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.

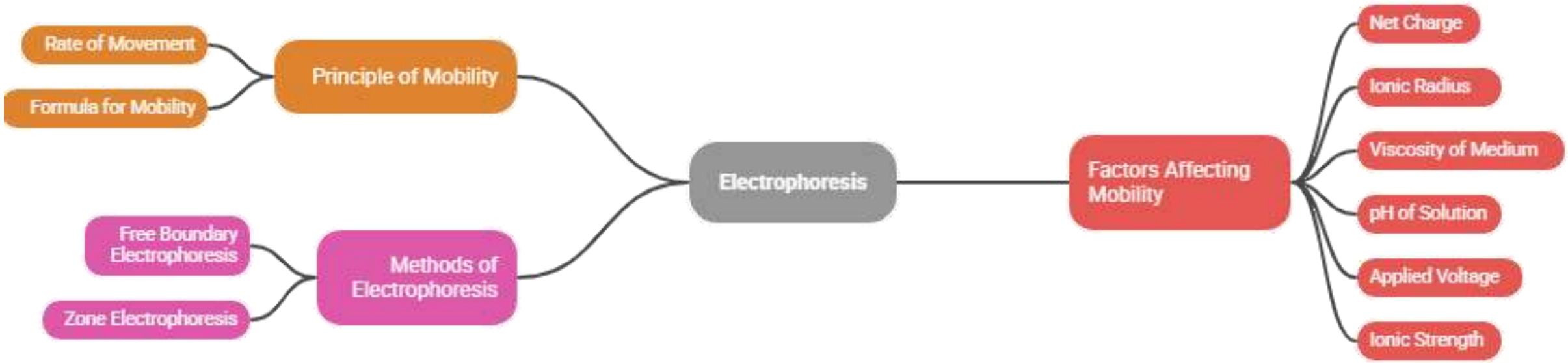
Coimbatore -641035

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

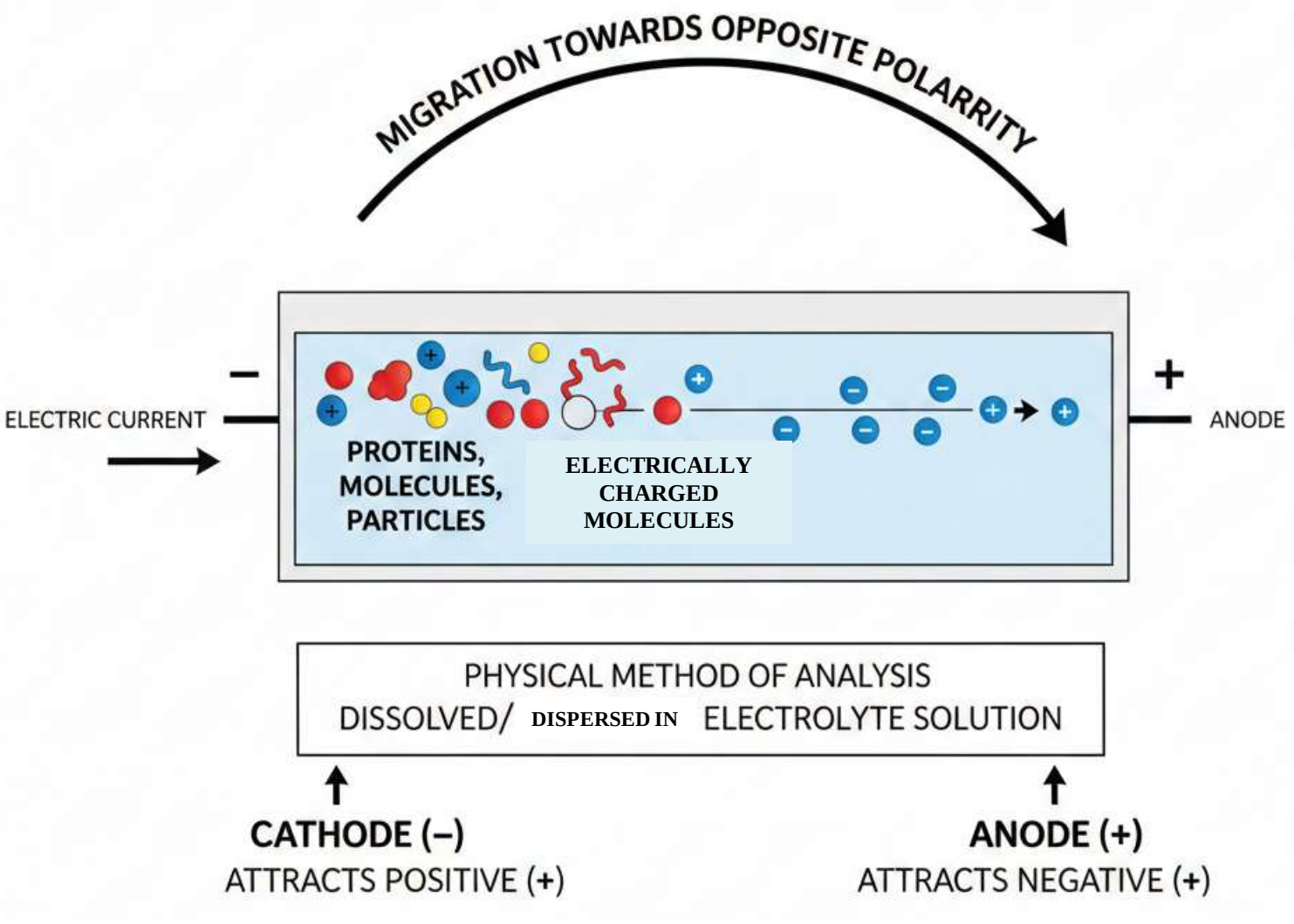
VII SEM/ IV YEAR

TOPIC 27: ELECTROPHORESIS: FACTORS AFFECTING ELECTROPHORETIC MOBILITY

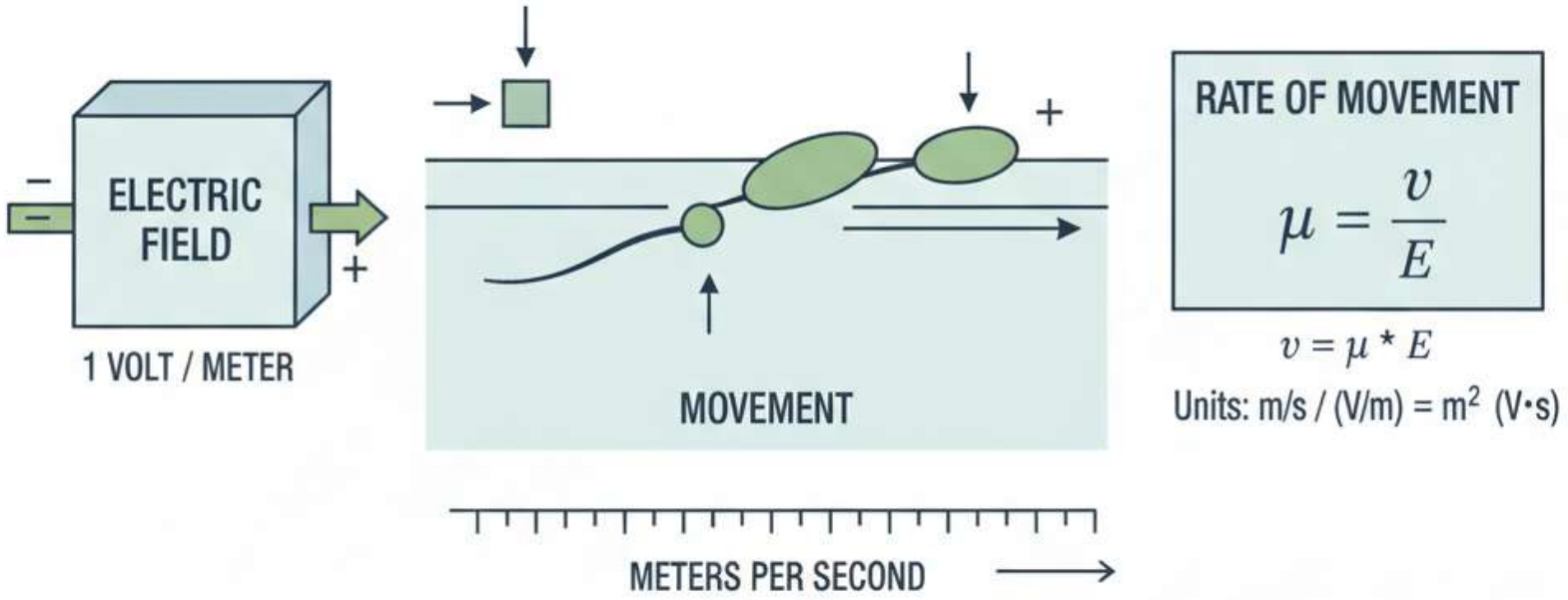
MINDMAP:


Rate of Movement
Formula for Mobility
Principle of Mobility
Free Boundary Electrophoresis
Zone Electrophoresis
Methods of Electrophoresis
Electrophoresis
Factors Affecting Mobility
Net Charge
Ionic Radius
Viscosity of Medium
pH of Solution
Applied Voltage
Ionic Strength

Electrophoresis



Principle of Electrophoretic Mobility



Formula for Electrophoretic Mobility

$$\mu = Q / (6\pi\eta r)$$

Where:

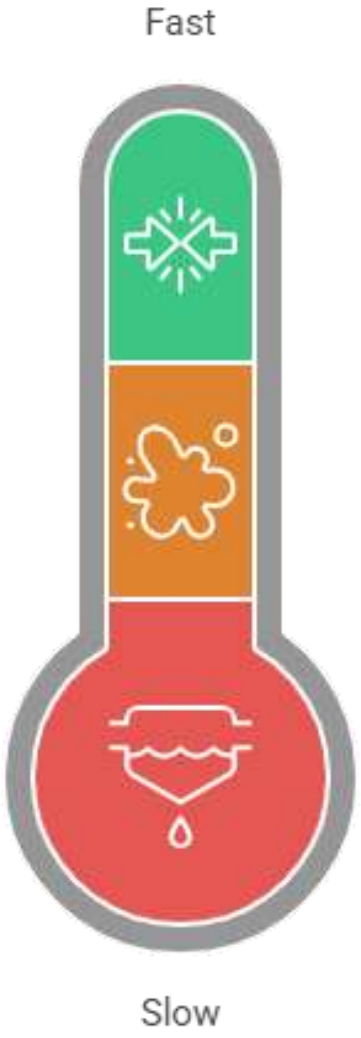
μ = Electrophoretic mobility

Q = Net charge on the ion

r = Ionic radius of the solute

η = Viscosity of the medium

Mobility



High Charge

Attracted strongly to electrode

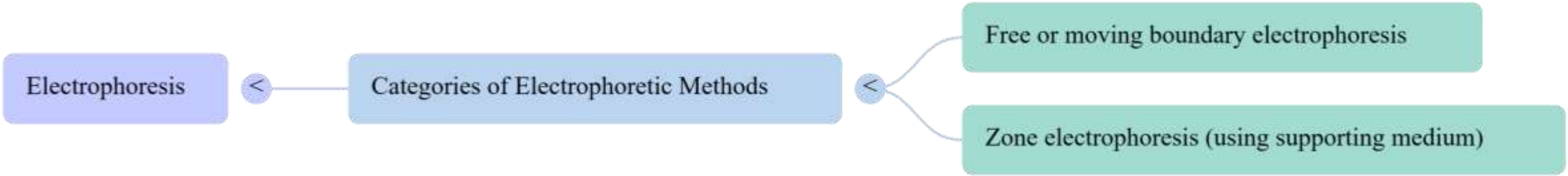
Large Size

Experiences more friction

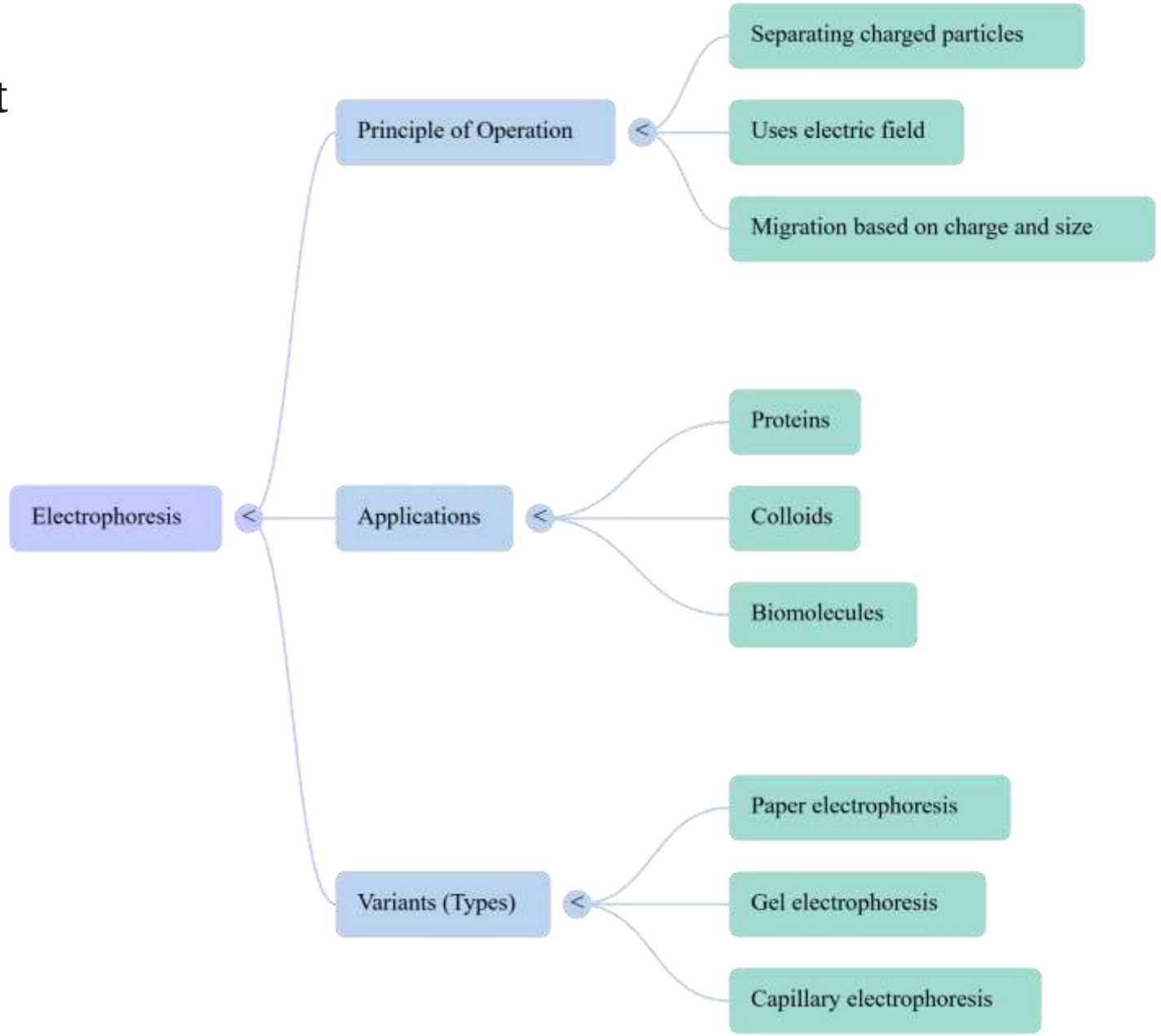
High Viscosity

Resists molecular movement

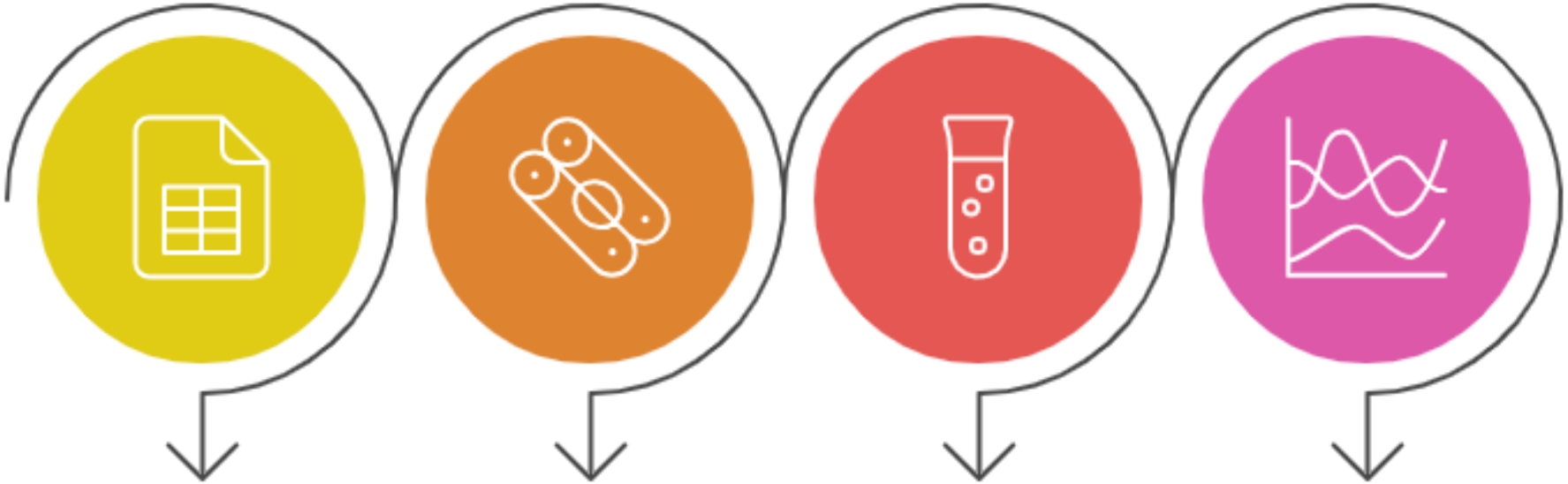
Categories of Electrophoretic Methods



Practical Context



Electrophoresis Types



Paper Electrophoresis

Uses paper as the medium, with low or high voltage.

Gel Electrophoresis

Employs agar, agarose, or polyacrylamide gels.

