SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

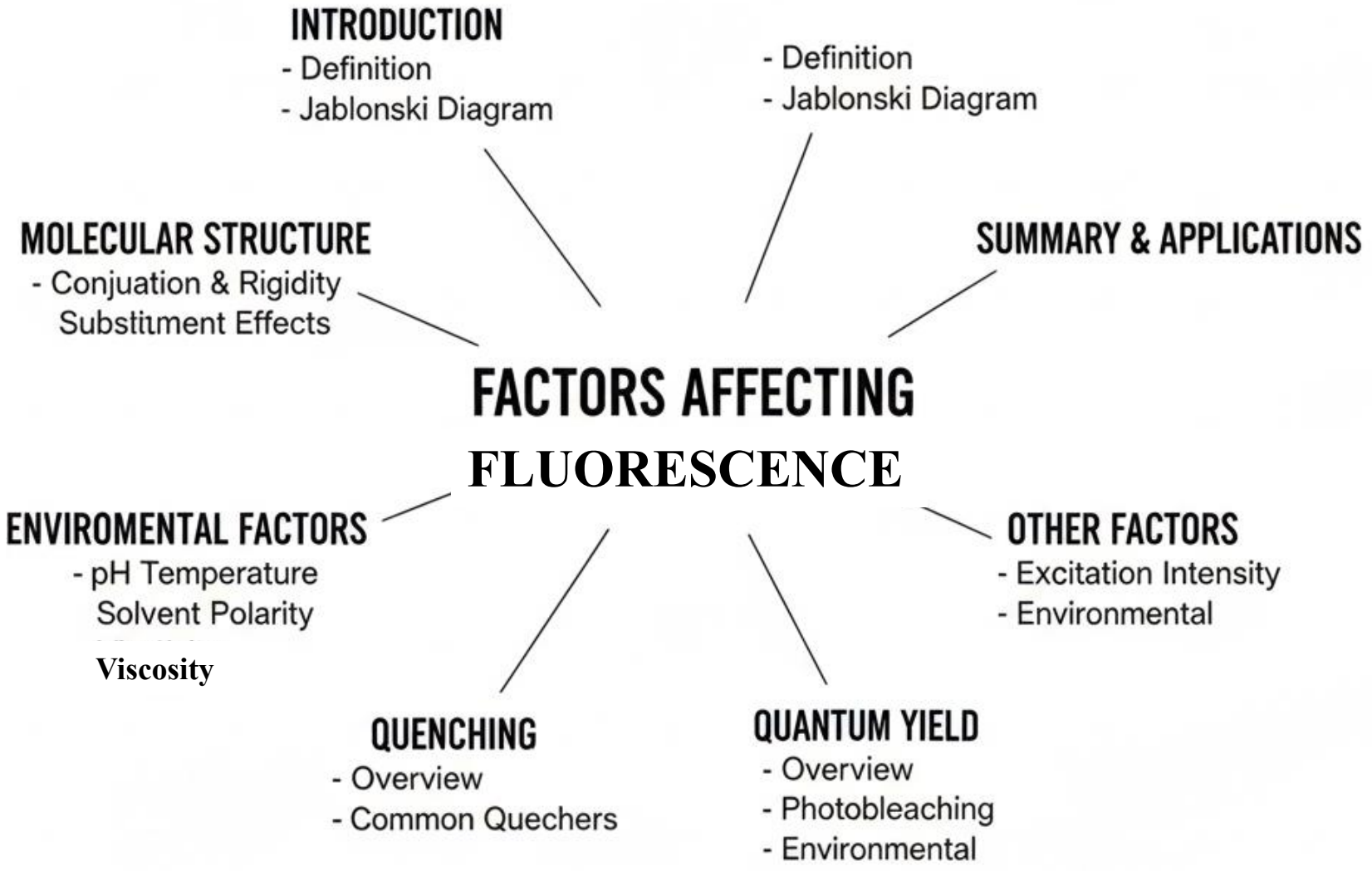
Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai
Approved by Pharmacy Council of India, New Delhi.
Coimbatore -641035

COURSE NAME: INSTRUMENTAL METHODS OF ANALYSIS (BP 701 T)

