First letter of last name →

Organic Chemistry I
Pham - Chem 30A
University of California, Los Angeles
Fall 2016 - Exam 1 - 10/21/16

I hereby state that I have neither given nor received aid to or from other students during this exam. I vouch for the honesty and integrity of each and every answer given.

Signature_____ ID#_____

Name (printed)_____

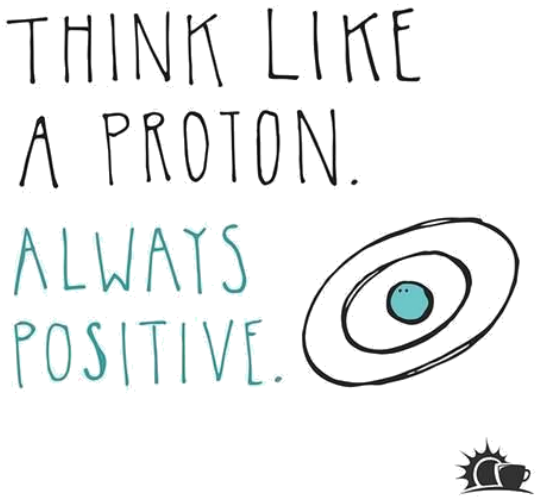
Circle your TA's name: Janice Gina Mike

Given Information

$\Delta G = -RT*\ln(K_{eq})$	$\Delta G = \Delta H - T\Delta S$	$[\alpha]_\lambda^T = \alpha / l*c$	%ee = |%R - %S|
$R = 1.987 \times 10^{-3}$ kcal mol^{-1} K^{-1}			

See back page for periodic table

	Possible	Your score
I. Nomenclature	14	
II. Chair Conformations	12	
III. Resonance	24	
IV. Acid/Base	12	
V. Stereochemistry	24	
VI. General Knowledge	14	
Bonus	0 (6)	
Total	100	



**Note: Some questions will be marked with a (**). This means that bonus points are possible for these questions (either by being specific, elaborate, chemically accurate, etc.), but do not spend all of your time trying to get them!

Last Name _____

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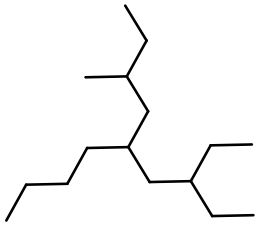
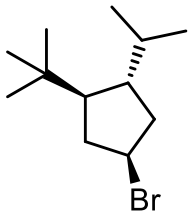
I. Nomenclature (14 pts) Using IUPAC nomenclature, **name** the following molecules. You may use either systematic names or common names for the substituents.



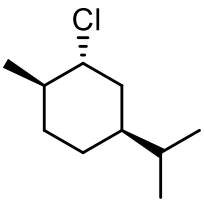
Name: ____**5-butyl-3-ethyl-7-methylnonane**_____



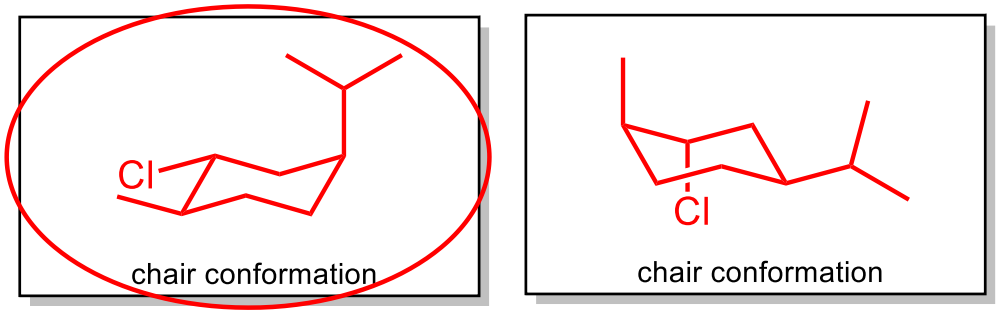
Name: __**(1R,2S,4R)-4-bromo-1-*tert*-butyl-2-isopropylcyclopentane**_____

Is this molecule optically active? **Circle one**: (YES) NO

II. Chair Conformations (12 pts) In the spaces provided, **draw the two chair conformations** of the molecule below. **Circle the more stable** chair conformation. ΔG values are given for relevant substituents. Incorrectly drawn or messy chairs may result in lost points.



