

Name: _____

Fall 1999
Chemistry 30475 – Organic Chemistry Laboratory
Quiz #2 – 25 points

Your exam should have a total of three pages.

Characteristic IR Absorption Wavenumbers

Functional Group	Wavenumber (cm ⁻¹)	Functional Group	Wavenumber (cm ⁻¹)
O–H	3400-3600	C≡N	2215-2260
N–H	3200-3400	C≡C	2100-2150
Alkyne C–H	3310-3320	C=O	1660-1780
Aromatic C–H	~3030	C=C	1600-1660
Alkene C–H	3020-3100	Aromatic C=C	1450-1600
Alkane C–H	2850-2960	C–O	1050-1200

- 1) [3 pts] Given the following experimental data, calculate the R_f values for each compound and identify the unknown.

	d _{solvent}	d _{compound}	R _f	Identity of Unknown
A	4.0 mm	3.0 mm		
B	5.0 mm	3.0 mm		
C	6.0 mm	4.0 mm		
Unknown	7.0 mm	4.0 mm		

- 2) [2 pts] A mixture containing a red dye and a green dye was subjected to column chromatography on a polar silica column. This mixture was eluted with hexane.
- a) If the red dye comes off of the column first, which dye is more polar?
- b) Identify the mobile phase and the stationary phase in this experiment.
- 3) [2 pts] An isomer of C₃H₆I₂ (M.W. = 296) is placed in a mass spectrometer. The following major peaks are observed in the mass spectrum. Use this information to determine the most probable structure of this compound. (The mass of I ~ 127).
 m/z = 296, 295, 281, 169, 155.

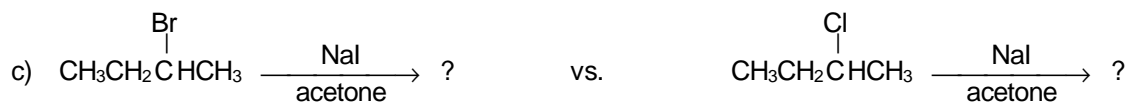
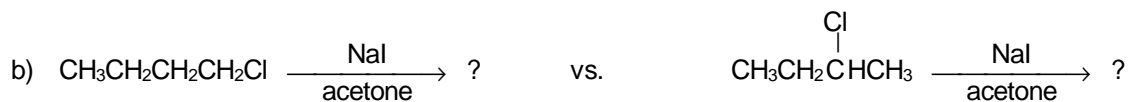
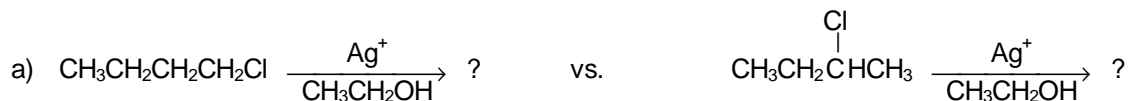
- 4) [3 pts] A compound $C_5H_8OBr_2$ has the following spectral data. Predict the structure of this compound.

IR: 2987 cm^{-1} (strong), 1708 cm^{-1} (strong). (No peaks over 3000 cm^{-1})

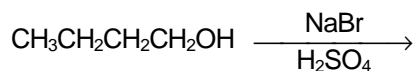
$^1\text{H NMR}$: 1.1 (3H, triplet), 1.5 (2H, multiplet), 2.2 (2H, singlet), 2.3 (1H, triplet)

- 5) [3 pts] Explain how one could use IR spectroscopy to distinguish between cyclohexane, cyclohexene, and cyclohexanol.

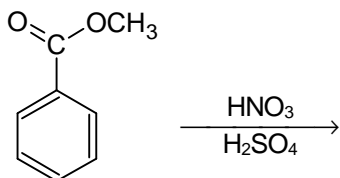
- 6) [3 pts] For each of the following pairs, circle the reaction that is expected to occur at a faster rate.



- 7) [2 pts] Predict the structure of the major product expected from the following reaction and the structure of one minor product.



- 8) [3 pts] Answer the following questions about the reaction shown below.
- Predict the structure of the major product expected from the following reaction.
 - What is the electrophile in this reaction?
 - Is COOCH_3 an activating or deactivating substituent?



- 9) [4 pts] Complete the following table by showing the structures of the missing products.