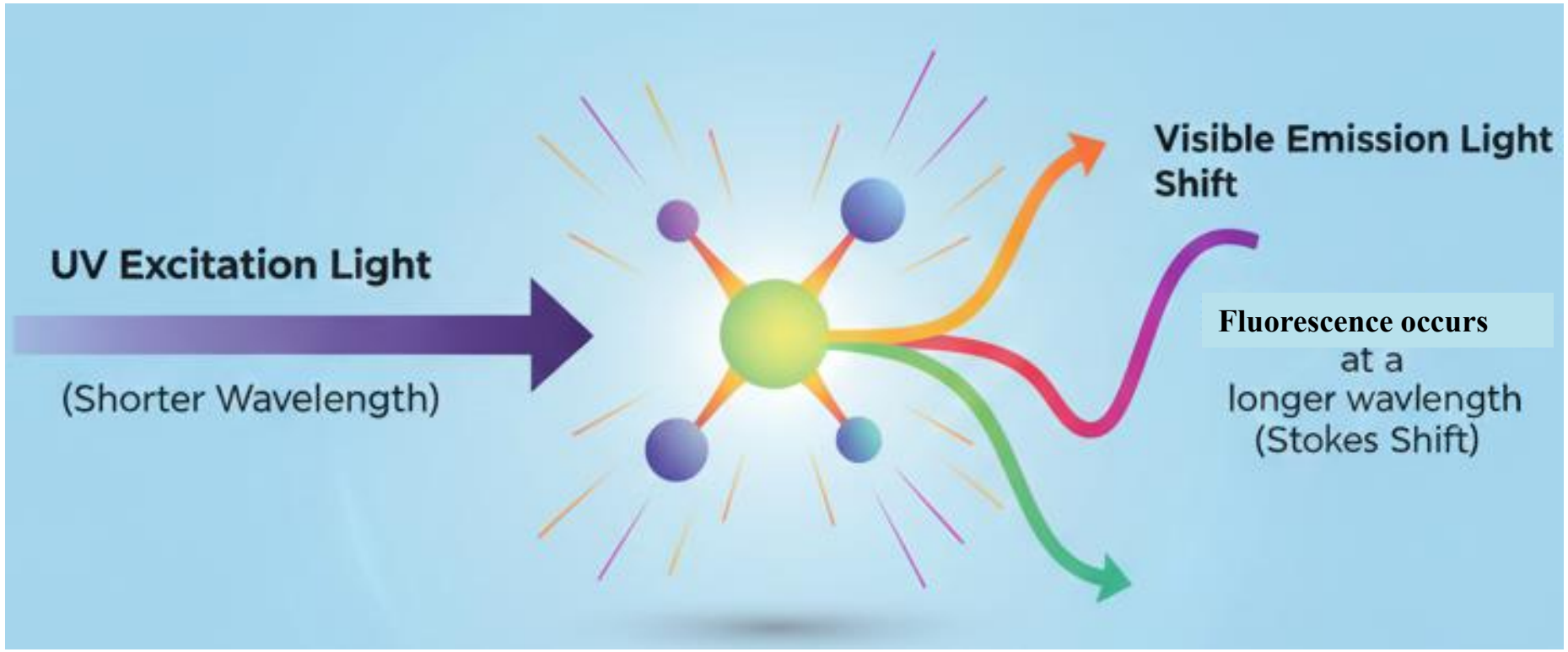
VII SEM/ IV YEAR

TOPIC 8: FACTORS AFFECTING FLUORESCENCE

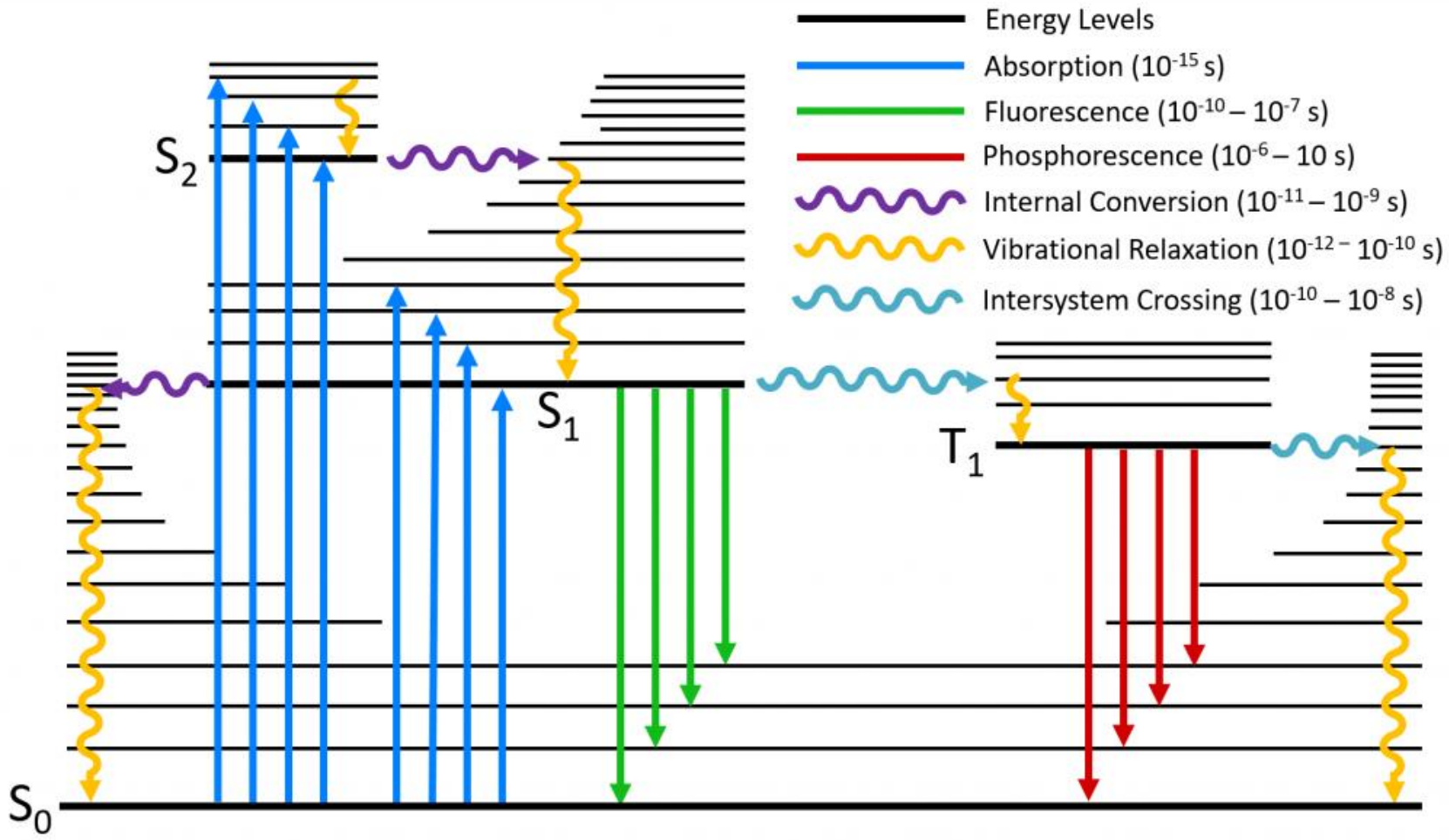
MINDMAP:


INTRODUCTION
- Definition
- Jablonski Diagram
- Definition
- Jablonski Diagram
MOLECULAR STRUCTURE
- Conjuation & Rigidity
Substitment Effects
SUMMARY & APPLICATIONS
FACTORS AFFECTING
FLUORESCENCE
ENVIROMENTAL FACTORS
- pH Temperature
Solvent Polarity
Viscosity
OTHER FACTORS
- Excitation Intensity
- Environmental
QUENCHING
- Overview
- Common Quechers
QUANTUM YIELD
- Overview
- Photobleaching
- Environmental

Fluorescence

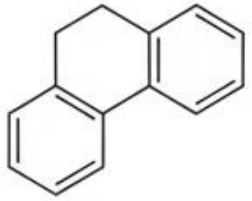


Jablonski Diagram



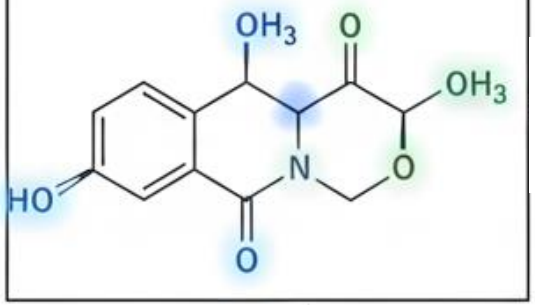
Molecular Structure - Conjugation and Rigidity

AROMATIC RINGS → EXTENDED CONJUGATION → STRONG FLUORESCENCE



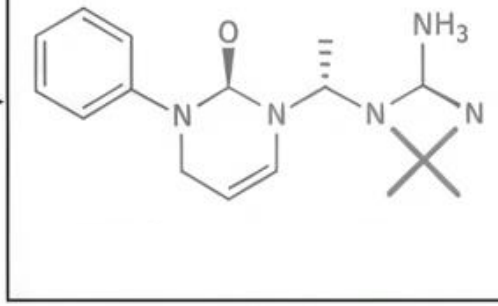
EXTENDED CONJUGATION → RIGID PLANAR STRUCTURES → HIGH INTENSITY; REDUCED VIBRATIONAL LOSS

RIGID PLANAR STRUCTURES → FLUORESCEIN (RIGID)



