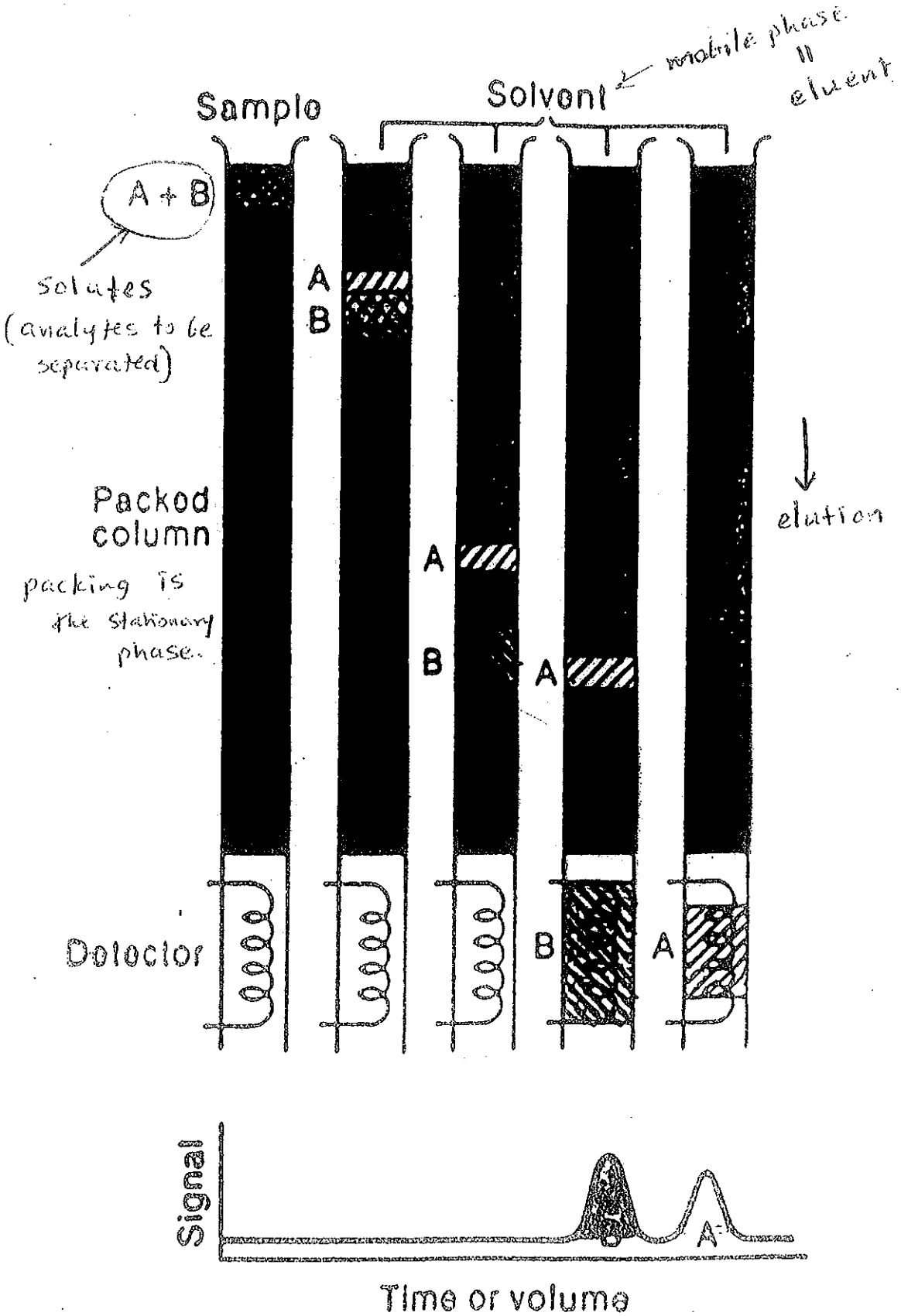
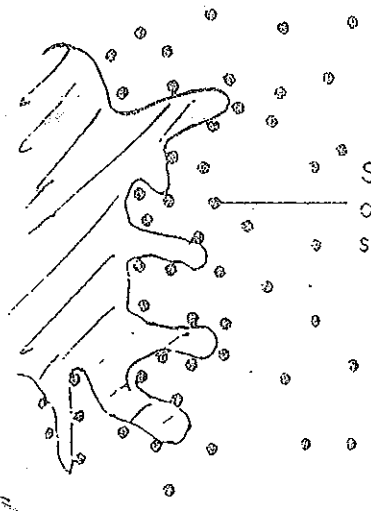
Solutes, mobile phase, stationary phase