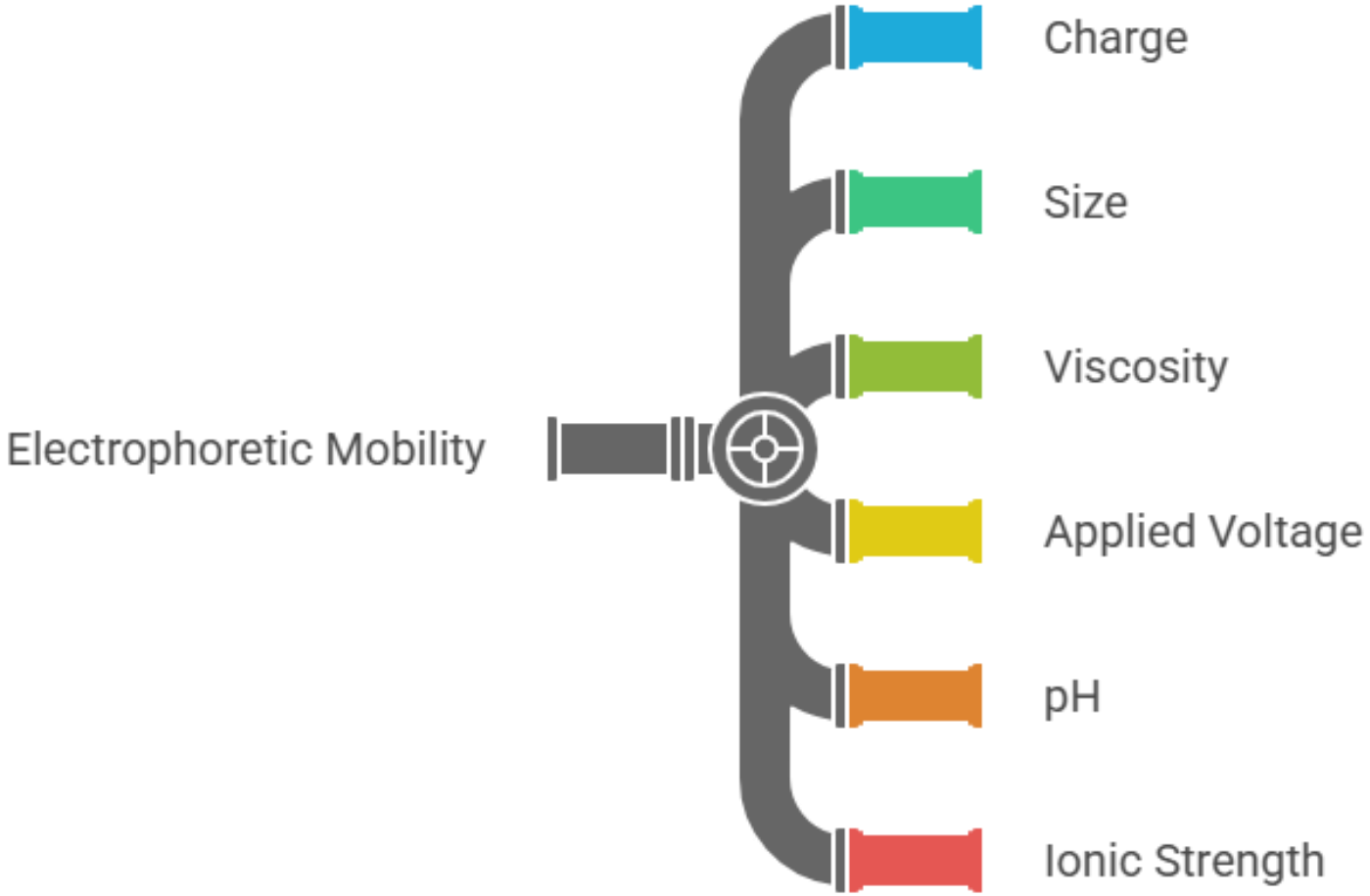
Capillary Electrophoresis

Utilizes a narrow bore fused quartz tube.

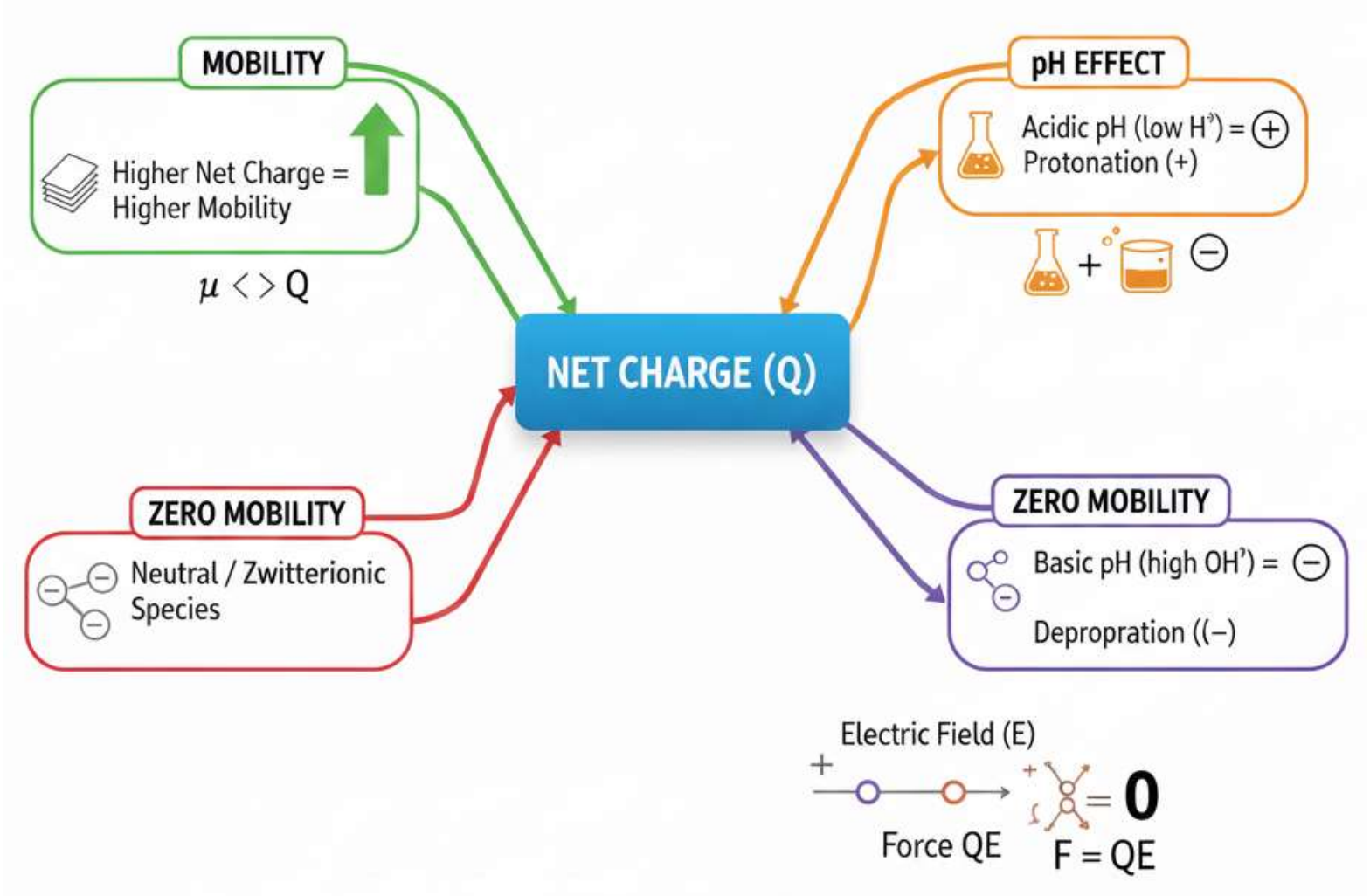
Common Features

Migration under DC voltage and detection of bands.