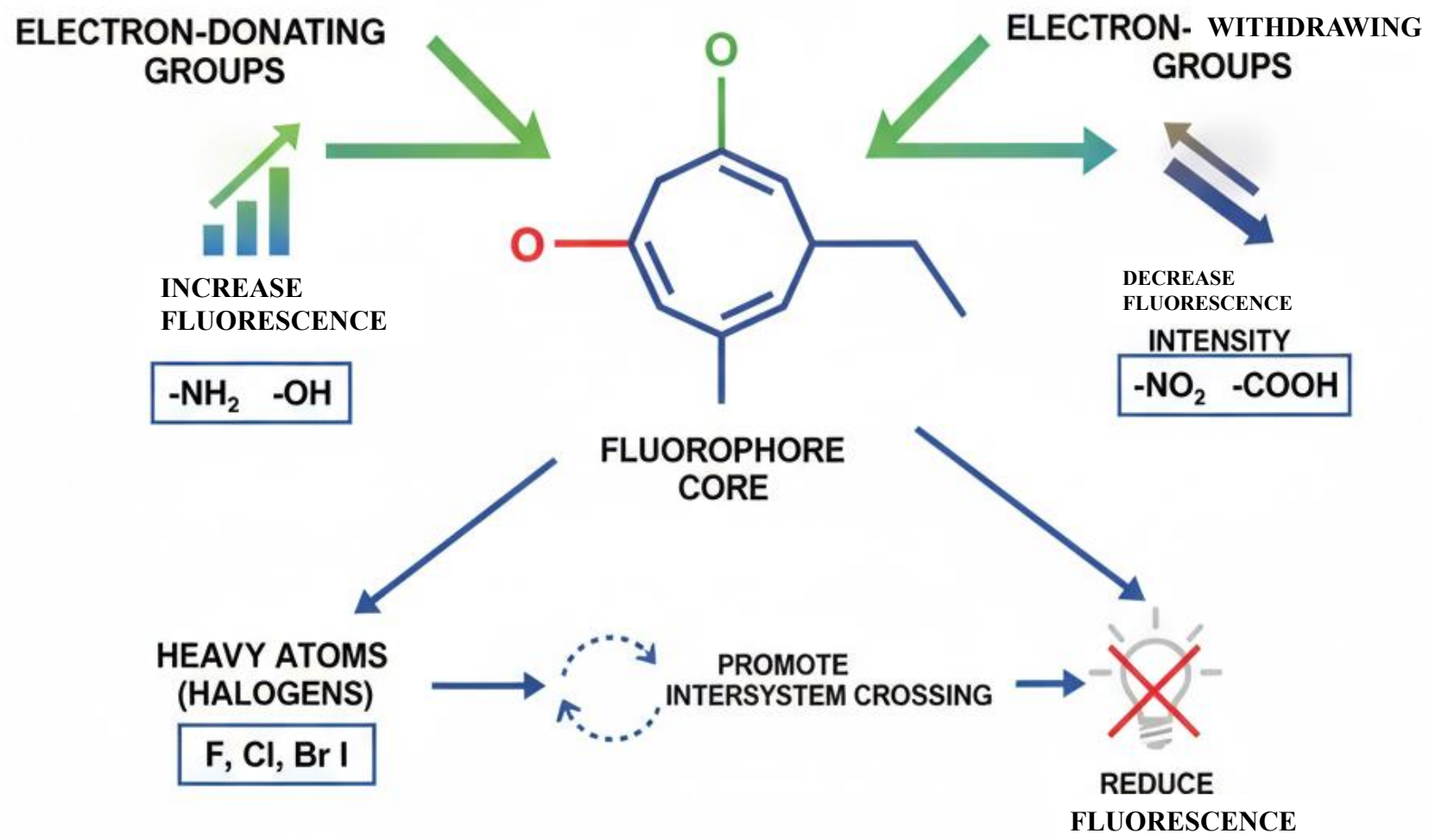
STRONG FLUORESCENCE

RIGID PLANAR STRUCTURES → FLEXIBLE ANALOGS

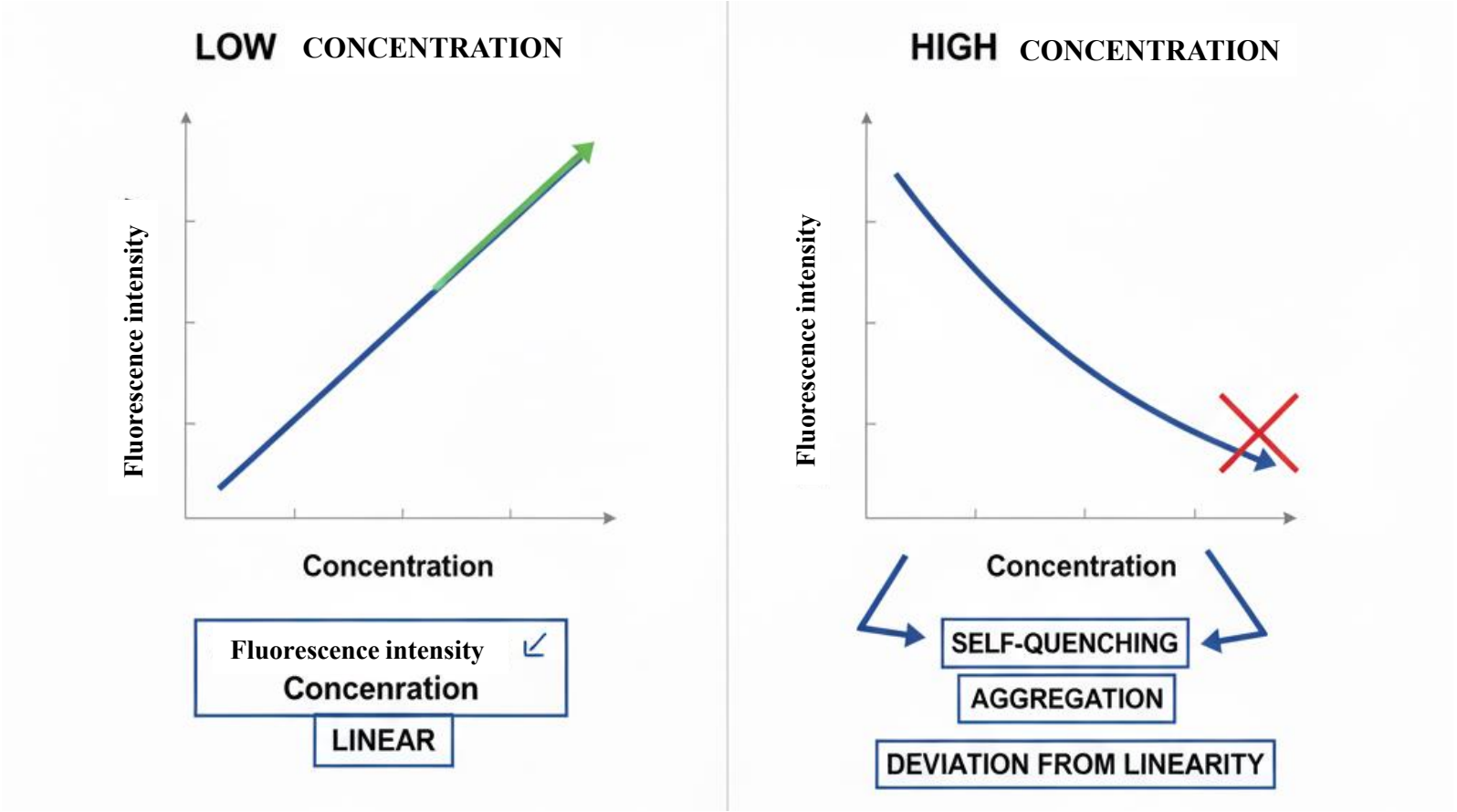


WEAK/ NO FLUORESCENCE

