

Important Electronic Spectroscopy Formulas PDF



**Formulas
Examples
with Units**

List of 15 Important Electronic Spectroscopy Formulas

1) Angular Wavenumber Formula ↻

Formula

$$k = \frac{2 \cdot \pi}{\lambda_{\text{wave}}}$$

Example with Units

$$0.6347_{\text{m}} = \frac{2 \cdot 3.1416}{9.9_{\text{m}}}$$

Evaluate Formula ↻

2) Binding Energy of Photoelectron Formula ↻

Formula

$$E_{\text{binding}} = ([hP] \cdot \nu) - E_{\text{kinetic}} - \Phi$$

Example with Units

$$5.1261 \text{ N}^*_{\text{m}} = (6.6\text{E-}34 \cdot 1\text{E+}34 \text{ Hz}) - 6.6\text{E-}19 \text{ J} - 1.5 \text{ J}$$

Evaluate Formula ↻

3) Coherence Length of Wave Formula ↻

Formula

$$l_c = \frac{(\lambda_{\text{wave}})^2}{2 \cdot \Delta\lambda}$$

Example with Units

$$4.0838_{\text{m}} = \frac{(9.9_{\text{m}})^2}{2 \cdot 12_{\text{m}}}$$

Evaluate Formula ↻

4) Eigenvalue of Energy given Angular Momentum Quantum Number Formula ↻

Formula

$$E = \frac{1 \cdot (1 + 1) \cdot ([hP])^2}{2 \cdot I}$$

Example with Units

$$7.2\text{E-}63 \text{ J} = \frac{1.9 \cdot (1.9 + 1) \cdot (6.6\text{E-}34)^2}{2 \cdot 0.000168 \text{ kg} \cdot \text{m}^2}$$

Evaluate Formula ↻

5) Energy of Higher State Formula ↻

Formula

$$E_m = (v_{mn} \cdot [hP]) + E_n$$

Example with Units

$$8.3\text{E-}33 \text{ J} = (5 \text{ Hz} \cdot 6.6\text{E-}34) + 5\text{E-}33 \text{ J}$$

Evaluate Formula ↻

6) Energy of Lower State Formula ↻

Formula

$$E_n = (v_{mn} \cdot [hP]) + E_m$$

Example with Units

$$1.1\text{E-}32 \text{ J} = (5 \text{ Hz} \cdot 6.6\text{E-}34) + 8\text{E-}33 \text{ J}$$

Evaluate Formula ↻



7) Frequency of Absorbed Radiation Formula

Formula

$$\nu_{mn} = \frac{E_m - E_n}{[hP]}$$

Example with Units

$$4.5276 \text{ Hz} = \frac{8\text{E-}33\text{J} - 5\text{E-}33\text{J}}{6.6\text{E-}34}$$

Evaluate Formula 

8) Kinetic Energy of Photoelectron Formula

Formula

$$E_{\text{kinetic}} = ([hP] \cdot \nu) - E_{\text{binding}} - \Phi$$

Example with Units

$$0.0261\text{J} = (6.6\text{E-}34 \cdot 1\text{E+}34 \text{ Hz}) - 5.1\text{N*m} - 1.5\text{J}$$

Evaluate Formula 

9) Moment of Inertia given Eigen Value of Energy Formula

Formula

$$I = \frac{1 \cdot (1 + 1) \cdot ([hP])^2}{2 \cdot E}$$

Example with Units

$$0.0002 \text{ kg}\cdot\text{m}^2 = \frac{1.9 \cdot (1.9 + 1) \cdot (6.6\text{E-}34)^2}{2 \cdot 7\text{E-}63\text{J}}$$

