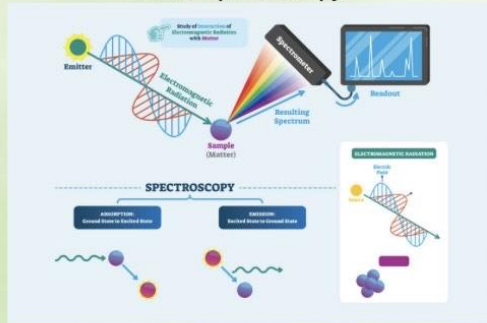


# Spectroscopy Application on Connective Tissue and Prostate Cancer

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## What is Spectroscopy?

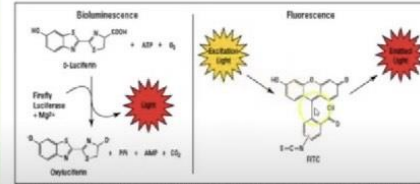


<sup>1</sup> Spectroscopy provides non destructive and non-invasive medical diagnostics with optical techniques able to be used in real time. Some nonmedical uses of spectroscopy are applied in astronomy and geography.

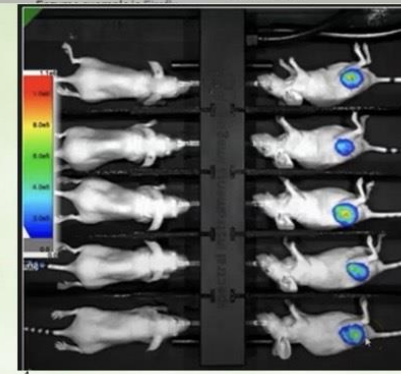
## How Does Spectroscopy Benefit Us?

- **Optical imaging:** Detection of visible light photons:
  - **Bioluminescence:** Light produced by enzymes
  - **Fluorescence:** Light emitted from molecular probes

*In-Vivo*

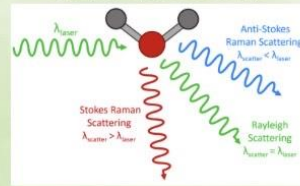


- Light is produced by enzyme.
- Light is emitted by a molecular probe, following its absorption of "excitation light"

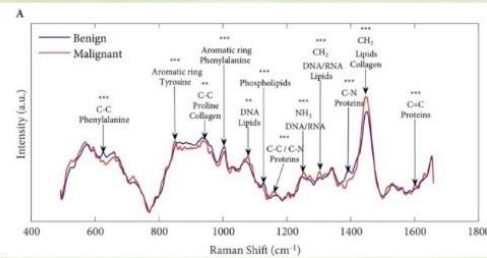


Optical imaging is particularly useful for visualizing soft tissues, similar to a mri.

## Raman Spectroscopy



<sup>1</sup> Raman bands arise due to scattering of light by vibrational modes in a molecule.



<sup>2</sup> Cancer cell detection can be difficult and invasive for benign and malignant carcinomas. Some cancer development is also asymptomatic. Spectroscopy determines chemical characterization and composition.

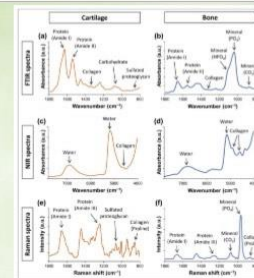
## The Spectra

Table 3. Typical absorbance bands of relevance to the analysis of NIR spectra of connective tissues. [41,42,43,44,45,46,47,48,49]

Frequency (cm <sup>-1</sup> )	Tissue Component
8500	Water (O-H stretching and bending)
7000	Water (O-H stretching)
6688	Protein/collagen (N-H stretching)
5800	Lipid (CH <sub>2</sub> stretching)
5200	Water (O-H stretching and bending)
4890	Protein/collagen (N-H bending)
4910	Protein/collagen (C-H stretching and deformation)
4310	Proteoglycan (sugar ring vibrations)

## References

- <sup>1</sup> Pasco. 2022. What is Spectroscopy? [online] Available at: <https://www.pasco.com/products/guides/what-is-spectroscopy> [Accessed 1 June 2022].
- <sup>2</sup> Gaba, F., Tipping, W. J., Salji, M., Faulds, K., Graham, D., & Leung, H. Y. (2022, March 17). Raman spectroscopy in prostate cancer: Techniques, applications and advancements. Cancers. Retrieved June 1, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8946151/
- <sup>3</sup> Querido, W., Kandel, S., & Pleshko, N. (2021, February 9). Applications of vibrational spectroscopy for analysis of connective tissues. MDPI. Retrieved June 1, 2022, from https://www.mdpi.com/1420-3049/26/4/922
- <sup>4</sup> YouTube. (2020). How In Vivo Imaging Works: Bioluminescence & Fluorescence, Reporter Expression, and more! YouTube. Retrieved June 1, 2022, from https://www.youtube.com/watch?v=ZqtNMUhi8.



<sup>3</sup> The spectra provides info on chemical composition ultimately helping in disease detection.