

Department of Chemistry and Biochemistry

Chemistry 59-230/232

Time: 50 min.

Midterm #2

Nov. 18, 2005

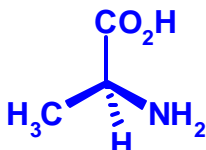
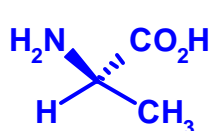
NAME _____ ID# _____

LAB SECTION (and TA) _____

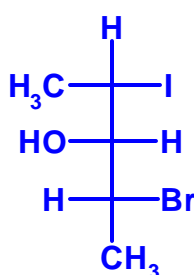
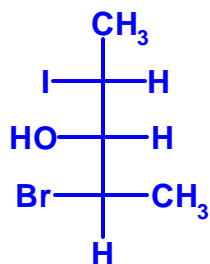
*Note: **Please answer on the test paper.** There is an extra sheet for rough work at the back, but it will not be marked unless asked. Tests written in pencil will be marked, but cannot be returned for remarking.*

- Identify the relationship between each of the following pairs (i.e., enantiomers, diastereomers, identical, structural isomers). Are any of the compounds meso forms? If so, indicate which one(s). (total 14 marks)

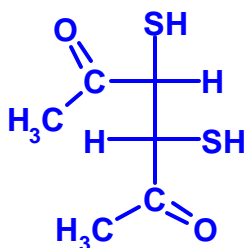
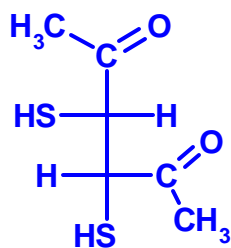
a.



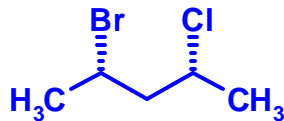
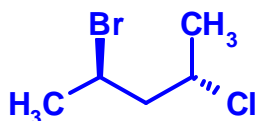
b.



c.



d.

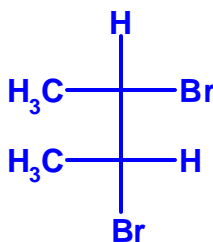
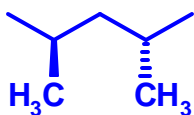
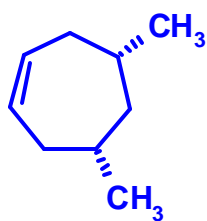


- For the structures on the right side **1a** and **1b** only, identify each chiral centre as (R)- or (S)-. Show how you arrived at your answer (4 marks each centre, total 16)

a.

b.

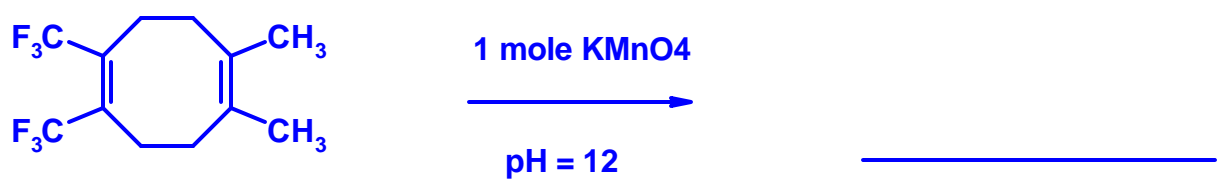
c) Do the following compounds rotate plane polarized light? Answer only yes or no. (6 marks)