Substituent	ΔG° (eq ⟶ ax) (kcal/mol)
-Cl	0.5
-CH_3	1.7
-iPr	2.1



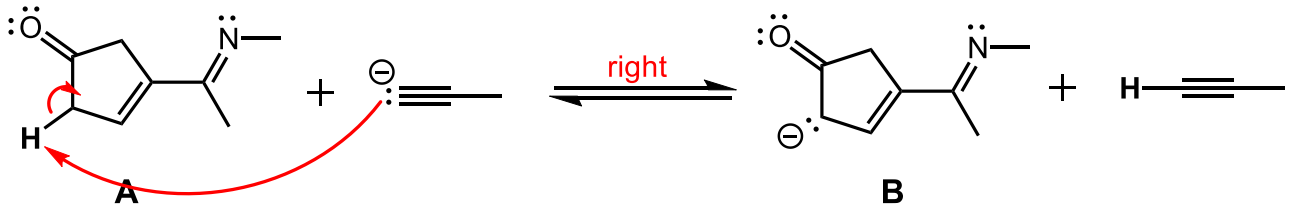
What term or concept **best explains** why one chair conformation is more stable than the other?

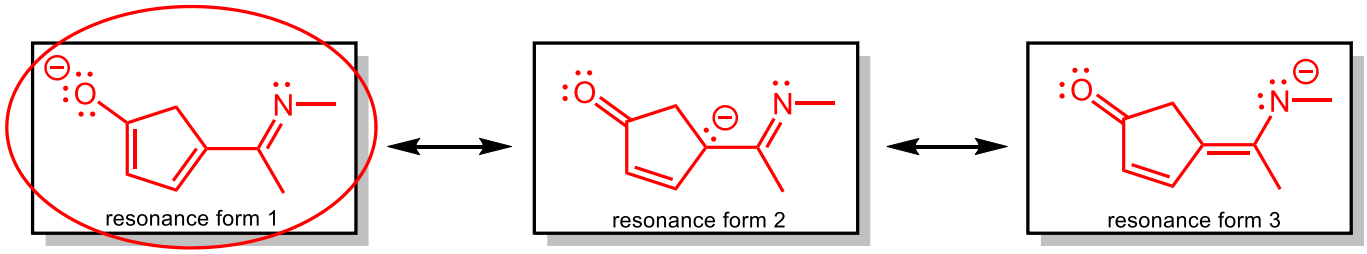
1,3-diaxial interactions

Last Name _____

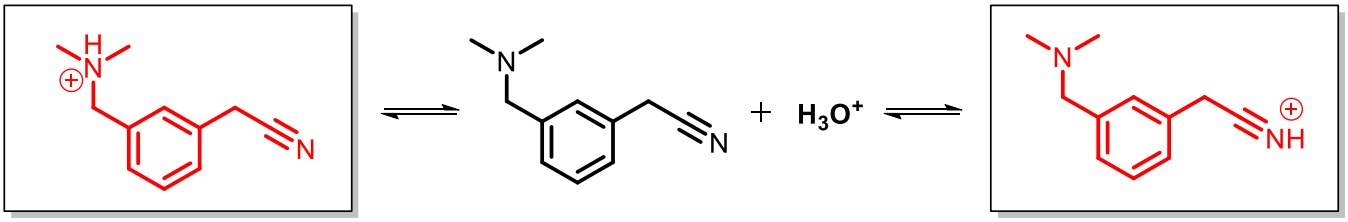
III. Resonance (24 pts) The reaction of molecule A with an alkynyl anion results in anion B and propyne.

a) **Draw** curved arrows on the reactants side to show the movement of electrons, tracking which bonds are formed and broken.
b) **In the spaces provided, draw** three additional important resonance contributors for molecule B.
c) Of the **four resonance structures** (B and the 3 you have drawn), **circle** the most important resonance form.
d) Does the reaction favor the reactants ("left") or the products ("right")? **Write** the answer **above** the equilibrium arrows.