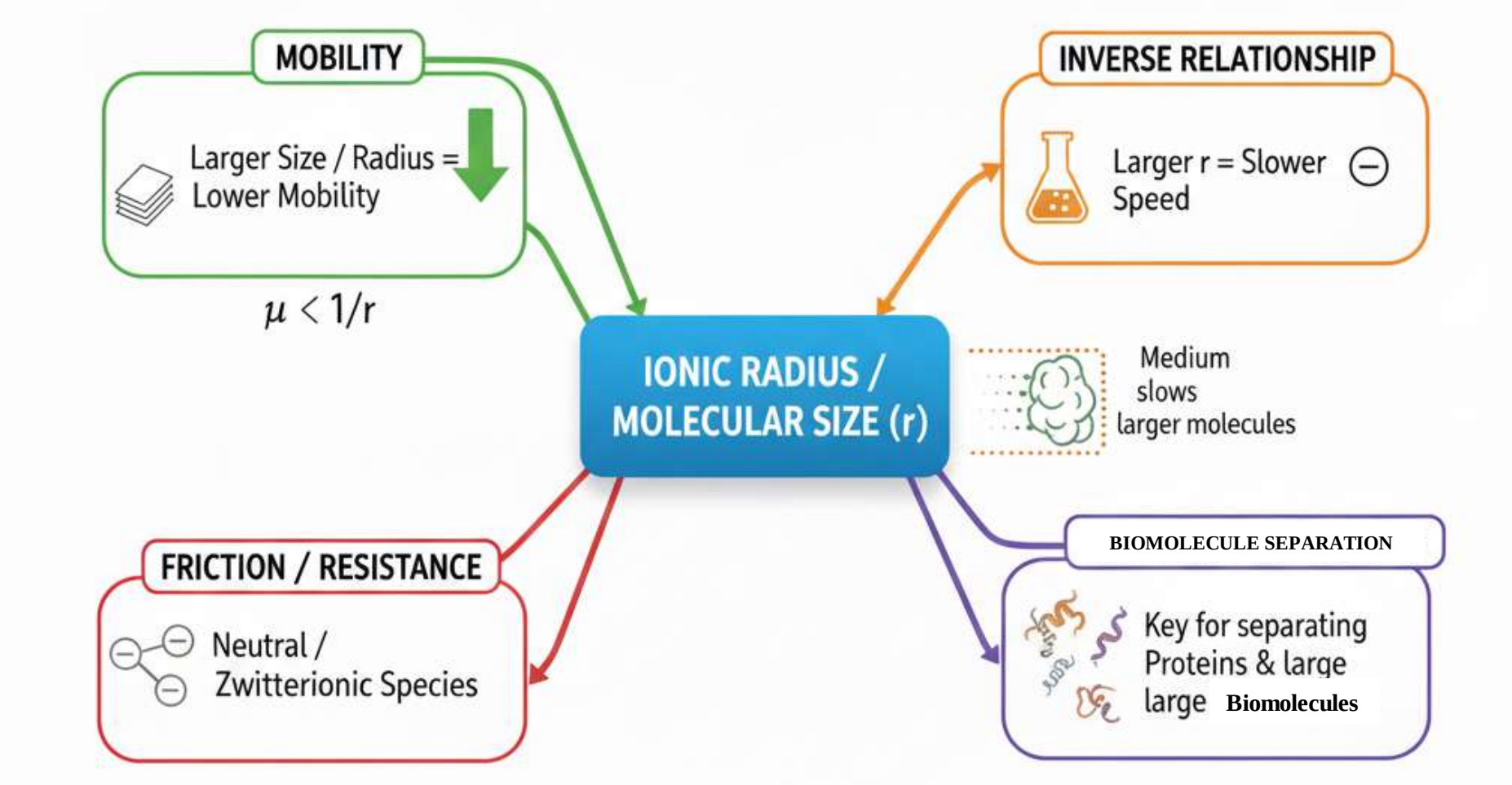
Introduction to Factors Affecting Mobility



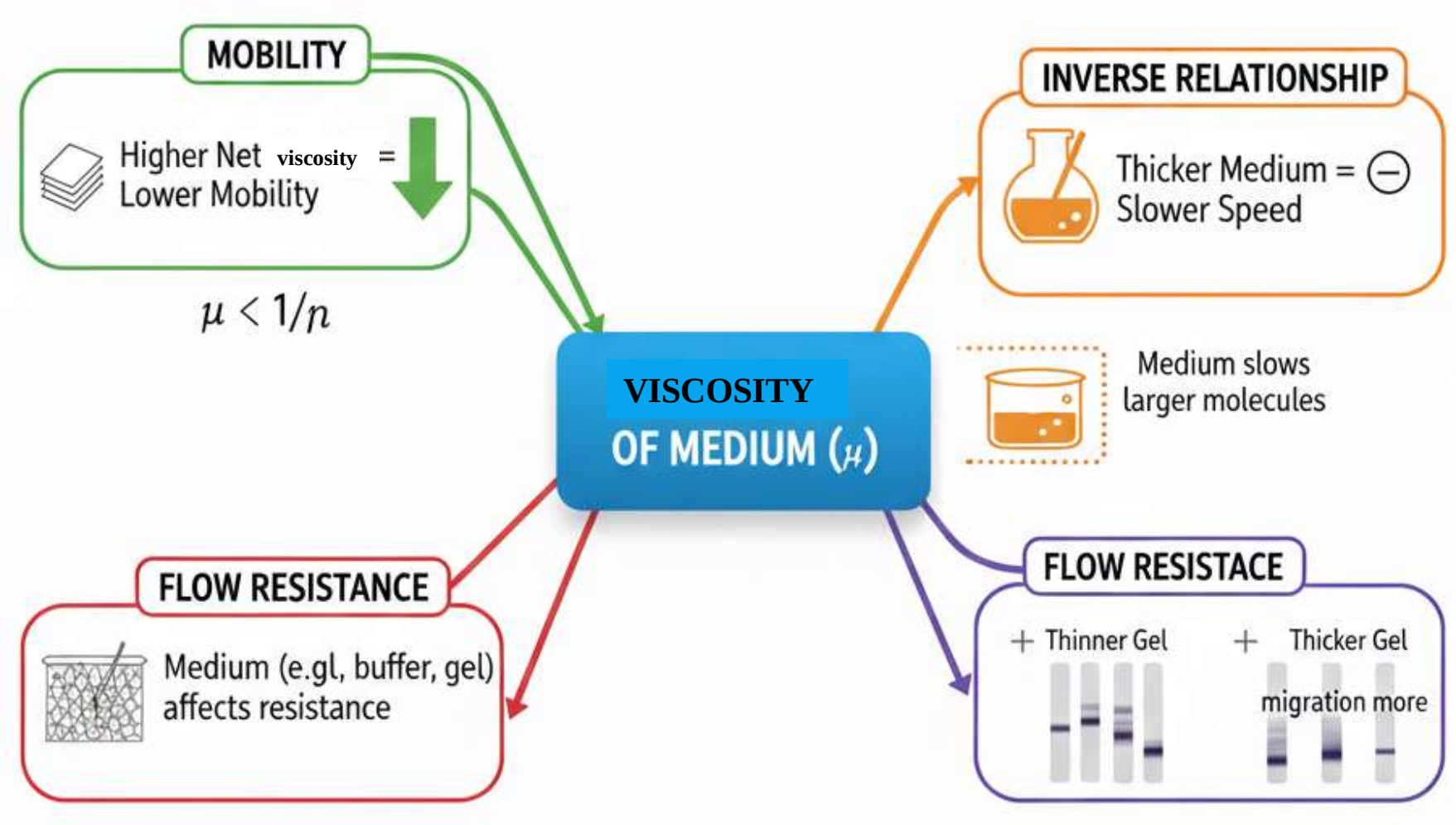
Net Charge (Q)


MOBILITY
Higher Net Charge = Higher Mobility
$\mu <> Q$
pH EFFECT
Acidic pH (low H^+) = ⊕
Protonation (+)
NET CHARGE (Q)
ZERO MOBILITY
Neutral / Zwitterionic Species
ZERO MOBILITY
Basic pH (high OH^-) = ⊖
Depropration ((–)
Electric Field (E)
Force QE
= 0
F = QE