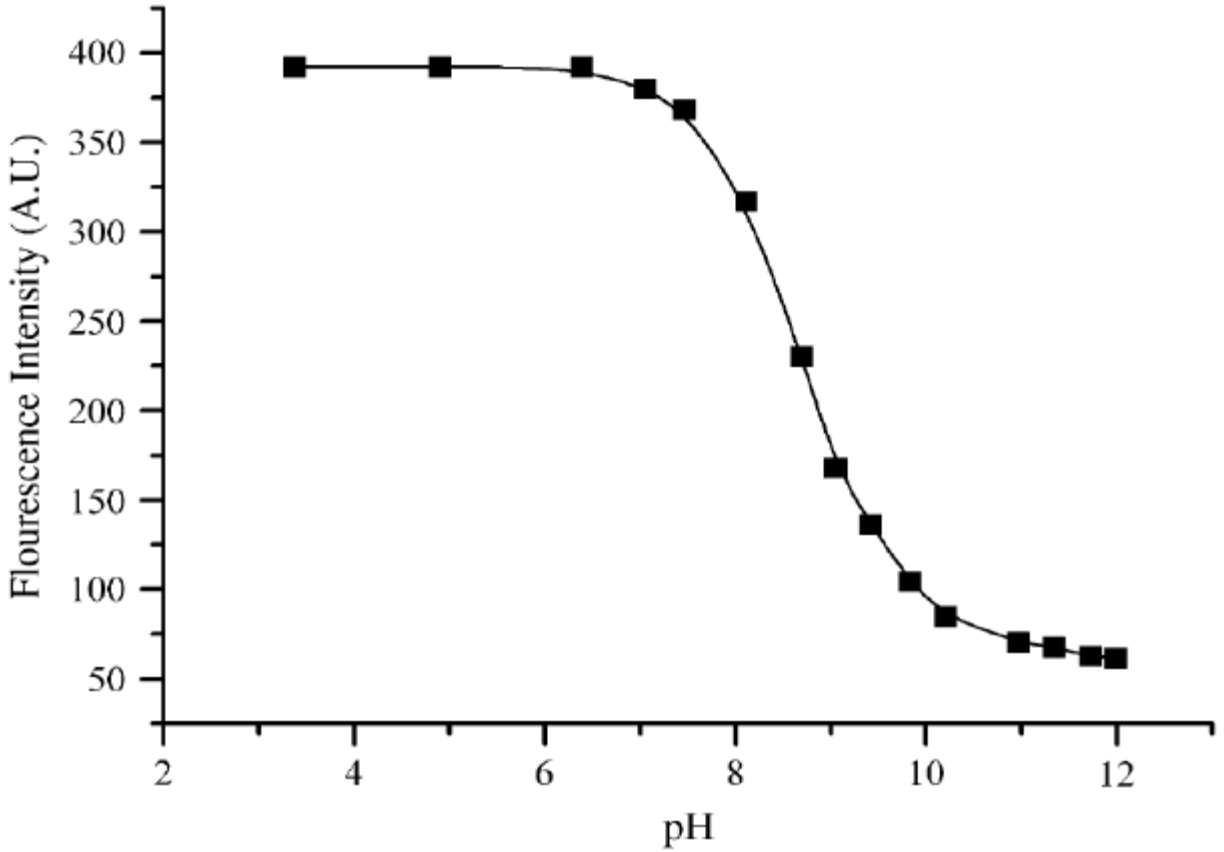
Substituent Effects



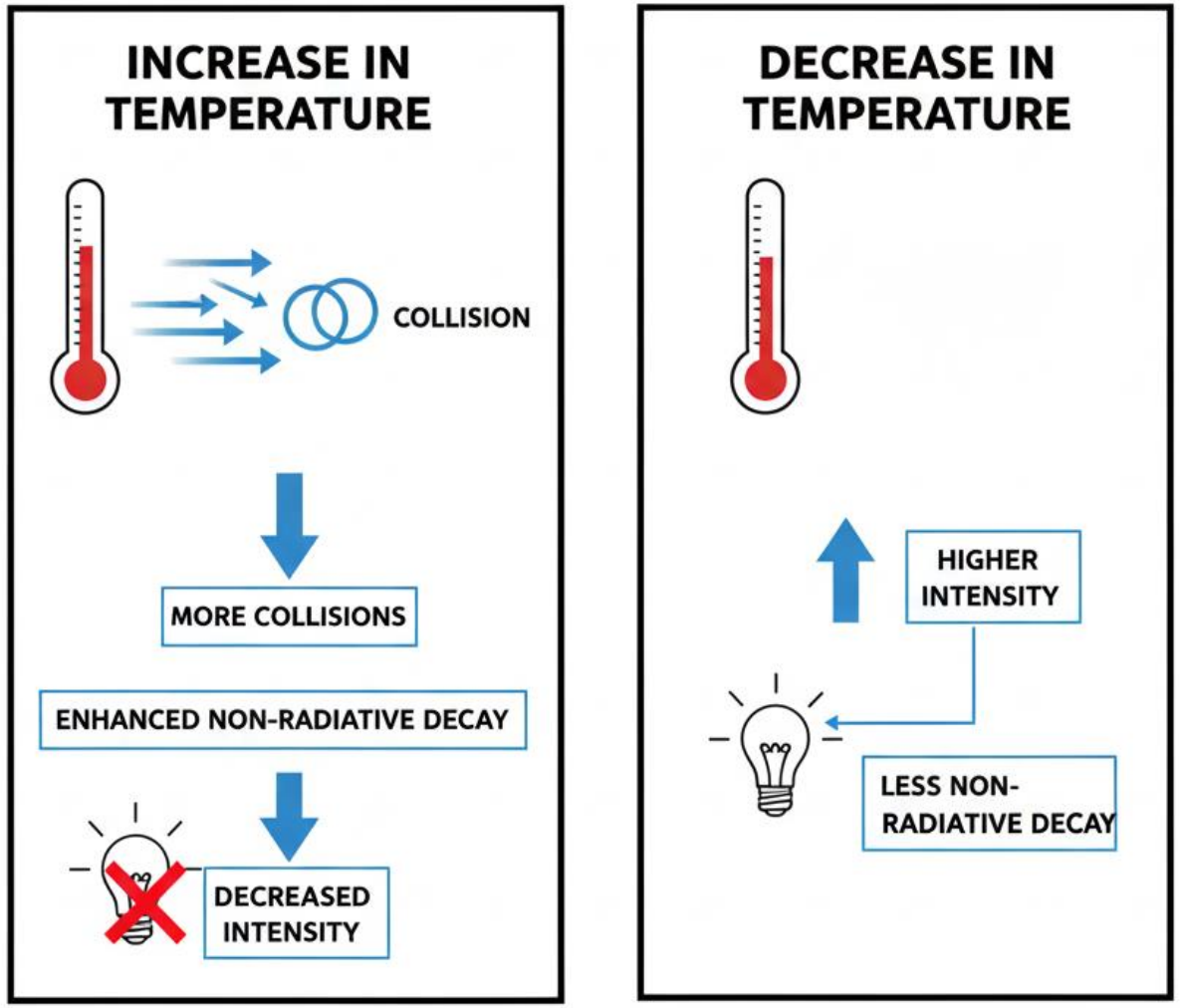
Concentration Effects



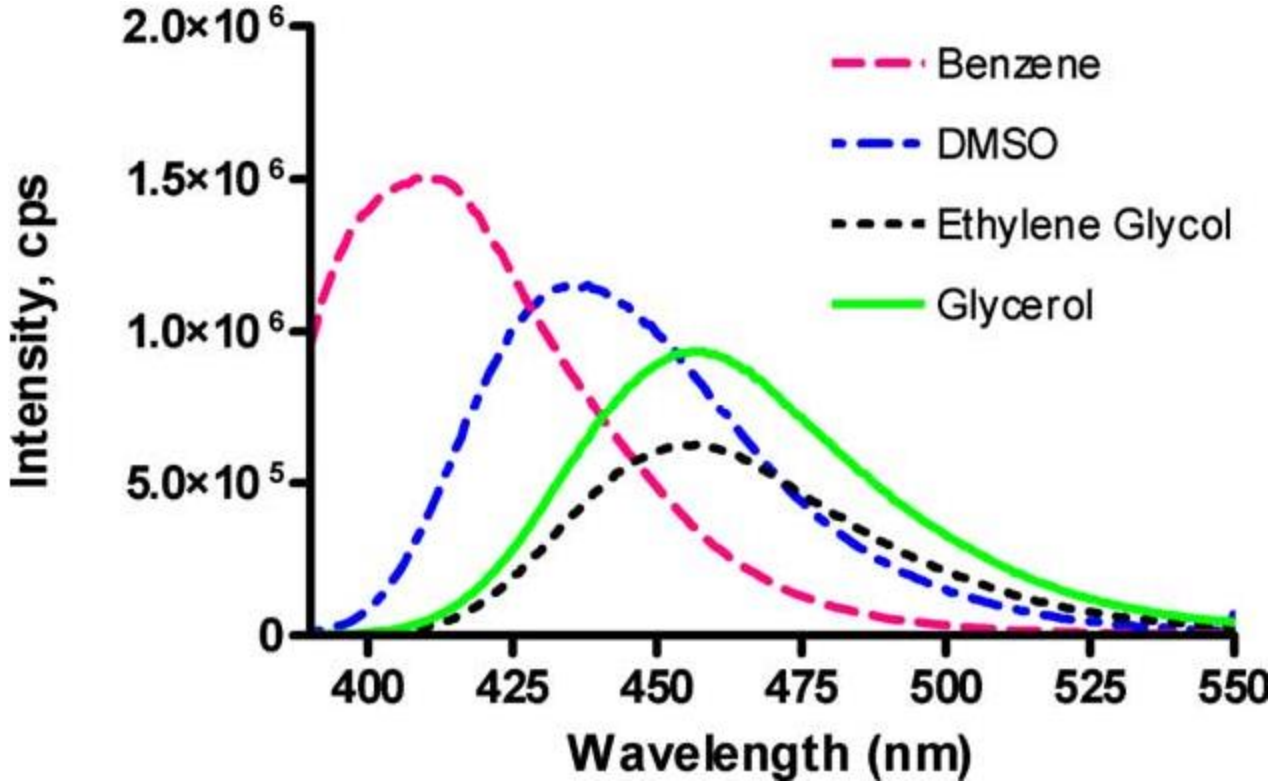
pH Effects


Flourescence Intensity (A.U.)