Evaluate Formula 

10) Range of Wavelength Formula

Formula

$$\Delta\lambda = \frac{(\lambda_{\text{wave}})^2}{2 \cdot I_C}$$

Example with Units

$$12.2207 \text{ m} = \frac{(9.9 \text{ m})^2}{2 \cdot 4.01 \text{ m}}$$

Evaluate Formula 

11) Rydberg Constant given Compton Wavelength Formula

Formula

$$R = \frac{(\alpha)^2}{2 \cdot \lambda_c}$$

Example with Units

$$1.1\text{E-}7 \text{ cm}^{-1} = \frac{(7.297\text{E-}3)^2}{2 \cdot 2.42 \text{ m}}$$

Evaluate Formula 

12) Spectroscopic Wave Number Formula

Formula

$$\tilde{\nu} = \frac{1}{\lambda_{\text{lightwave}}}$$

Example with Units

$$0.0005 \text{ cm}^{-1} = \frac{1}{21 \text{ m}}$$

Evaluate Formula 

13) Wavelength given Angular Wave Number Formula

Formula

$$\lambda_{\text{wave}} = \frac{2 \cdot \pi}{k}$$

Example with Units

$$9.9733 \text{ m} = \frac{2 \cdot 3.1416}{0.63 \text{ m}}$$

Evaluate Formula 

14) Wavelength given Spectroscopic Wave Number Formula

Formula

$$\lambda_{\text{lightwave}} = \frac{1}{\tilde{\nu}}$$

Example with Units

$$20 \text{ m} = \frac{1}{0.0005 \text{ cm}^{-1}}$$

Evaluate Formula 



15) Work Function Formula

Evaluate Formula 

Formula

$$\Phi = ([hP] \cdot \nu) - E_{\text{binding}} - E_{\text{kinetic}}$$

Example with Units

$$1.5261_{\text{J}} = (6.6\text{E-}34 \cdot 1\text{E+}34_{\text{Hz}}) - 5.1\text{N*m} - 6.6\text{E-}19_{\text{J}}$$



Variables used in list of Electronic Spectroscopy Formulas above

- **E** Eigenvalue of Energy (*Joule*)
- **E_{binding}** Binding Energy of Photoelectron (*Newton Meter*)
- **E_{kinetic}** Kinetic Energy of Photoelectron (*Joule*)
- **E_m** Energy of Higher State (*Joule*)
- **E_n** Energy of Lower State (*Joule*)
- **I** Moment of Inertia (*Kilogram Square Meter*)
- **k** Angular Wavenumber (*Meter*)
- **l** Angular Momentum Quantum Number
- **l_C** Coherence Length (*Meter*)
- **R** Rydberg Constant (*1 per Centimeter*)
- **v⁻** Spectroscopic Wavenumber (*1 per Centimeter*)
- **α** Fine-Structure Constant
- **Δλ** Range of Wavelengths (*Meter*)
- **λ_C** Compton Wavelength (*Meter*)
- **λ_{lightwave}** Wavelength of Light Wave (*Meter*)
- **λ_{wave}** Wavelength of Wave (*Meter*)
- **v** Photon Frequency (*Hertz*)
- **v_{mn}** Frequency of Absorbed Radiation (*Hertz*)
- **Φ** Work Function (*Joule*)

Constants, Functions, Measurements used in list of Electronic Spectroscopy Formulas above

- **constant(s):** pi, 3.14159265358979323846264338327950288
Archimedes' constant
- **constant(s):** [hP], 6.626070040E-34
Planck constant
- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Energy** in Joule (J)
Energy Unit Conversion 
- **Measurement: Frequency** in Hertz (Hz)
Frequency Unit Conversion 
- **Measurement: Wavelength** in Meter (m)
Wavelength Unit Conversion 
- **Measurement: Torque** in Newton Meter (N*m)
Torque Unit Conversion 
- **Measurement: Moment of Inertia** in Kilogram Square Meter (kg·m²)
Moment of Inertia Unit Conversion 
- **Measurement: Reciprocal Length** in 1 per Centimeter (cm⁻¹)
Reciprocal Length Unit Conversion 



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