IV. Acid/Base Reaction (12 pts) Protonation of the molecule below can occur at different positions. In the spaces provided, **draw the two most likely protonated forms** that result from its reaction with hydronium. Of the two protonated molecules you have just drawn, **circle the one with the lower pKa**.



In *10 words or fewer*, **explain why the circled molecule has a lower pKa.

If you circled the left molecule: No resonance stabilization of positive charge on sp^3-hybridized N.

If you circled the right molecule: Positive charge is destabilized on sp-hybridized N.

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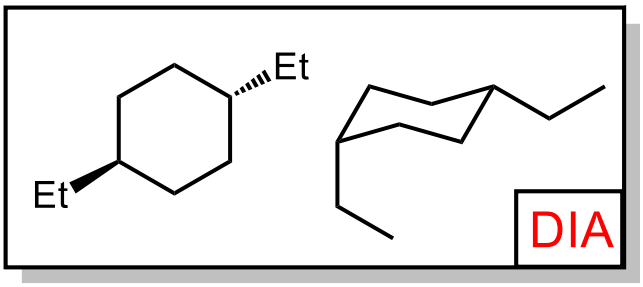
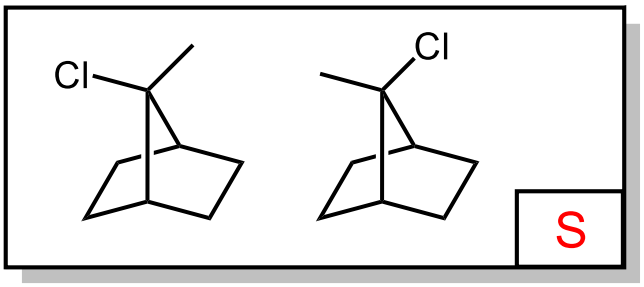
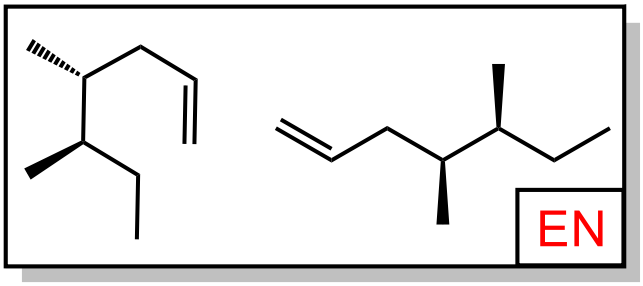
V. Stereochemistry (24 pts) **Indicate the relationship** between the following pairs of compounds, using the following notation: constitutional isomers (CI), enantiomers (EN), diastereomers (DIA), unrelated (U), or the same molecule (S). **Write your answers inside the corner boxes** provided. You may use the extra space at the bottom of the page as scratch paper.