400
350
300
250
200
150
100
50
2
4
6
8
10
12
pH

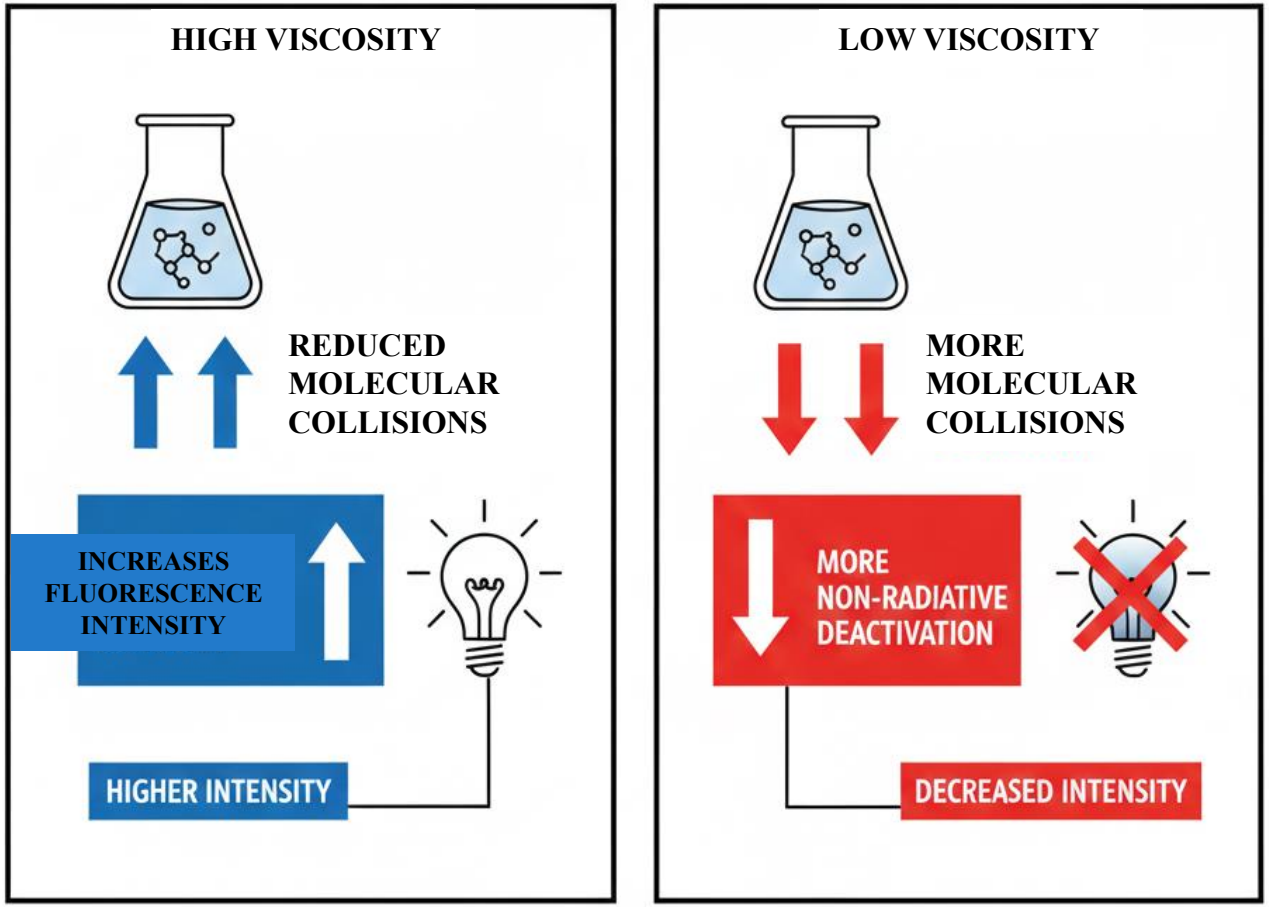
Temperature Effects



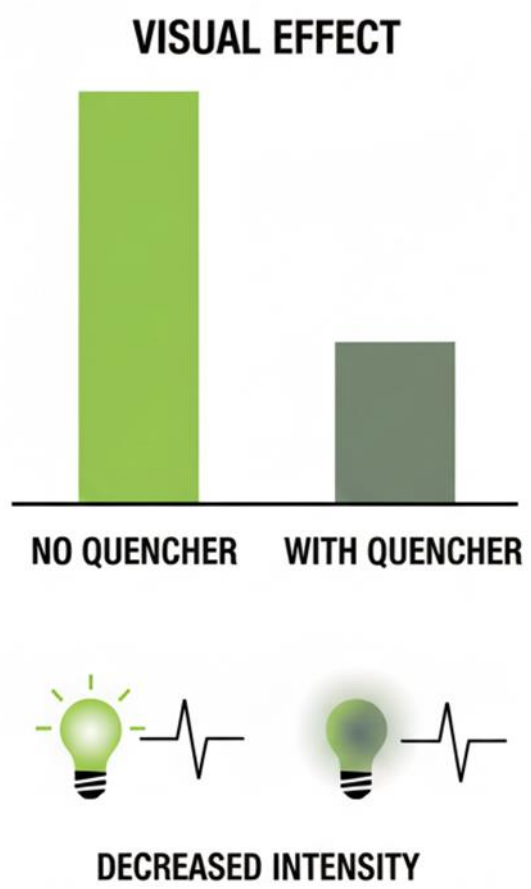
Solvent Polarity Effects

