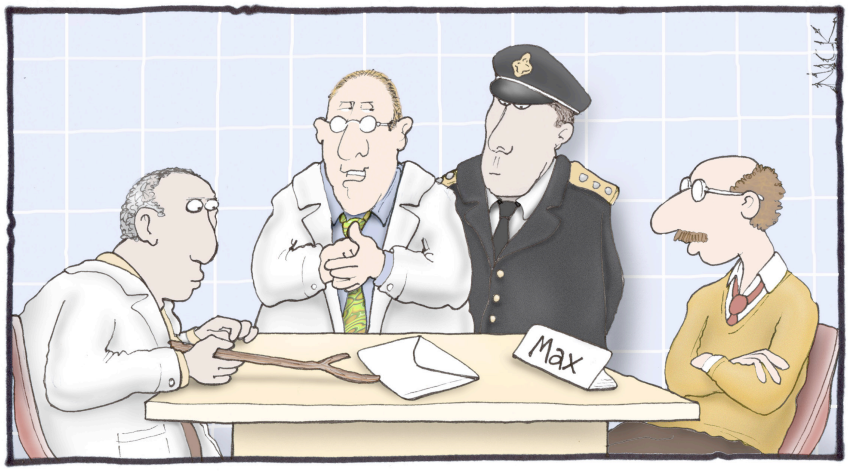
Chem 341 Organic Chemistry I

Exam 03

17 November 2006

NAME_____



"In this laboratory we're always pushing the envelope to the Max."

Please read through each question carefully and answer in the spaces provided.

A good strategy is to go through the test and answer all the questions you can do easily. Then go back and tackle the more difficult problems.

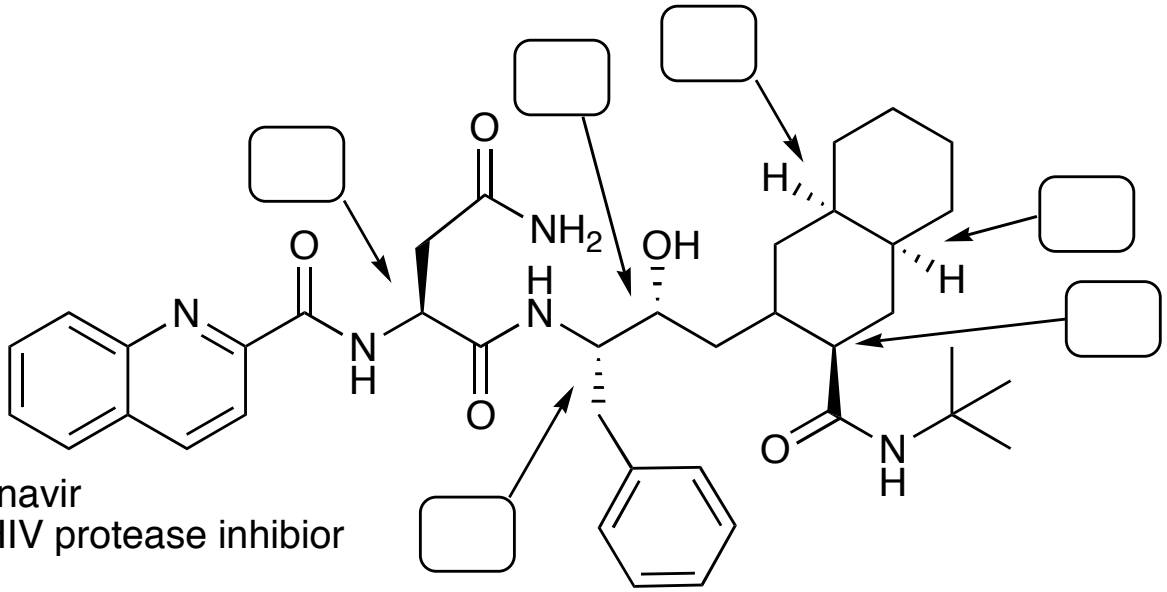
Please make sure your structures are drawn clearly and indicate any necessary stereochemistry with bold or dashed bonds.

Finally, think about what you know. Reason and common sense can often help you out.

You may use the back of the pages for scratch paper.

