdot \exp(-\alpha \cdot x)$$

ex $$21.12338\text{cd} = 700\text{cd} \cdot \exp(-0.5001 \cdot 7\text{m})$$

6) Inverse Square Law

Open Calculator

fx $$L_v = \frac{I_t}{d^2}$$

ex $$0.265118\text{cd*sr/m}^2 = \frac{21\text{cd}}{(8.9\text{m})^2}$$

7) Lambert's Cosine Law

Open Calculator

fx $$E_\theta = E_v \cdot \cos(\theta_i)$$

ex $$0.883346 = 1.02\text{lx} \cdot \cos(30^\circ)$$

8) Luminance for Lambertian Surfaces

Open Calculator

fx $$L_v = \frac{E_v}{\pi}$$

ex $$0.324676 cd*sr/m^2 = \frac{1.02 lx}{\pi}$$

9) Luminous Intensity

Open Calculator

fx $$I_v = \frac{Lm}{\omega}$$

ex $$1.55 cd = \frac{41.85 cd*sr}{27 sr}$$

10) Number of Floodlighting Units

Open Calculator

fx $$N = \frac{A_{light} \cdot E_v}{0.7 \cdot \Phi_B}$$

ex $$1.710253 = \frac{8.98 m^2 \cdot 1.02 lx}{0.7 \cdot 7.651 lm}$$

11) Refracted Angle using Snell's Law

Open Calculator

fx $$\theta_r = \arcsin h\left(\frac{n_1 \cdot \sin(\theta_i)}{n_2}\right)$$

ex $$18.46714^\circ = \arcsin h\left(\frac{1.01 \cdot \sin(30^\circ)}{1.54}\right)$$

12) Specific Consumption

Open Calculator

fx $$S.C. = \frac{2 \cdot P_{in}}{CP}$$

ex $$374.1935 = \frac{2 \cdot 290W}{1.55cd}$$

13) Spectral Luminous Efficacy

Open Calculator

fx $$K_\lambda = K_m \cdot V_\lambda$$

ex $$2561.22lm/W = 55.8lm/W \cdot 45.9$$

14) Spectral Reflection Factor

Open Calculator

fx $$P_\lambda = \frac{J_\lambda}{G_\lambda}$$

ex $$1.304348 = \frac{4.5}{3.45}$$

15) Spectral Transmission Factor

Open Calculator

fx $$T_\lambda = \frac{J_\lambda'}{G_\lambda}$$

ex $$1.127536 = \frac{3.89}{3.45}$$

16) Utilization Factor of Electrical Energy

Open Calculator

fx $$\mathrm{UF} = \frac{\mathrm{L_r}}{\mathrm{L_e}}$$

ex $$0.157895 = \frac{6\mathrm{cd}}{38\mathrm{cd}}$$

Variables Used

- A_{light} Area to be Lighted *(Square Meter)*
- **c** Concentration of Absorption Material
- **CP** Candle Power *(Candela)*
- **d** Distance *(Meter)*
- E_v Illumination Intensity *(Lux)*
- E_θ Illuminance at Angle of Incidence
- G_λ Spectral Irradiation
- I_o Intensity of Light Entering the Material *(Candela)*
- I_t Intensity of Transmitted Light *(Candela)*
- I_v Luminous Intensity *(Candela)*
- J_λ Reflected Spectral Emission
- J_λ' Transmitted Spectral Emission
- K_m Maximum Sensitivity *(Lumen Per Watt)*
- K_λ Spectral Luminous Efficacy *(Lumen Per Watt)*
- **L** Length of Illumination *(Meter)*
- L_e Lumen Emitting from Source *(Candela)*
- L_r Lumen Reaching Working Plane *(Candela)*
- L_v Luminance *(Candela Steradian per Sq Meter)*
- **Lm** Lumen *(Candela Steradian)*
- **N** Number of Floodlighting Units
- n_1 Refractive Index of Medium 1

- n_2 Refractive Index of Medium 2
- P_{in} Input Power *(Watt)*
- P_λ Spectral Reflection Factor
- r_λ Reflection Loss
- **S.C.** Specific Consumption
- T_λ Spectral Transmission Factor
- **UF** Utilization Factor
- V_λ Photopic Efficiency Value
- **x** Path Length *(Meter)*
- **α** Absorption Coefficient
- **β** Absorption per Concentration Coefficient
- **θ** Illumination Angle *(Degree)*
- θ_i Incident Angle *(Degree)*
- θ_r Refracted Angle *(Degree)*
- Φ_B Lumen Flux *(Lumen)*
- **ω** Solid Angle *(Steradian)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **arcsinh**, arcsinh(Number)
  Inverse hyperbolic sine function
- Function: **cos**, cos(Angle)
  Trigonometric cosine function
- Function: **exp**, exp(Number)
  Exponential function
- Function: **sin**, sin(Angle)
  Trigonometric sine function
- Function: **sinh**, sinh(Number)
  Hyperbolic sine function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Luminous Intensity** in Candela (cd)
  Luminous Intensity Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Illuminance** in Lux (lx), Candela Steradian per Sq Meter (cd*sr/m²)
  Illuminance Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion

- Measurement: **Luminous Flux** in Candela Steradian (cd*sr), Lumen (lm)
  Luminous Flux Unit Conversion
- Measurement: **Luminous Efficacy** in Lumen Per Watt (lm/W)
  Luminous Efficacy Unit Conversion
- Measurement: **Solid Angle** in Steradian (sr)
  Solid Angle Unit Conversion

Check other formula lists

- **Advanced Illumination Formulas**
- **Illumination Parameters Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

12/18/2023 | 2:51:32 PM UTC *Please leave your feedback here...*