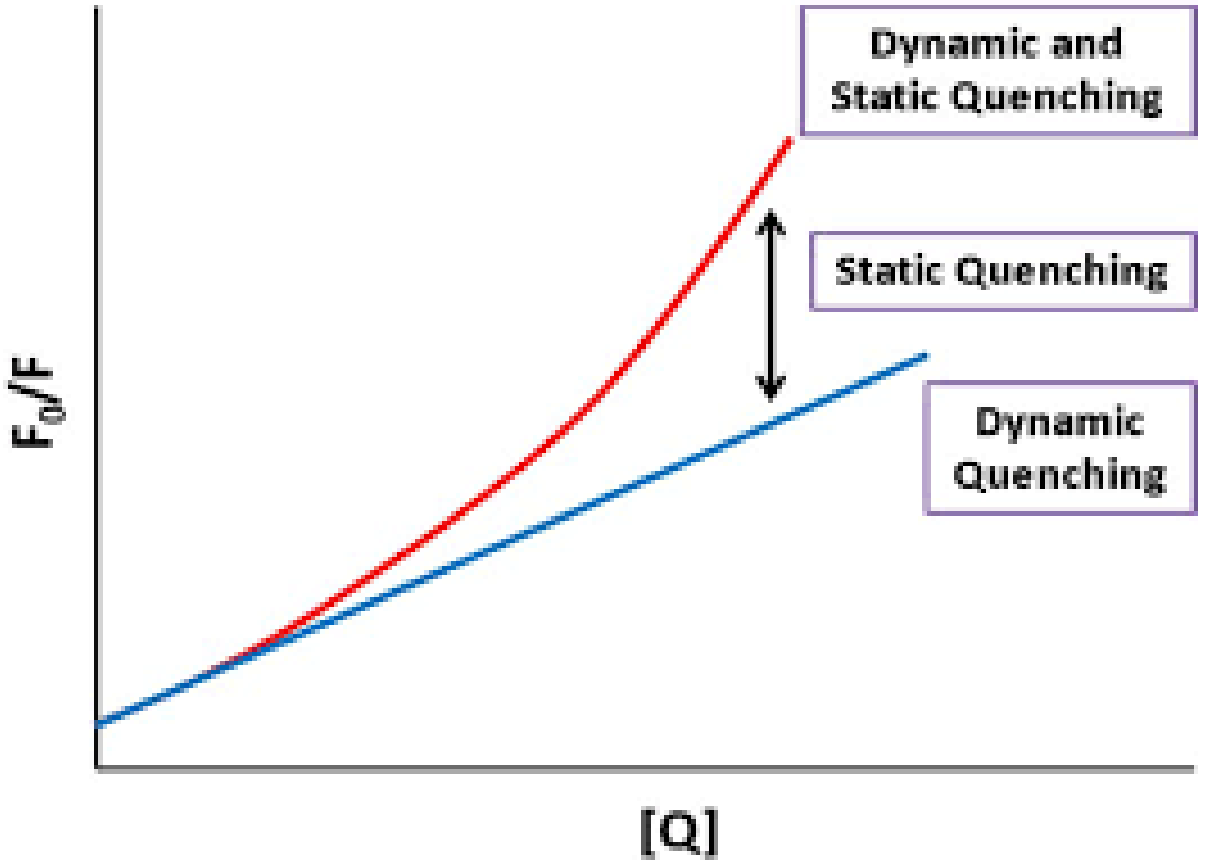


Viscosity Effects

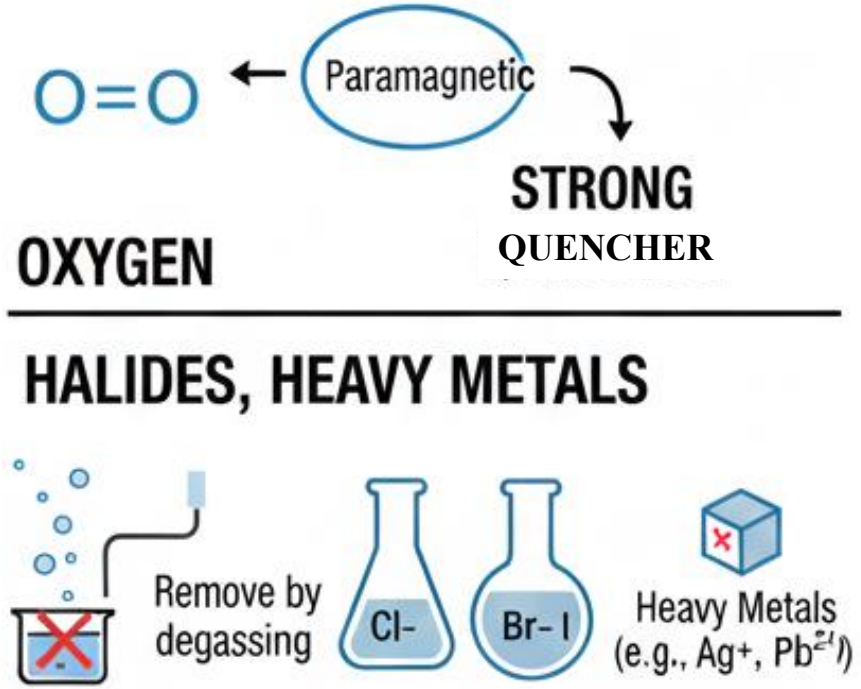


Quenching


VISUAL EFFECT
NO QUENCHER
WITH QUENCHER
DECREASED INTENSITY

