

Name: Key Date: _____ Class Pd. _____

Unit 3: Quiz: Solutions, Chromatography & Beer's Law
AP Chemistry Version 1

1. Using the data provided below to answer the questions that follow:

Table 1: Beer's Law data for β -carotene standards at λ_{max}

Concentration (M)	Absorbance (λ_{max})
1.21×10^{-5}	1.62
8.09×10^{-6}	1.08
4.04×10^{-6}	0.44
2.02×10^{-6}	0.13

$$y = 1.49 \times 10^5 x - 0.158$$

a) Determine the concentration of a solution of beta carotene that has an absorbance of 0.25.

$$0.25 = 1.49 \times 10^5 x - 0.158$$
$$x = 2.74 \times 10^{-6} \text{ M}$$

b) Determine the absorbance of a 5.20×10^{-6} M solution of beta carotene.

$$y = 1.49 \times 10^5 (5.20 \times 10^{-6}) - 0.158$$
$$y = 0.617$$

2. Identify which type of separation technique would be best for the following situations.

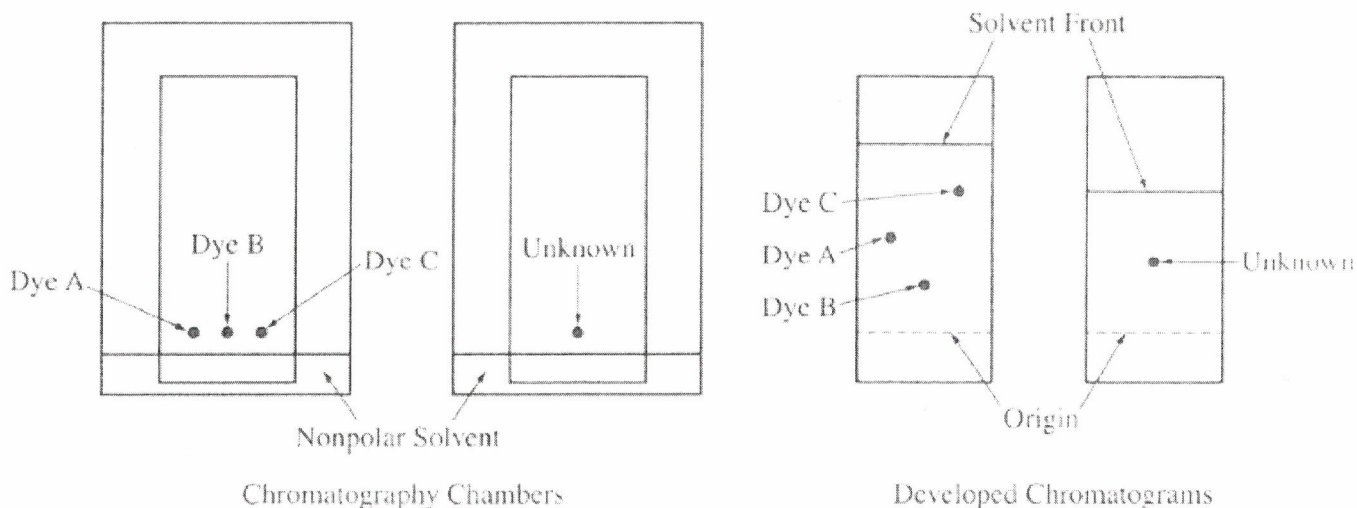
Filtration Distillation Chromatography Evaporation

- a) Mixture of ethanol(l) and water (l). *distillation*
b) Mixture of lead(II) iodide (s) and water(l) *Filtration*
c) Mixture of food dyes in candy coating of purple skittles. *Chromatography*

3. Explain the process of solution formation. You can choose to use words, pictures or a combination of the two.

*See ver 2
or notes*

4.



- a) Which Dye is least polar? Justify using interactions between the chromatography paper and the dye or the dye and the solvent.

C b/c moved most so less attraction to polar paper

- b) Identify the unknown dye.

A

5. When a sample of methane (CH_4) was combusted, 27.7 mL of CO_2 was collected over water at 25.0 °C and 1.00 atm. The vapor pressure of water at 25.0 °C is 23.8 torr. Determine the mass of methane that was burned.



$$P_T = 760 \text{ torr}$$

$$P_{\text{CO}_2} = 760 \text{ torr} - 23.8 \text{ torr} = 736.2 \text{ torr}$$

$$(736.2)(0.0277) = n(62.36)(298)$$

$$n = 0.001097 \text{ mol CO}_2$$

$$\frac{0.001097 \text{ mol CO}_2}{1 \text{ mol CO}_2} \times \frac{1 \text{ mol CH}_4}{1 \text{ mol CH}_4} \times \frac{16.042 \text{ g}}{1 \text{ mol CH}_4} = 0.0176 \text{ g CH}_4$$

