

Last Name _____

First Name _____

Student ID# _____

Chemistry 343 – Hour Exam #2

Monday, April 3, 2000

General Instructions:

- (i) Do not open exam until 9:55 (when bell rings).
- (ii) Use blank paper on the back of each page to work out answers. Final answers must be written legibly in the space provided.
- (iii) Print your name on each page.

*****No credit will be given for illegible and/or ambiguous answers.*****

	<u>Grade</u>
page 3	_____ /8
page 4	_____ /13
page 5	_____ /20
page 6	_____ /15
page 7	_____ /24
page 8	_____ /20
TOTAL	_____ /100

(Substantiated evidence for cheating or other misconduct is grounds for automatic course failure and subject to further prosecution.)

Name _____

(scratch paper)

Name _____

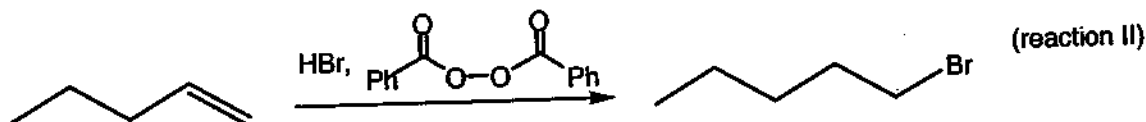
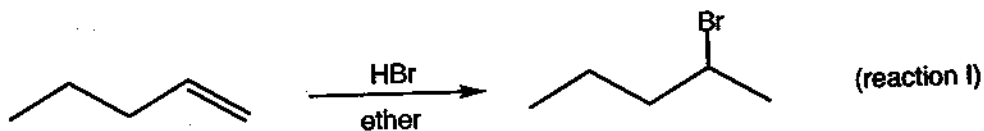
1. [8 pts] Provide skeletal structures for the following compounds. It's not necessary to include hydrogen atoms.

(a) (3 pts) 4-bromo-3,3-dimethyl-1-hexen-5-yne

(b) (5 pts) 1-ethynyl-3-methylcyclohexane. (Your drawing should clearly display the most favorable three-dimensional conformation.)

Name _____

2. [33 points] HBr will add to olefins to generate both the Markovnikov or anti-Markovnikov addition product, depending on the reaction conditions (see below).



(a) (3 pts) Indicate whether reactions I and II proceed by homolytic or heterolytic mechanisms.

Reaction I:

Reaction II:

(b) (10 pts) Provide a complete arrow pushing mechanism for reaction I. Place brackets around any unstable intermediate species.

Name _____

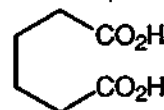
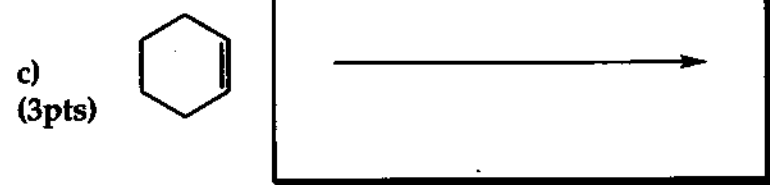
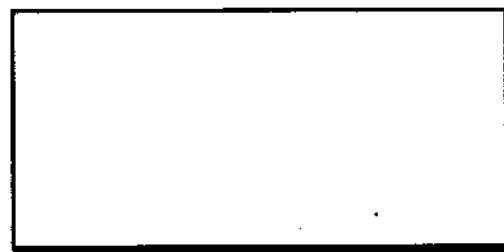
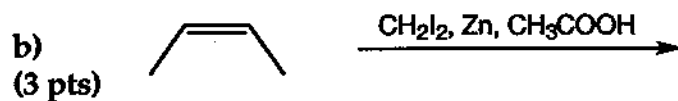
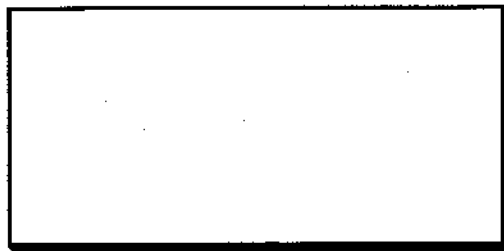
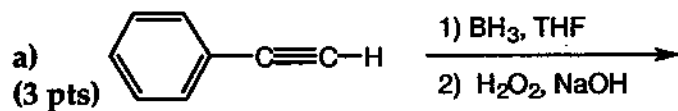
(c) The product of reaction I is chiral.

