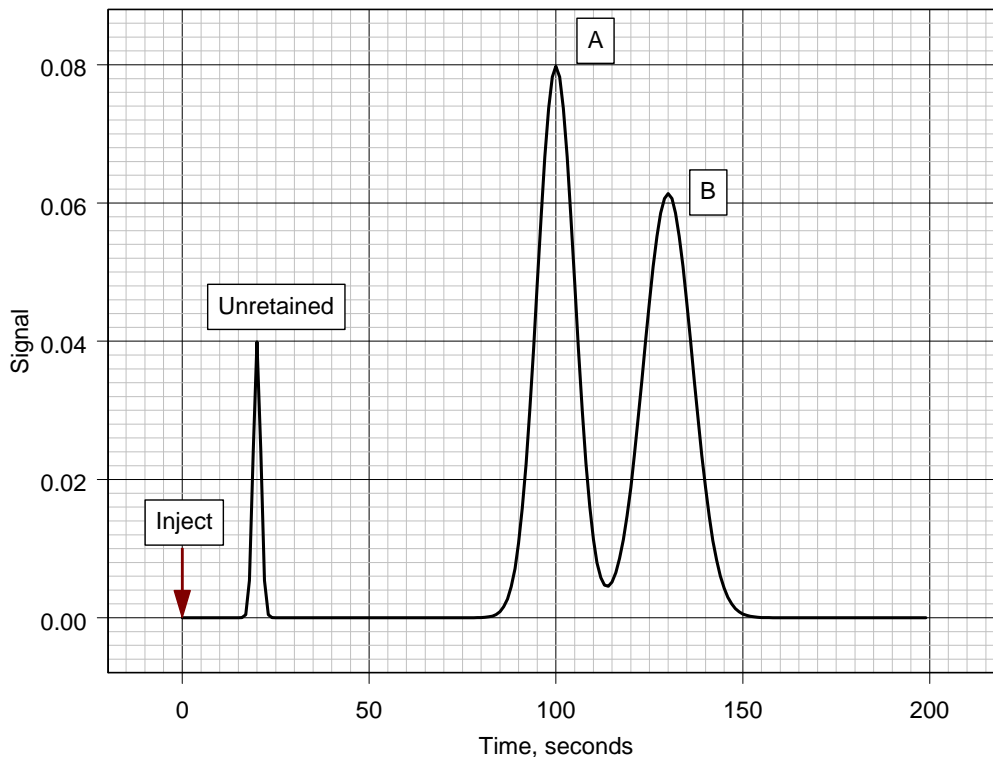


Problem Set 10. Chromatography Calculations  
Chem 2222 Summer 2008.

1. Chromatogram Calculations

The chromatogram was obtained on a 5.0-cm long column. For solute A, report



- the retention time,  $t_r$
  - the adjusted retention time,  $t_r'$
  - the retention factor,  $k$
  - the number of theoretical plates,  $N$
  - the plate height,  $H$  (include units)
  - the resolution for solutes A and B.
2. A urine sample was analyzed by gas chromatography for cocaine using benzoylecgonine as an internal standard. The cocaine in a 100-mL sample of urine was extracted into methylene chloride. After addition of 0.200 g benzoylecgonine, the extract mixture was diluted to exactly 25 mL. Injection of 1.0  $\mu\text{L}$  of the prepared sample onto a GC column at 225  $^\circ\text{C}$  yielded peak areas of 680 for cocaine and 606 for the internal standard. Using the calibration data provided below, calculate the concentration of cocaine (mg/mL) in the urine sample.

Standard	Cocaine	Int. Std.	$A_x$	$A_{is}$
	mg/mL	mg/mL		
	$C_x$	$C_{is}$		
1	2.50	5.00	120	600
2	5.00	5.00	241	603
3	10.00	5.00	480	596
4	25.00	5.00	1198	602

$A_x$  and  $A_{is}$  are the peak areas for cocaine and the internal standard, respectively.

3. Similar to Skoog7e24-21. The following data are for a liquid chromatography column

Length of Packing	200 mm
Flow rate	0.95 mL/min
$V_M$	2.33 mL
$V_S$	0.134 mL

A chromatogram of a mixture of species A and B provided the following data:

	Retention Time, s	Width of Peak Base (w), s
Unretained	110.2	
A	512.5	22.1
B	540.0	23.3

For solutes A and B, calculate:

- the average number of theoretical plates
- the average plate height
- the retention factors
- the selectivity factor
- the distribution constants
- the resolution