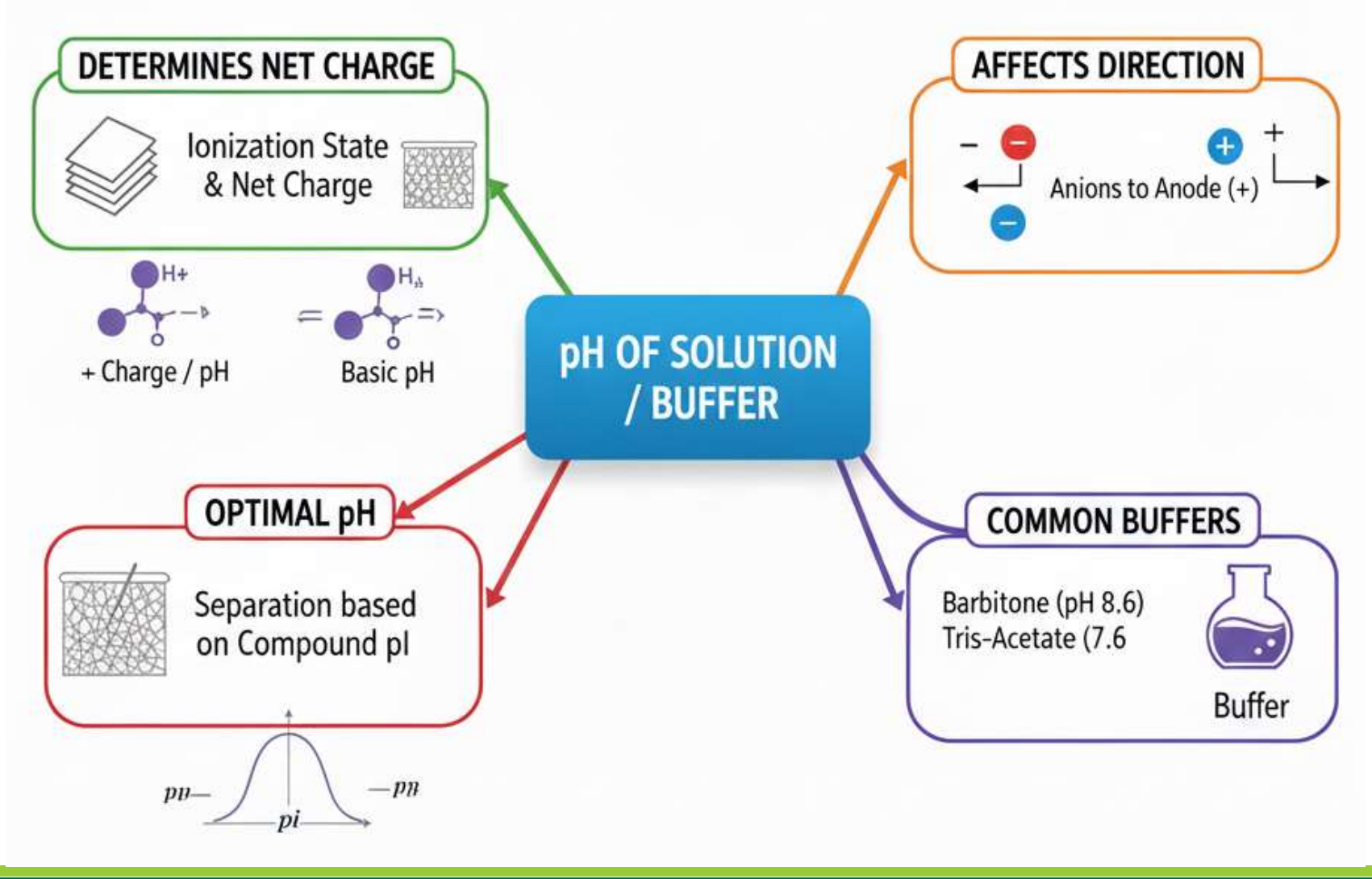
Ionic Radius/Molecular Size (r)



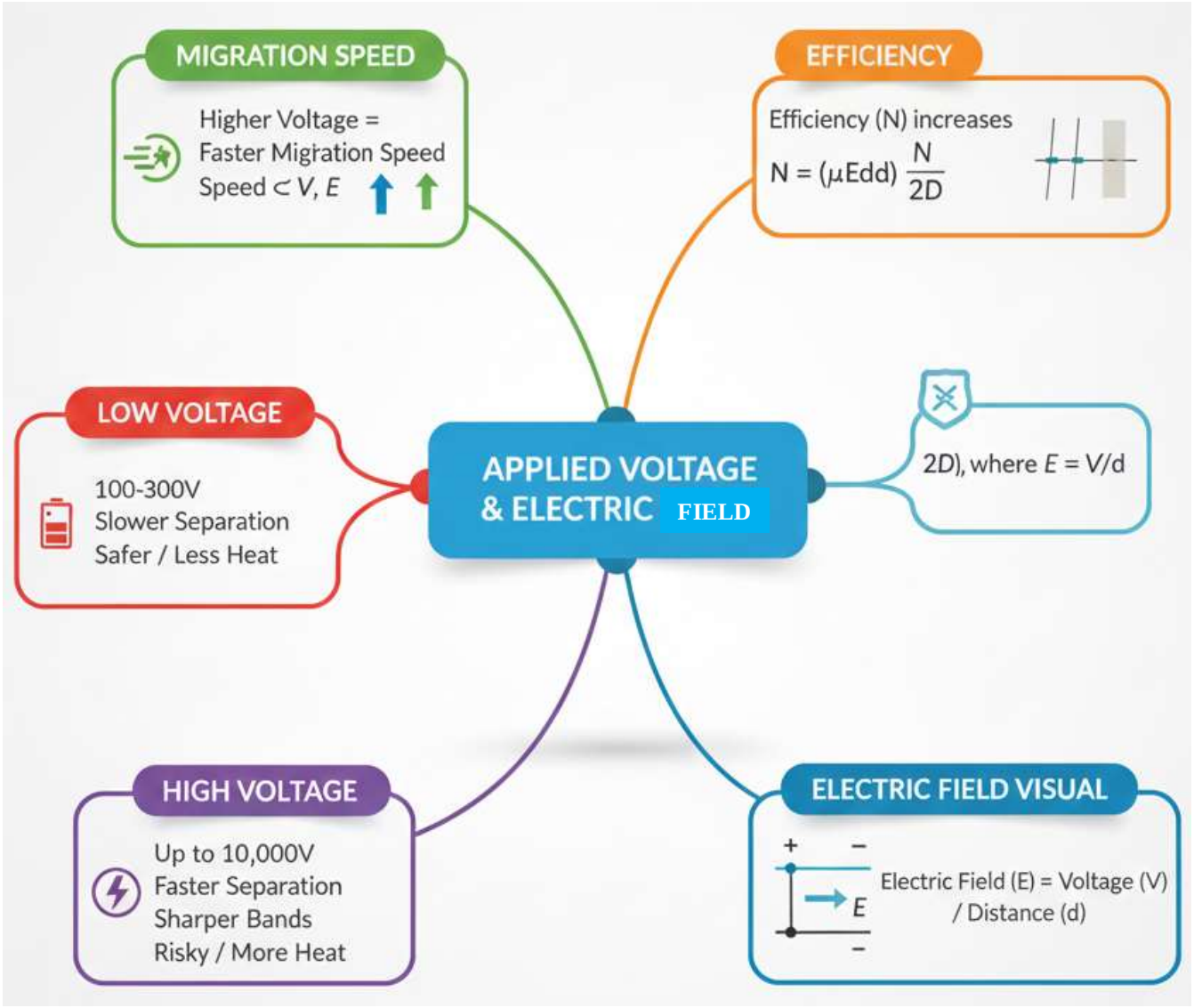
Viscosity of Medium (η)