Problem 1	12 pts	_____	Problem 6	10 pts	_____
Problem 2	8 pts	_____	Problem 7	25 pts	_____
Problem 3	6 pts	_____	Problem 8	24 pts	_____
Problem 4	6 pts	_____	BONUS	5 pts	_____
Problem 5	15 pts	_____	TOTAL	100 pts	_____

1) The anti-HIV drug shown below has 6 stereogenic carbons. In the boxes provided, indicate the configuration using the R or S designation. (12 pts)



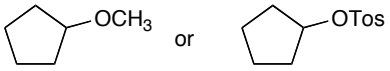
saquinavir
anti-HIV protease inhibior

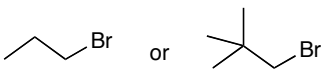
2) Draw the correct structure for the following. (8 pts)

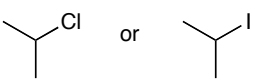
a) (1*S*,3*R*)-1,3-dimethylcyclohexane

b) (*S*)-2-chloro-5-methyl-3-hexyne

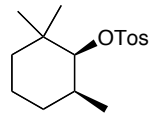
3) For each pair of molecules below, circle the one that would be the best substrate for a S_N2 substitution reaction. (6 pts)

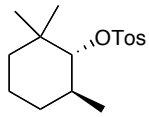
a) 

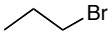
b) 

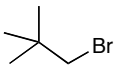
c) 

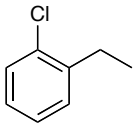
4) For each pair of molecules below, circle the one that would be the best substrate for an E2 eliminiation reaction (6 pts)

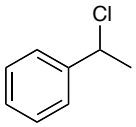
a) 

or 

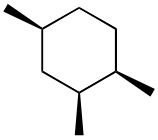
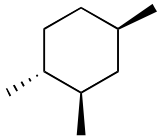
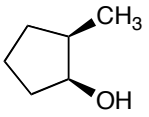
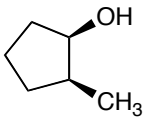
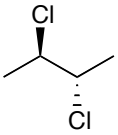
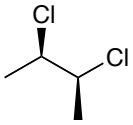
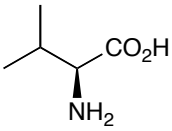
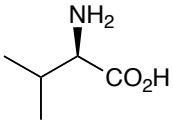
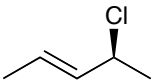
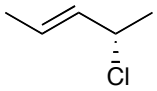
b) 

or 

c) 

or 

5) For the following pairs of molecules, check the appropriate box that describes their relationship. Indicate whether or not it is a meso compound. (15 pts)

	identical	enantiomers	diastereomers	Is this a Meso compound (circle Y or N)
 	☐	☐	☐	**Y** **N**
 	☐	☐	☐	**Y** **N**
 	☐	☐	☐	**Y** **N**
 	☐	☐	☐	**Y** **N**
 	☐	☐	☐	**Y** **N**

6) Circle True or False for the following statements about substitutions and eliminations. (4 pts)

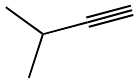
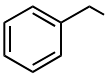
a) S_N2 substitution can take place readily on 3° substrates. **T** **F**

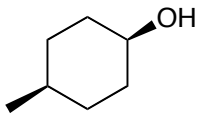
b) E1 elimination competes with SN1 substitution. **T** **F**

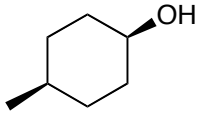
c) S_N1 substitution requires a strong nucleophile. **T** **F**

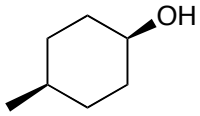
d) E2 elimination can take place readily on 3° substrates. **T** **F**

7) Provide the major organic product for the following reactions. Show any stereochemistry clearly with bold wedges or dashed bonds. (25 pts)

a)  1) $NaNH_2$ 2) 

