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Raman Spectroscopy Formulas

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List of 13 Raman Spectroscopy Formulas

Raman Spectroscopy

1) Anti Stokes Scattering Frequency

Open Calculator

fx $$\nu_{as} = \nu_{initial} + \nu_{vib}$$

ex $$33\text{Hz} = 31\text{Hz} + 2\text{Hz}$$

2) Depolarization Ratio

Open Calculator

fx $$\rho = \left(\frac{I_{perpendicular}}{I_{parallel}}\right)$$

ex $$8.421053 = \left(\frac{16\text{cd}}{1.9\text{cd}}\right)$$

3) Electric Field given Polarizability

Open Calculator

fx $$E = \frac{\mu}{\alpha}$$

ex $$599.7001\text{V/m} = \frac{400\text{C*m}}{0.667\text{C*m}^2\text{/V}}$$

4) Energy 1 of Vibrational Level

Open Calculator

fx $$E_1 = E_2 - (f_{1,2} \cdot [hP])$$

ex $$55J = 55J - (90Hz \cdot [hP])$$

5) Energy 2 of Vibrational Level

Open Calculator

fx $$E_2 = E_1 + (f_{1,2} \cdot [hP])$$

ex $$54J = 54J + (90Hz \cdot [hP])$$

6) Frequency Associated to Transition

Open Calculator

fx $$f = \frac{E_2 - E_1}{[hP]}$$

ex $$1.5E\hat{}33Hz = \frac{55J - 54J}{[hP]}$$

7) Incident Frequency given Anti Stokes Frequency

Open Calculator

fx $$v_0 = v_{as} - v_{vib}$$

ex $$32.5Hz = 34.5Hz - 2Hz$$

8) Incident Frequency given Stokes Frequency

Open Calculator

fx $$v_0 = v_s + v_{vib}$$

ex $$30Hz = 28Hz + 2Hz$$

9) Molecular Dipole Moment

Open Calculator

fx $\mu = \alpha \cdot E$

ex $400.2\text{C*m} = 0.667\text{C*m}^2/\text{V} \cdot 600\text{V/m}$

10) Polarizability

Open Calculator

fx $\alpha = \frac{\mu}{E}$

ex $0.666667\text{C*m}^2/\text{V} = \frac{400\text{C*m}}{600\text{V/m}}$

11) Stokes Scattering Frequency

Open Calculator

fx $v_s = v_{initial} - v_{vib}$

ex $29\text{Hz} = 31\text{Hz} - 2\text{Hz}$

12) Vibrational Frequency given Anti Stokes Frequency

Open Calculator

fx $v_{vib\ anti} = v_{as} - v_0$

ex $4.5\text{Hz} = 34.5\text{Hz} - 30\text{Hz}$

13) Vibrational Frequency given Stokes Frequency

Open Calculator

fx $v_{vib} = v_0 - v_s$

ex $2\text{Hz} = 30\text{Hz} - 28\text{Hz}$

Variables Used

- **E** Electric Field *(Volt per Meter)*
- E_1 Energy Level 1 *(Joule)*
- E_2 Energy Level 2 *(Joule)*
- **f** Transition Frequency (1 to 2) *(Hertz)*
- $f_{1,2}$ Transition Frequency *(Hertz)*
- $I_{parallel}$ Intensity of Parallel Component *(Candela)*
- $I_{perpendicular}$ Intensity of Perpendicular Component *(Candela)*
- v_0 Incident Frequency *(Hertz)*
- v_{as} Anti Stokes Frequency *(Hertz)*
- $v_{initial}$ Initial Frequency *(Hertz)*
- v_s Stokes Scattering Frequency *(Hertz)*
- $v_{vib\ anti}$ Vibrational Frequency in Anti Stokes *(Hertz)*
- v_{vib} Vibrational Frequency *(Hertz)*
- **α** Polarizability *(Coulomb Square Meter per Volt)*
- **μ** Molecular Dipole Moment *(Coulomb Meter)*
- **ρ** Depolarization Ratio

Constants, Functions, Measurements used

- Constant: **[hP]**, 6.626070040E-34 Kilogram Meter² / Second
  Planck constant
- Measurement: **Luminous Intensity** in Candela (cd)
  Luminous Intensity Unit Conversion
- Measurement: **Energy** in Joule (J)
  Energy Unit Conversion
- Measurement: **Frequency** in Hertz (Hz)
  Frequency Unit Conversion
- Measurement: **Electric Field Strength** in Volt per Meter (V/m)
  Electric Field Strength Unit Conversion
- Measurement: **Electric Dipole Moment** in Coulomb Meter (C*m)
  Electric Dipole Moment Unit Conversion
- Measurement: **Polarizability** in Coulomb Square Meter per Volt (C*m²/V)
  Polarizability Unit Conversion

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- **Nuclear Magnetic Resonance Spectroscopy Formulas**
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