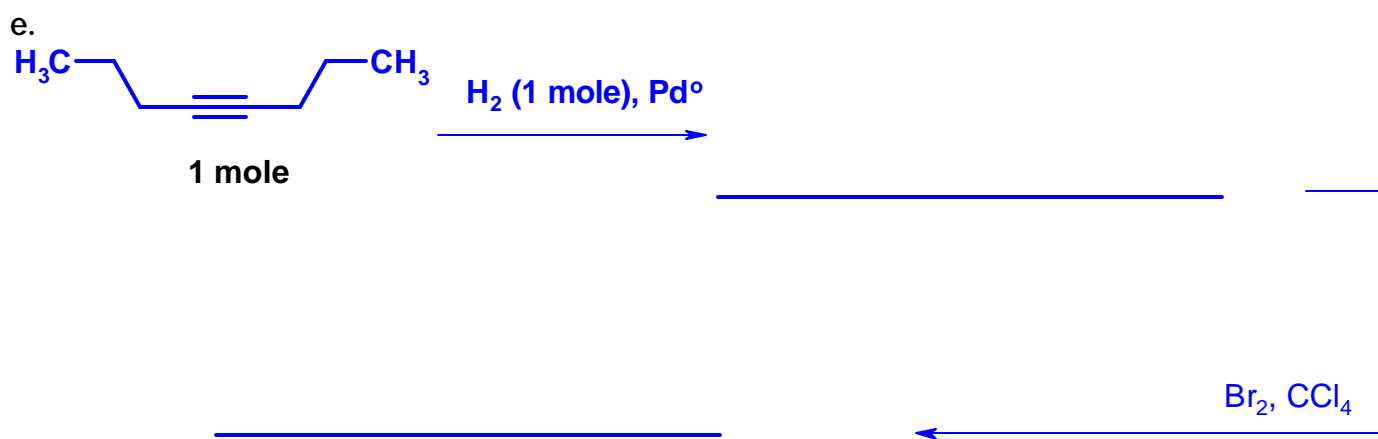
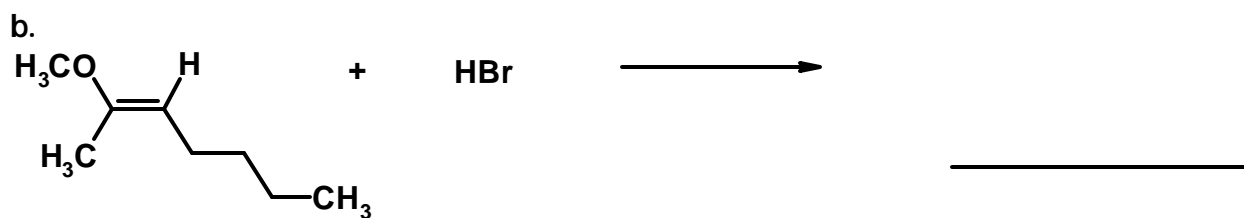
3. Draw the complete mechanism of the acid catalyzed addition of water to 2-methyl-1-butene. Indicate which is the slow step. (10 marks)

4. For each of the following reactions, fill in the blank with the structural formula of the required chemical. Show any required catalysts over the reaction arrow. Be sure to include stereochemistry where it is important (except c). Note: There *may* be more than one reagent or more than one step required per blank. (Total 30 marks)

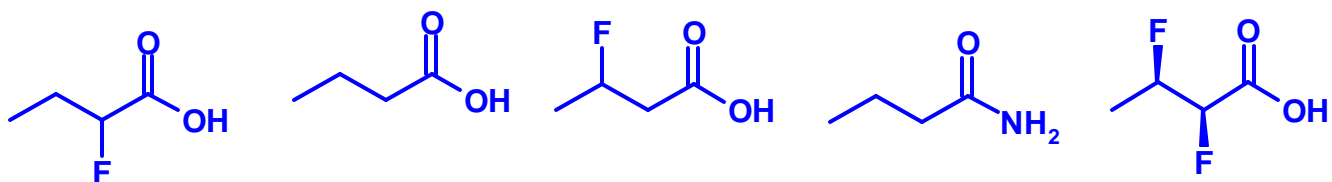
a.