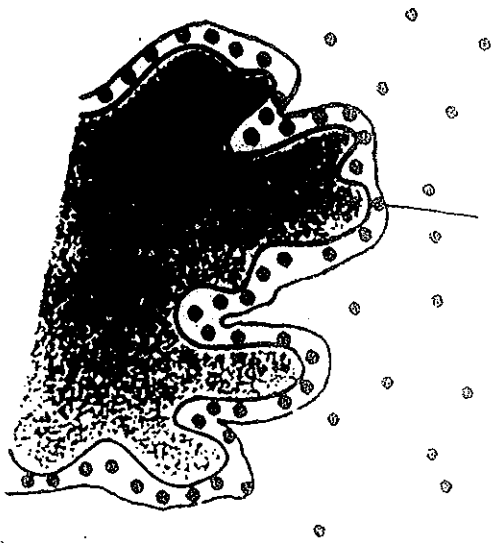
Affinity of A to the stationary phase > that of B

chromatogram
(recorded signal)

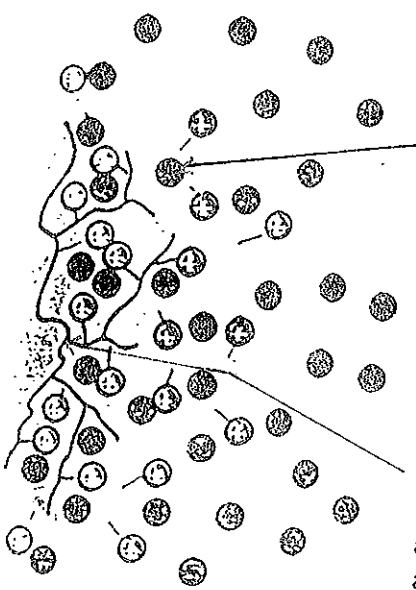
Classification	Specific Method	Stationary Phase	Type of equilibrium
Liquid chromatography (LC) (Mobile phase a liquid)	Liquid-liquid or partition	Liquid adsorbed onto solid	Partition between immiscible liquids
	Liquid-bonded phase	Organic species bonded to solid surface	Partition between liquid and bonded surface
	Liquid-solid, or adsorption	Solid	Adsorption
	Ion exchange	Ion-exchange resin	Ion exchange
	Size exclusion	Interstices of polymeric solid	Partition/sieving
Gas chromatography (GC) (Mobile phase a gas)	Gas-liquid	Liquid adsorbed onto solid surface	Partition between gas and liquid
	Gas-bonded phase	Organic species bonded to solid surface	Partition between gas and bonded liquid
	Gas-solid	Solid	Adsorption
Supercritical-fluid chromatog. (SFC) (mobile phase a supercritical fluid)		Organic species bonded to solid surface	Partition between supercritical fluid and bonded surface