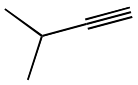
b)  1) TosCl, Et_3N 2) NaSH DMF

c)  1) PBr_3 2) NaSH DMF

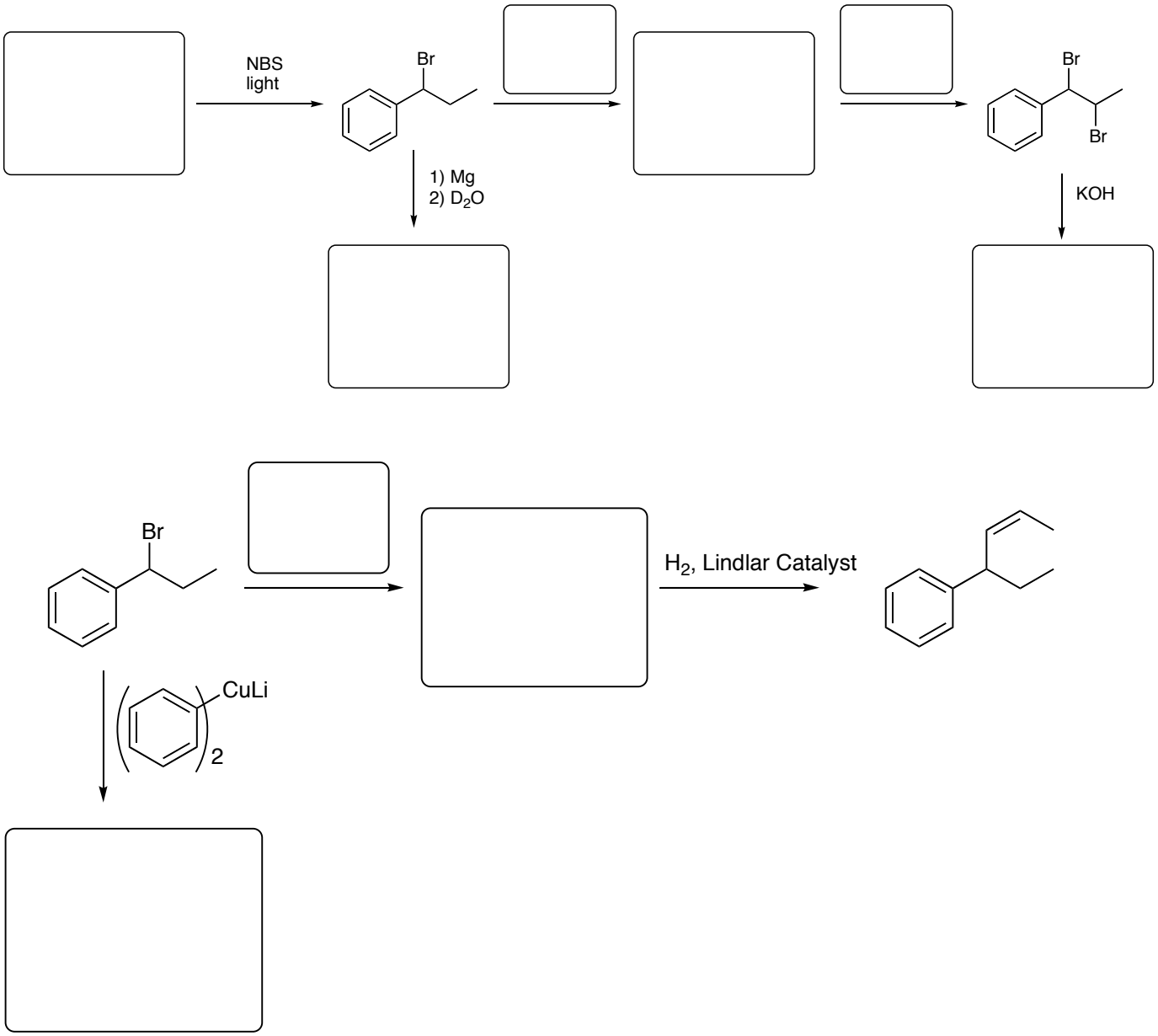
d)  1) PBr_3 2) NaOEt EtOH

e)  Li in NH_3

f)  $KMnO_4$ (2 organic products)

g)  H_2, Pd/C

8) For the following multistep syntheses, fill in the missing products and reagents. (24 pts)



BONUS: Who won the Nobel Prize in Chemistry this year and what was the enzyme he was working on? (5 pts)

The Periodic Table of the Elements

1 **H** Hydrogen 1.00794																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012182											5 **B** Boron 10.811	6 **C** Carbon 12.0107	7 **N** Nitrogen 14.00674	8 **O** Oxygen 15.9994	9 **F** Fluorine 18.9984032	10 **Ne** Neon 20.1797
11 **Na** Sodium 22.989770	12 **Mg** Magnesium 24.3050											13 **Al** Aluminum 26.981538	14 **Si** Silicon 28.0855	15 **P** Phosphorus 30.973761	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.4527	18 **Ar** Argon 39.948
19 **K** Potassium 39.0983	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.955910	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.9415	24 **Cr** Chromium 51.9961	25 **Mn** Manganese 54.938049	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933200	28 **Ni** Nickel 58.6934	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.92160	34 **Se** Selenium 78.96	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.80
37 **Rb** Rubidium 85.4678	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.90585	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.90638	42 **Mo** Molybdenum 95.94	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.90550	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.8682	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.710	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.60	53 **I** Iodine 126.90447	54 **Xe** Xenon 131.29
55 **Cs** Cesium 132.90545	56 **Ba** Barium 137.327	57 **La** Lanthanum 138.9055	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.9479	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.078	79 **Au** Gold 196.96655	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.3833	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.98038	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
87 **Fr** Francium (223)	88 **Ra** Radium (226)	89 **Ac** Actinium (227)	104 **Rf** Rutherfordium (261)	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (263)	107 **Bh** Bohrium (262)	108 **Hs** Hassium (265)	109 **Mt** Meitnerium (266)	110 (269)	111 (272)	112 (277)	113	114				

58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.90765	60 **Nd** Neodymium 144.24	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.92534	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.93032	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.93421	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
90 **Th** Thorium 232.0381	91 **Pa** Protactinium 231.03588	92 **U** Uranium 238.0289	93 **Np** Neptunium (237)	94 **Pu** Plutonium (244)	95 **Am** Americium (243)	96 **Cm** Curium (247)	97 **Bk** Berkelium (247)	98 **Cf** Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (262)