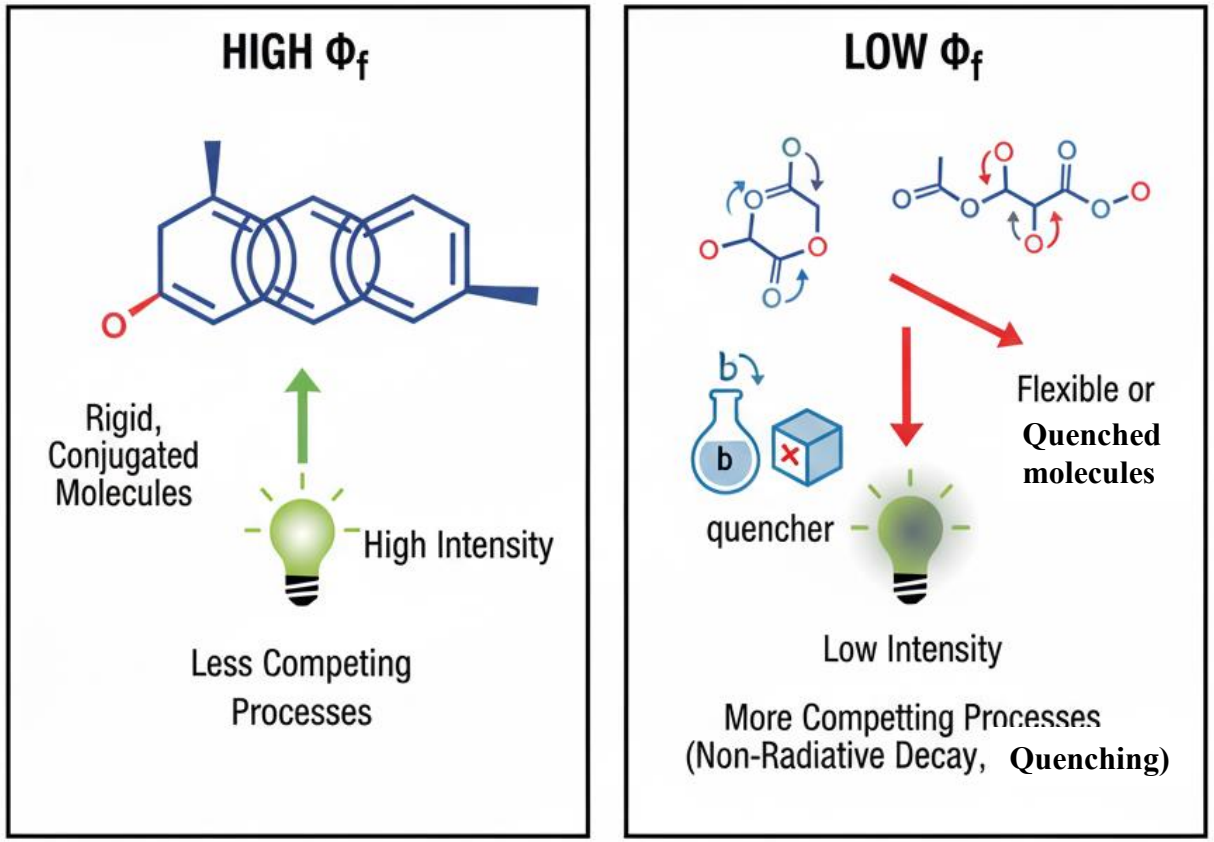

Dynamic and Static Quenching
Static Quenching
Dynamic Quenching
F_0/F
[Q]

Common Quenchers



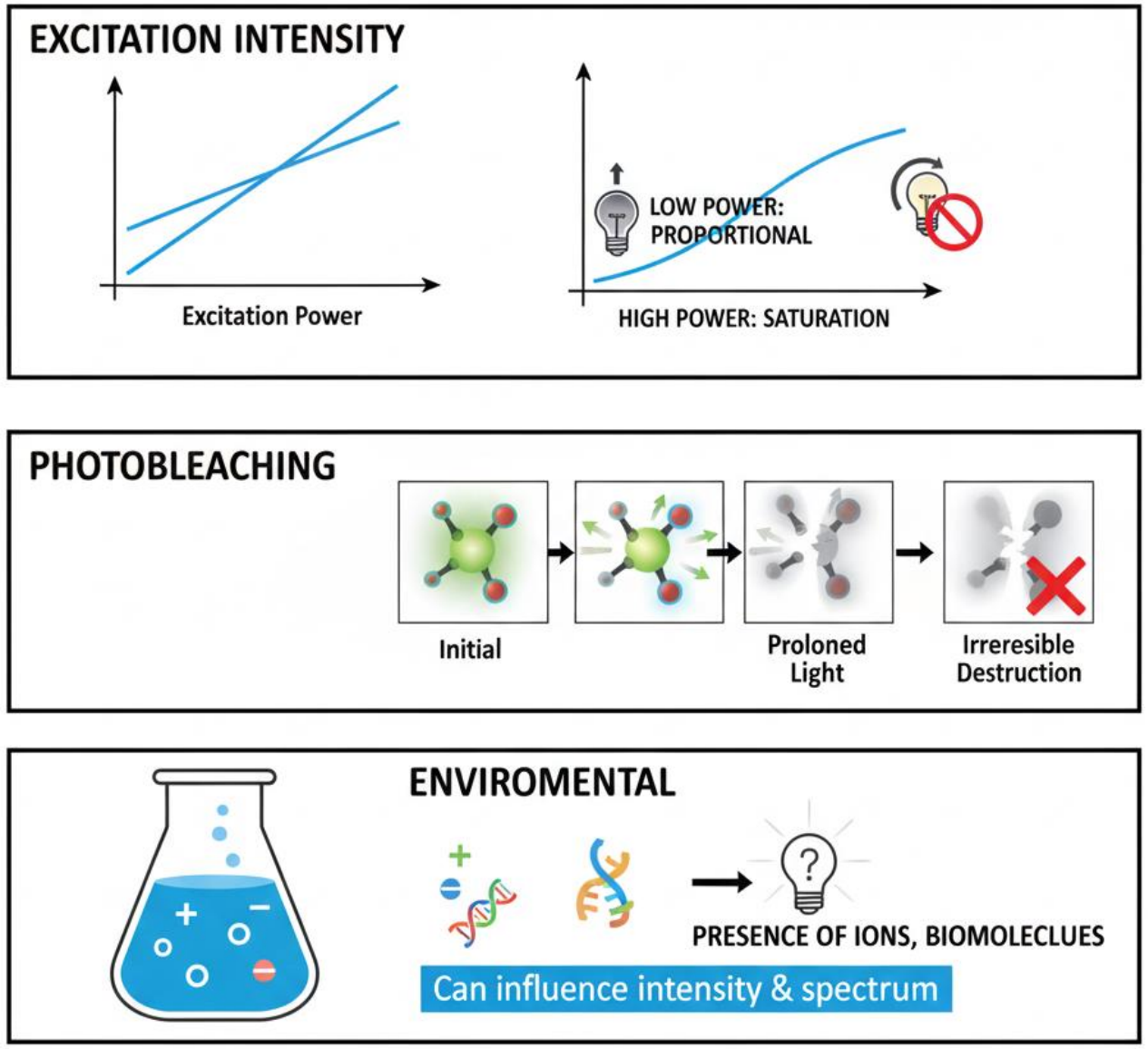
Quantum Yield (Φf)