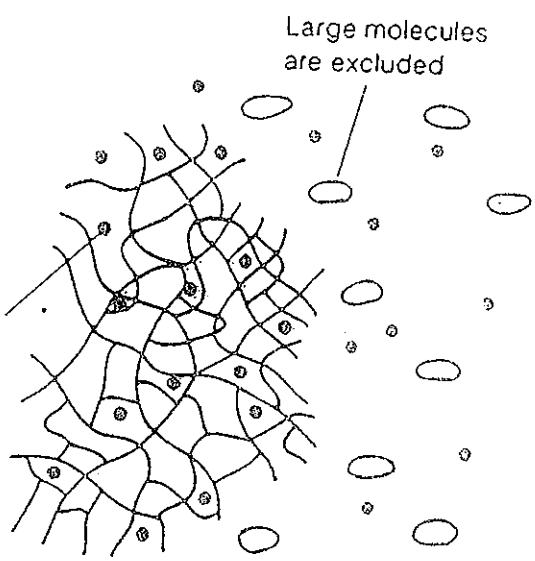
1 Adsorption chromatography



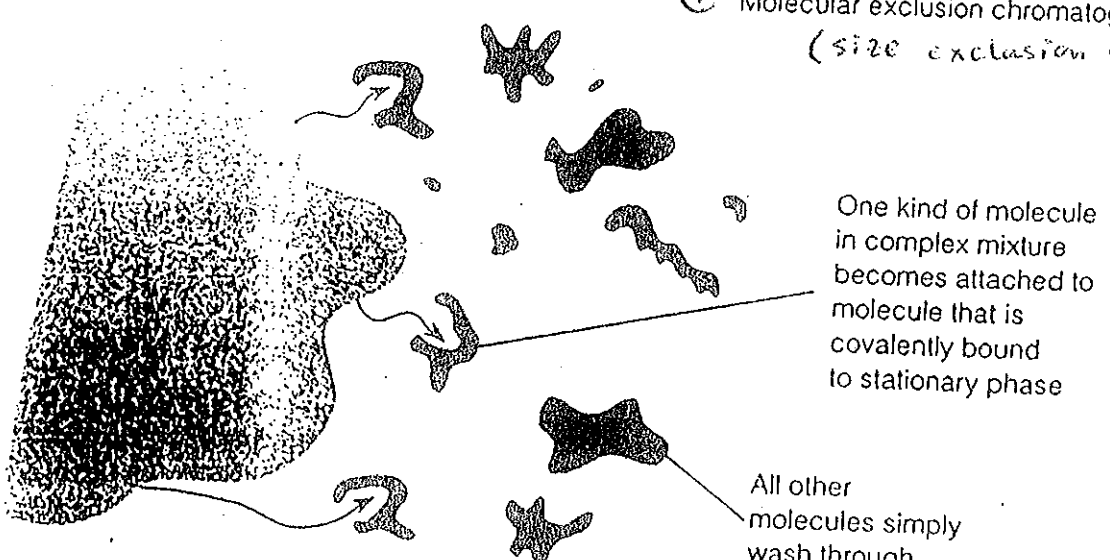
2 Partition chromatography



3 Ion-exchange chromatography



4 Molecular exclusion chromatography
(size exclusion chromatography)



5 Affinity chromatography

The relative retention for two compounds in gas chromatography is 1.068 on a column with a plate height of 0.520 mm. The capacity factor for compound 1 is 5.16.

(a) What length of column will separate the compounds with a resolution of 1.00?

(b) The unretained peak time on the column is 2.00 min. If the number of plates is the same for both compounds, find the retention times and widths of each peak.

SUMMARY OF CHROMATOGRAPHIC EQUATIONS.

Adjusted retention time $t_R' = t_R - t_m$

Capacity factor (or Capacity ratio) $k' = \frac{t_R'}{t_m}$

Selectivity coefficient (or Relative retention) $a = \frac{t_{R2}'}{t_{R1}'} = \frac{k_2'}{k_1'}$

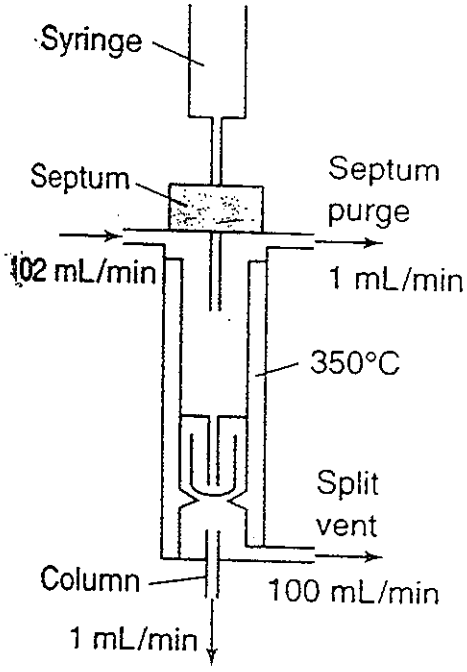
Efficiency (No. of plates) $N = 16\frac{t_R^2}{w^2} = 5.54\frac{t_R^2}{w_{1/2}^2}$