Unit 3: Quiz: Solutions, Chromatography & Beer's Law
AP Chemistry Version 2

2. Using the data provided below to answer the questions that follow:

Table 1: Beer's Law data for β -carotene standards at λ_{max}

Concentration (M)	Absorbance (λ_{max})
1.21×10^{-5}	1.62
8.09×10^{-6}	1.08
4.04×10^{-6}	0.44
2.02×10^{-6}	0.13

$$y = 1.49 \times 10^5 x - 0.158$$

a) Determine the concentration of a solution of beta carotene that has an absorbance of 0.75.

$$0.75 = 1.49 \times 10^5 x - 0.158$$

$$x = 6.09 \times 10^{-6} M$$

b) Determine the absorbance of a $9.50 \times 10^{-6} M$ solution of beta carotene.

$$y = 1.49 \times 10^5 (9.5 \times 10^{-6}) = 0.158$$

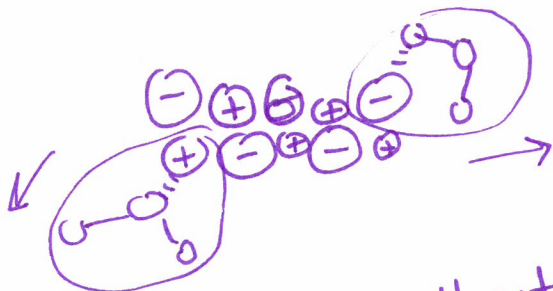
$$y = 1.26$$

2. Identify which type of separation technique would be best for the following situations.

Filtration Distillation Chromatography Evaporation

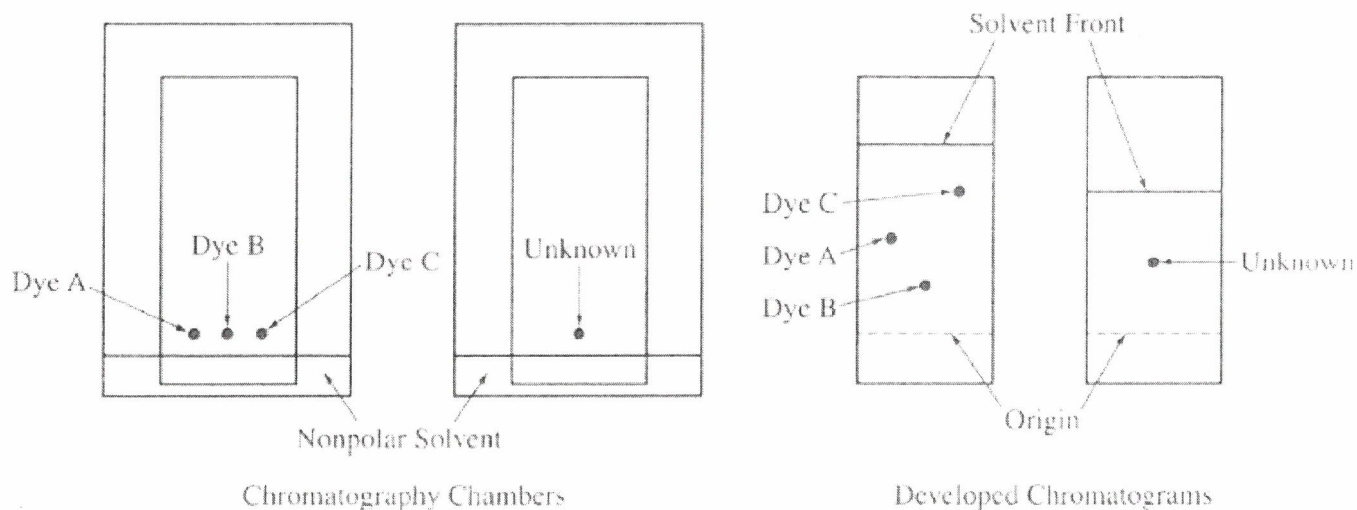
- a) Mixture of ethanol(l) and water (l). *Distillation*
 b) Mixture of $KNO_3(s)$ dissolved in water (l) *Evaporation*
 c) Mixture of food dyes in candy coating of purple skittles. *Chromatography*

3. Explain the process of solution formation. You can choose to use words, pictures or a combination of the two.



Solvent attracts the ions from compd + pulls them apart

4.



- c) Which Dye is most polar? Justify using interactions between the chromatography paper and the dye or the dye and the solvent.

B - moved the least b/c attracted more to the paper

- d) Identify the unknown dye.

A

5. When a sample of methane (CH_4) was combusted, 57.7 mL of CO_2 was collected over water at 25.0 °C and 1.00 atm. The vapor pressure of water at 25.0 °C is 23.8 torr. Determine the mass of methane that was burned.



$$P_T = 760 \text{ torr}$$

$$P_{\text{CO}_2} = 760 - 23.8 = 736.2 \text{ torr}$$

$$(736.2)(0.0577) = n(62.36)(298)$$

$$n = 0.00229 \text{ mol CO}_2$$

$$\frac{0.00229 \text{ mol CO}_2}{1 \text{ mol CO}_2} \times \frac{1 \text{ mol CH}_4}{1 \text{ mol CH}_4} \times \frac{16.042 \text{ g CH}_4}{1 \text{ mol CH}_4} = 0.367 \text{ g CH}_4$$