Φ_f = Photons Emitted / Photons **Absorbed**



Influenced by all competing processes (e.g., non-radiative decay, quenching

Other Factors



Summary

KEY FACTORS

- Structure
- Concentration
- pH
- Temperature
- Solvent/Visosity

CONTROL THESE FOR ACCURATE FLUORIMETRY

APPLICATIONS

- Structure
- Quantiative Analysis
- Sensing
- Imaging

Assessment

1. Fluorescence of phenol is stronger in:

Assessment

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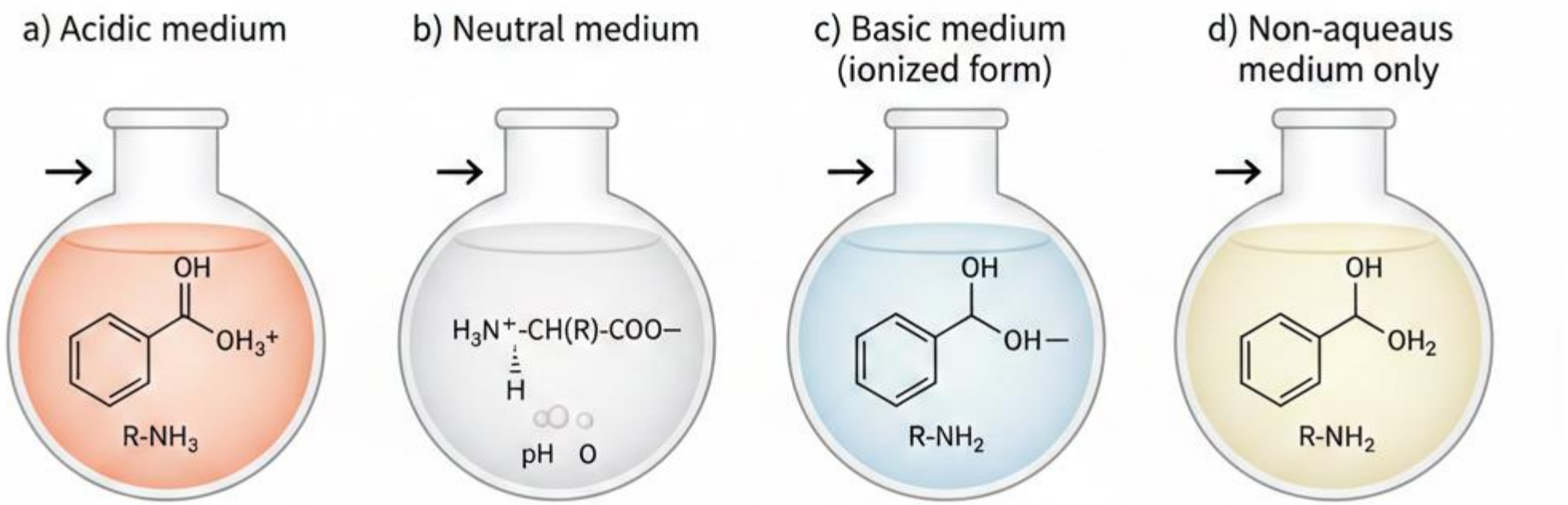

Assessment

2. In polar protic solvents, the emission spectrum of a fluorophore often shows:

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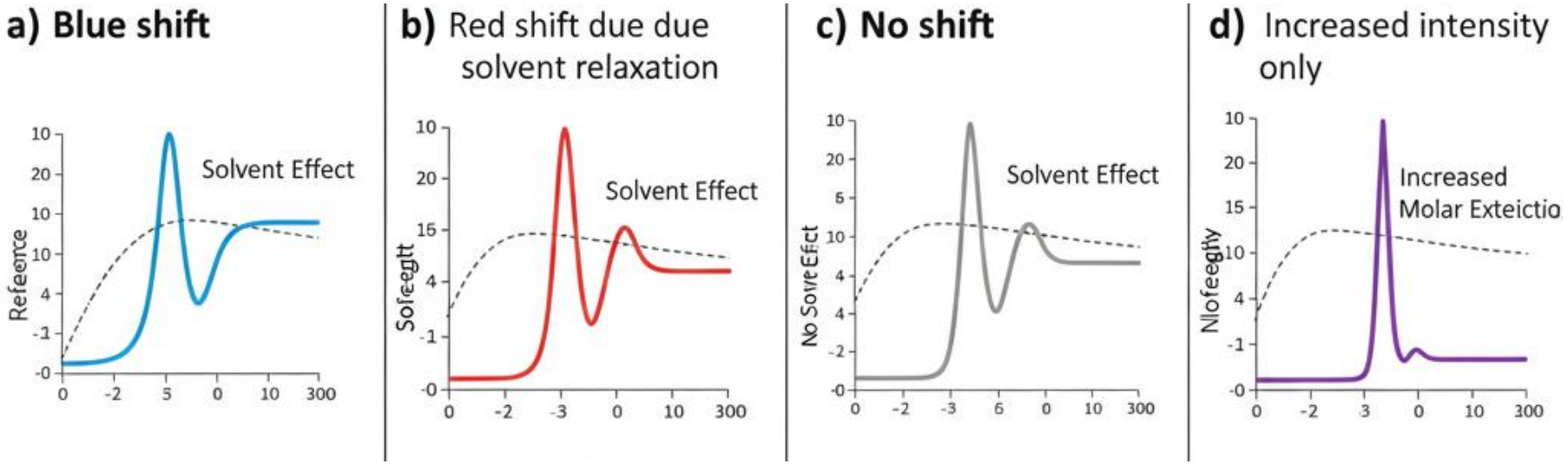


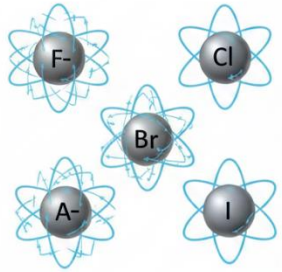
Assessment

3. Which factor does NOT typically cause quenching?

Assessment

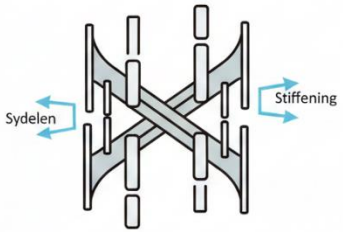
3. Which factor does NOT typically cause quenching?

a) Halide ions



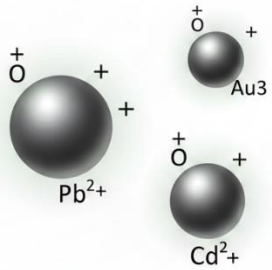
F-, Cl. Br, I-

b) Increased rigidity



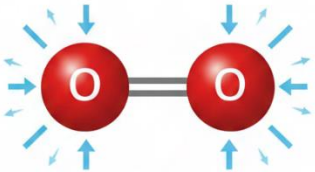
Cross-linking, Stiffening

c) Heavy metal ions



Pb^{2+} Hg^{2+} Au3

d) Molecular oxygen



O_2, Dioxigen

References

1. Lakowicz JR. Principles of fluorescence spectroscopy. 3rd ed. New York (NY): Springer; 2006.
2. Skoog DA, Holler FJ, Crouch SR. Principles of instrumental analysis. 7th ed. Boston (MA): Cengage Learning; 2018.
3. Guilbault GG, editor. Practical fluorescence. 2nd ed. New York (NY): Marcel Dekker; 1990.
4. Valeur B, Berberan-Santos MN. Molecular fluorescence: principles and applications. 2nd ed. Weinheim (Germany): Wiley-VCH; 2012.


Thank you!