(i) (4 pts) Redraw the product of reaction I using dashed or wedged bonds where necessary to reflect stereochemical configuration. If more than one isomer is generated, indicate this with an additional drawing.

(ii) (4 pts) Label any stereogenic centers in your drawing with an "R" or "S".

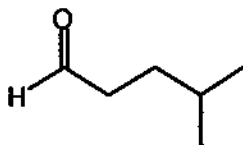
(d) (12 pts) Provide an explanation for the origin of Markovnikov selectivity in reaction I and anti-Markovnikov selectivity in reaction II. Draw the chemical structures of important intermediates to help explain your answer.

3) [15 pts] Provide the necessary starting material, reagents, or products. Stereochemistry should be indicated where appropriate, and if more than one step is required, indicate this by labeling independent steps with a 1), 2), etc.



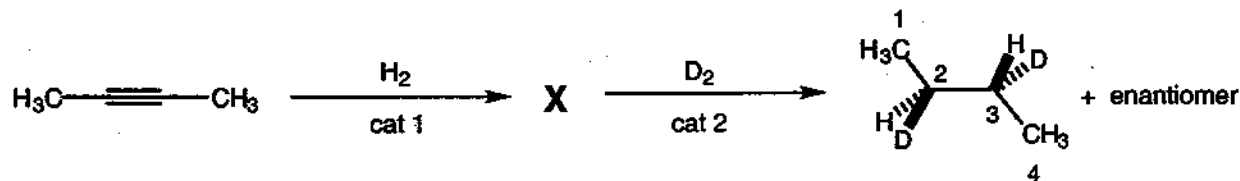
Name _____

4) [15 pts] Starting with an alkyne and any alkyl halide of your choice, provide a detailed synthetic route to the following molecule. Clearly draw all chemical structures.



5) [9 pts] Suggest *three* important reasons that life is based on the element carbon rather than another element in the periodic table.

6) [20 pts] 2-butyne can be reduced sequentially with H_2 and D_2 .



a) (4 pts) Identify the catalysts required in this reaction, cat 1 and cat 2.

cat 1 =

cat 2 =

b) (3 pts) What is the structure of intermediate X?

c) (3 pts) Assign the stereochemical configuration at C2 and C3 for the product shown?

C2 =

C3 =

d) (8 pts) Draw the structure of the product(s) generated if dissolving metal reduction is used in the first step rather than hydrogenation. Assign the stereochemical configuration at any stereogenic centers.

e) (2 pts) What is the relationship between the products in the equation above and those provided in part d)?

1	2																	
1 H 1.008																		2 He 4.003
3 Li 6.940	4 Be 9.013																	
11 Na 22.991	12 Mg 24.32																	
19 K 39.100	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.95	24 Cr 52.01	25 Mn 54.94	26 Fe 55.85	27 Co 58.91	28 Ni 58.71	29 Cu 63.54	30 Zn 65.38	31 Ga 69.72	32 Ge 72.60	33 As 74.91	34 Se 78.96	35 Br 79.916	36 Kr 83.80	
37 Rb 85.48	38 Sr 87.63	39 Y 88.92	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc (99)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.70	51 Sb 121.76	52 Te 127.61	53 I 126.91	54 Xe 131.30	
55 Cs 132.91	56 Ba 137.36	57 La 138.92	72 Hf 178.50	73 Ta 180.95	74 W 183.86	75 Re 186.22	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 197.0	80 Hg 200.61	81 Tl 204.39	82 Pb 207.21	83 Bi 208.9	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra 226.03	89 Ac 227.0	104 Rf (261)	105 Ha (262)	106 -- (263)													
Alkali Metals																		
		58 Ce 140.13	59 Pr 140.92	60 Nd 144.27	61 Pm (145)	62 Sm 150.36	63 Eu 152.35	64 Gd 157.26	65 Tb 158.93	66 Dy 162.51	67 Ho 164.94	68 Er 167.2	69 Tm 168.94	70 Yb 173.04	71 Lu 174.99			
		90 Th 232.04	91 Pa (231)	92 U 238.07	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (245)	97 Bk (249)	98 Cf (251)	99 Es (254)	100 Fm (255)	101 Md (256)	102 No (259)	103 Lr (260)			
Click Here For Conversion Factors																		

Radioactive → **84** **Po** (209)

← METALLOID (elements to left of metalloids are metals; to right, non-metals)

ATOMIC NO. →

← CHEMICAL SYMBOL

ATOMIC WEIGHT →

Parenteses indicate element is artificially produced & mass number of longest-lived isotope.

Halogens ↑

Noble Gases ↑