Plate height $HETP = \frac{L}{N}$

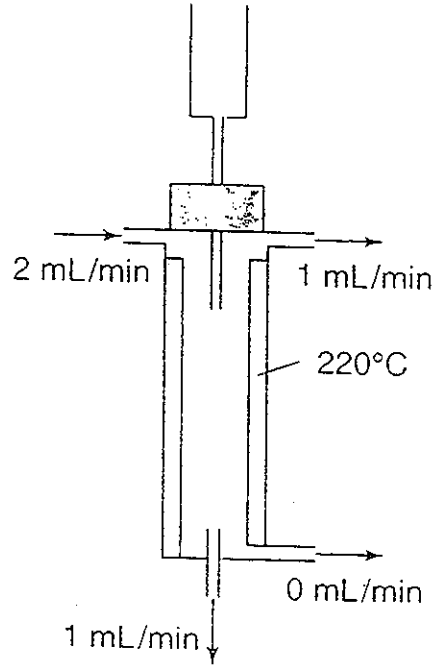
Resolution

$$\text{Resolution} = \frac{\Delta t_R}{w_{av}}$$

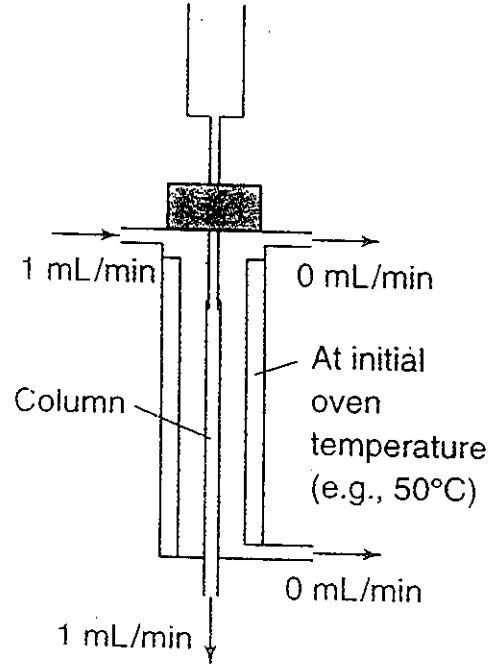
$$\text{Resolution} = \frac{\sqrt{N}}{4}\left(\frac{a-1}{a}\right)\left(\frac{k_2'}{1+k_{av}'}\right)$$



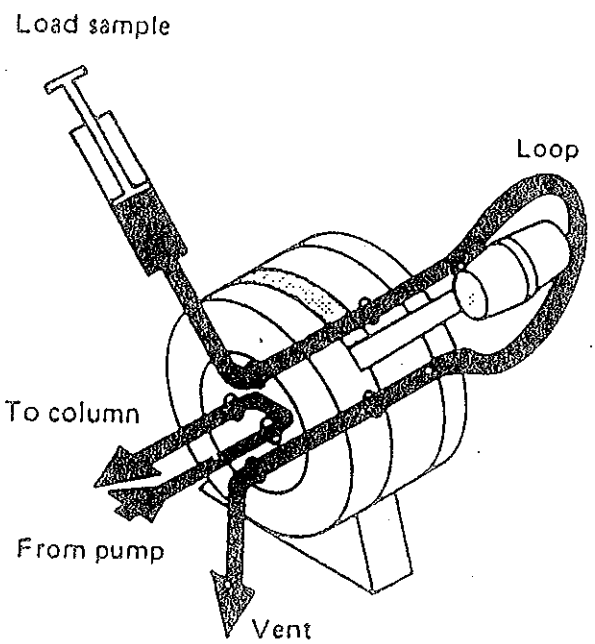
Split injection

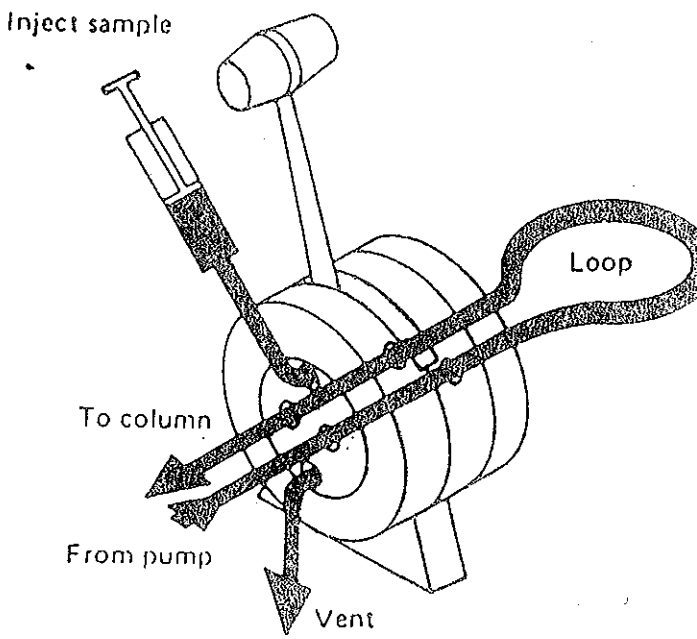


Splitless injection



On-column injection


Load sample
Loop
To column
From pump
Vent


Inject sample
Loop
To column
From pump
Vent