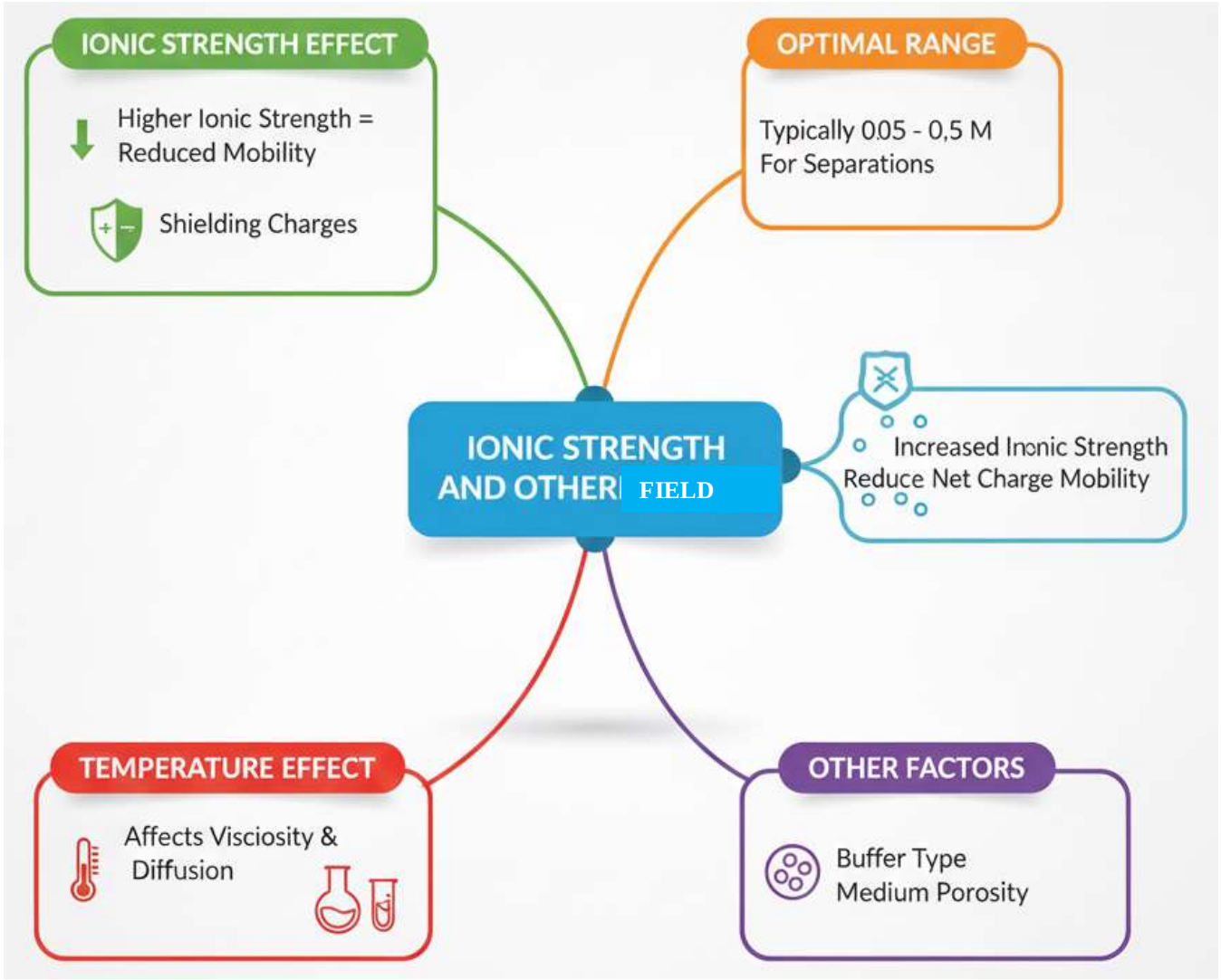
pH of Solution/Buffer



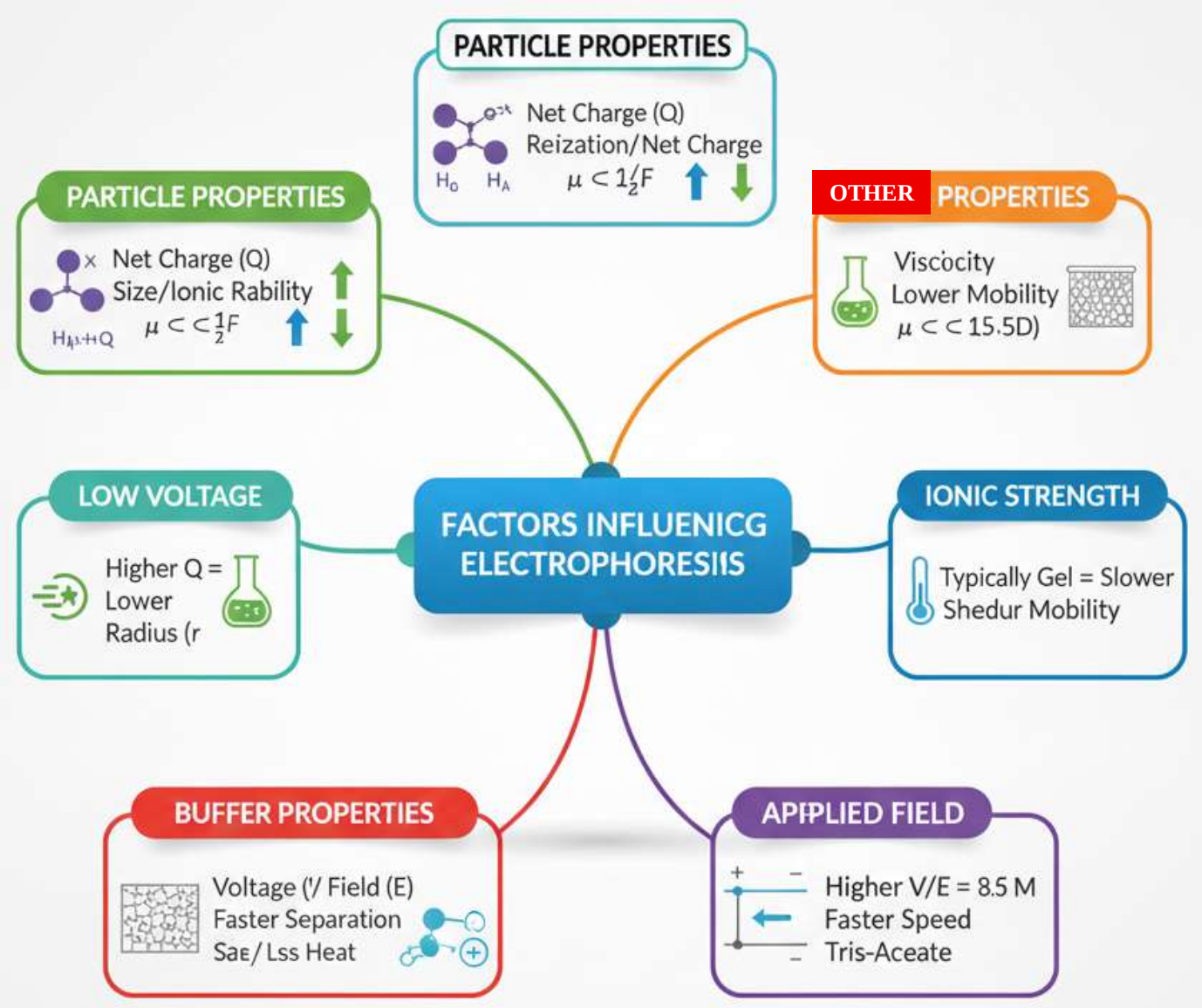
Applied Voltage and Electric Field



Ionic Strength and Other Influences



Summary:


PARTICLE PROPERTIES
Net Charge (Q)
Reization/Net Charge
μ < 1½F
PARTICLE PROPERTIES
Net Charge (Q)
Size/Ionic Rability
μ < < ½F
OTHER PROPERTIES
Viscocity
Lower Mobility
μ < < 15.5D)
LOW VOLTAGE
Higher Q =
Lower
Radius (r
FACTORS INFLUENICG ELECTROPHORESIIS
IONIC STRENGTH
Typically Gel = Slower
Shedur Mobility
BUFFER PROPERTIES
Voltage ('/ Field (E)
Faster Separation
Saε/ Lss Heat
APIPLIED FIELD
Higher V/E = 8.5 M
Faster Speed
Tris-Aceate

Assessment

1. Electrophoretic mobility is directly proportional to:

Assessment

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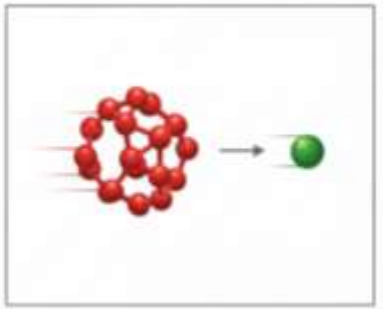
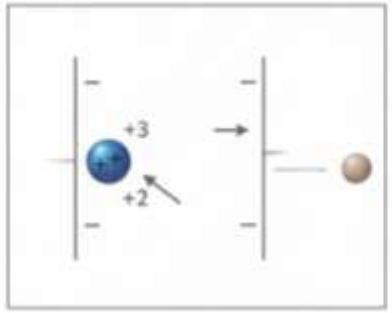
a) Viscority of the medium

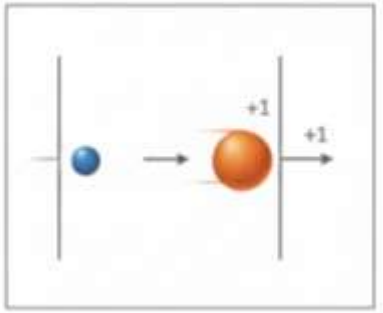
b) Molecular size



c) Net charge on the ion



d) Ionic radius



Assessment

2. Which factor inversely affects electrophoretic mobility?

Assessment

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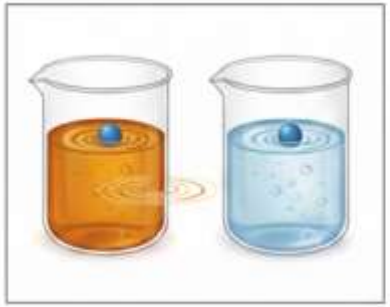
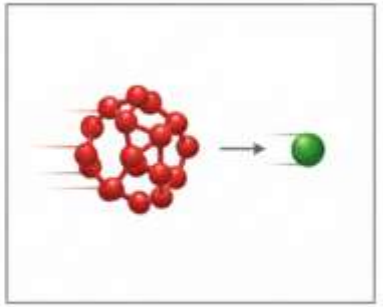
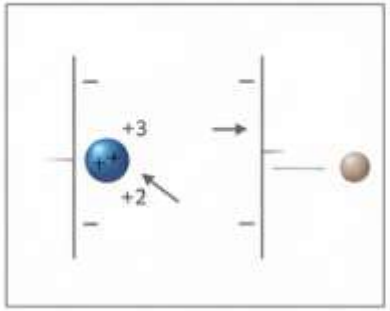
a) Viscority of the medium



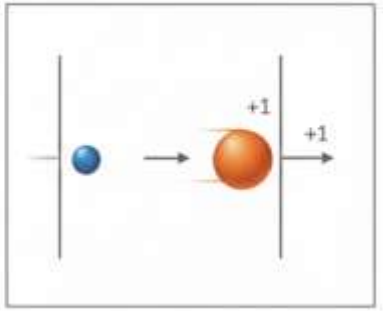
b) Molecular size



c) Net charge on the ion



d) Ionic radius



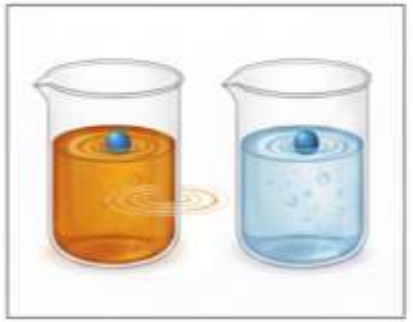
Assessment

3. The pH of the buffer in electrophoresis primarily affects:

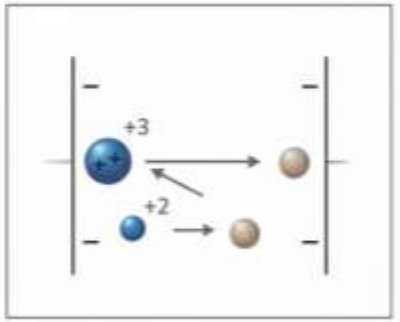
Assessment

3. The pH of the buffer in electrophoresis primarily affects:

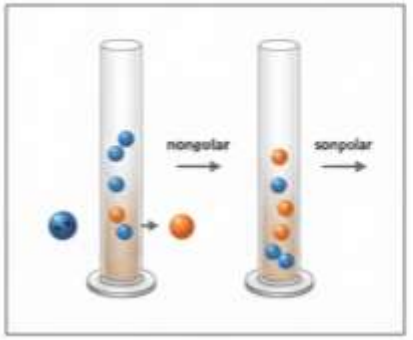
a) Viscority of the medium



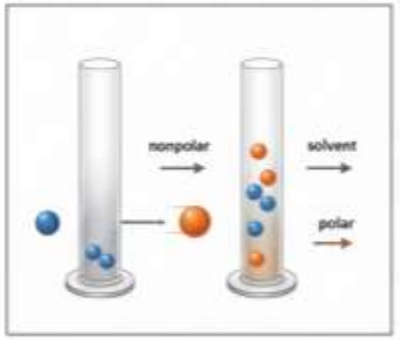
b) Molecular size



c) Column length



d) Solvent polarity



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Thank you!