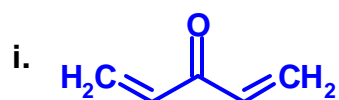
1 mole



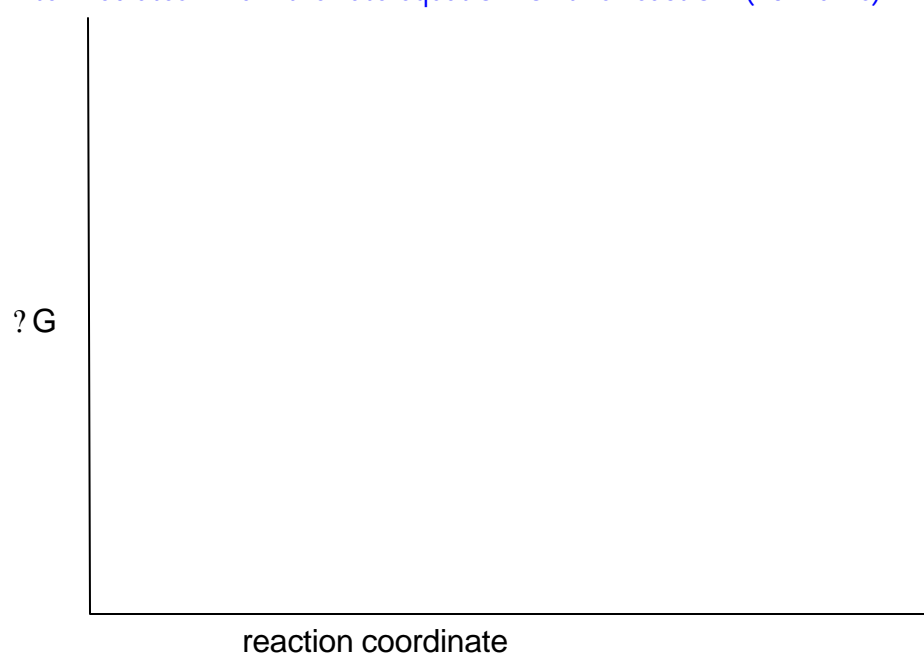
5a) Rank the following in terms of strength of acid, going from the strongest to weakest (4 marks)



b) Draw all reasonable resonance forms for the following structures. For each of these, show the appropriate use of curved arrows demonstrating the electron movement leading to the other resonance forms (10 marks).

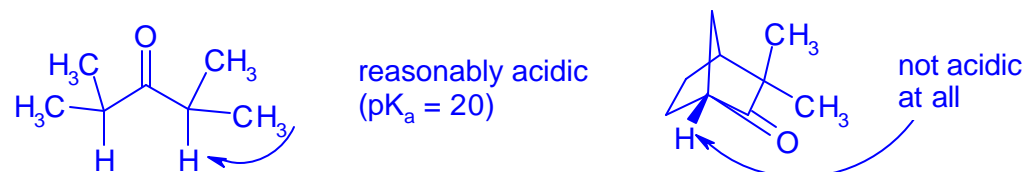


6. Draw the energy profile for the reaction of HBr with 1-methylcyclohexene. Label the product and any intermediates. Draw the rate equation for this reaction. (10 marks)



rate (v) =

Bonus. Believe it or not, C-H bonds adjacent to carbonyl compounds (i.e., ketones) are reasonably acidic, *almost* as acidic as water, by virtue of resonance stabilization of the conjugate anion. On the other hand, the apparently similar C-H bond drawn in the compound on the right is not very acidic at all. Can you explain why? (Up to 5 additional marks....hmm, you can continue the answer on extra sheet)



Periodic Table of the Elements

Periodic Table of the Elements																VIIA		0
IA												VIIA		0				
1 H 1.0079											1 H 1.0079	2 He 4.0026						
IIA												III A	IV A	V A	VIA			
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.1797	
11 Na 22.9898	12 Mg 24.3050											13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.4527	18 Ar 39.948	
		IIIB	IVB	VB	VIB	VII B	VIII			IB	IIB							
19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80	
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.82	50 Sn 118.710	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.29	
55 Cs 132.9054	56 Ba 137.327	57 *La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.9665	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra (226)	89 **Ac (227)	104 Unq (261)	105 Unp (262)	106 Unh (263)	107 Uns	108	109										

Atomic masses are 1989 IUPAC values up to four decimal places.

*	58 Ce 140.114	59 Pr 140.9076	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.9253	66 Dy 162.50	67 Ho 164.9303	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
**	90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)