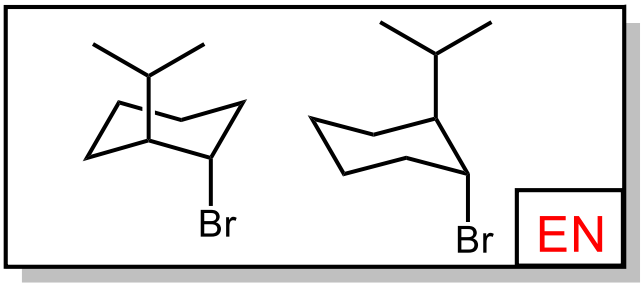
DIA



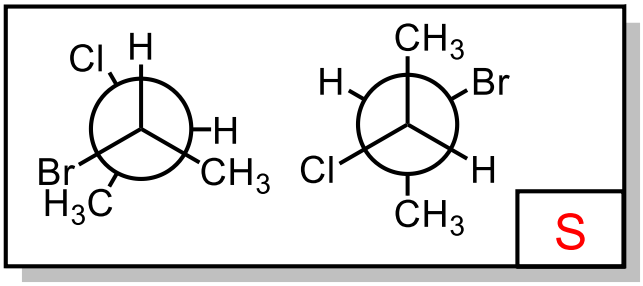
S



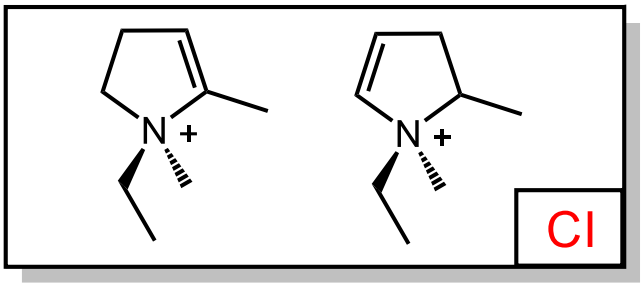
EN



EN



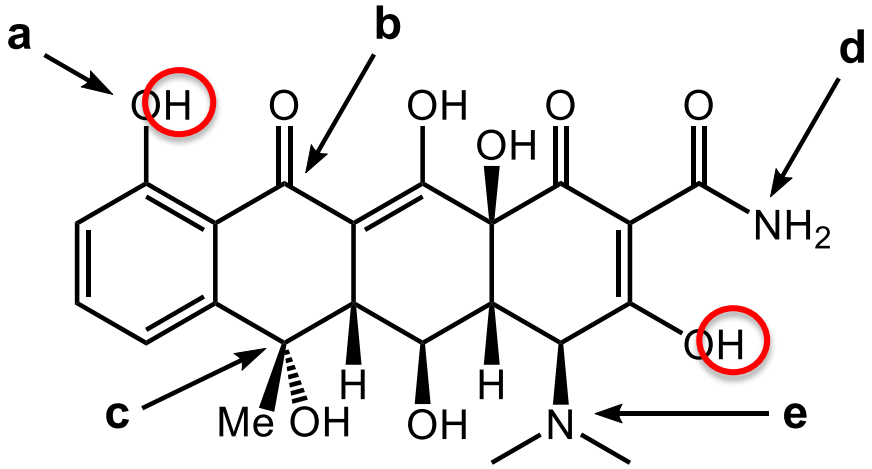
S



Cl

Last Name _____

VI. General knowledge (14 pts) **Answer** the next few questions about terramycin. For questions a-e, refer to the corresponding labeled arrows.



terramycin, an antibacterial

a) **Name the functional group. __alcohol/hydroxyl (**phenol)__

b) Name the functional group. ____ketone_____

c) What is the configuration (R/S) of this stereocenter? __S__

d) In what orbital do the lone pairs of nitrogen reside? ___p___

e) What is the molecular (VSEPR) shape around this nitrogen? ___trigonal pyramidal__

f) How many chiral centers does terramycin have? __6__

g) **Circle** the most acidic hydrogen in terramycin. Draw the hydrogen in first if it is not explicitly shown. (Note: There may be more than one acceptable answer, but you only need to circle one.) **2 answers accepted here**

****BONUS:** You may (and should!) answer both questions.

B1) If you haven't realized it yet, Professor Pham's office and all the TAs' office hours are in the same area, also known as the Young Hall Student Center and Lounge. To get bonus points, give the specific room number that each of the TAs have office hours, and where Prof. Pham's office is. (1 pt each)

Professor Pham: ___4222A____ Gina: ___4222-2____

Janice: ____4222-1____ Mike: ___4222-2____

B2) What is the significance of this upcoming Sunday, to a chemist? (2 pts) **Mole day!**

Last Name _____

PERIODIC CHART OF THE ELEMENTS

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	INERT GASES
1 H 1.00797														1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122									5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312									13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	✳57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	†89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

Numbers in parenthesis are mass numbers of most stable or most common isotope.

Atomic weights corrected to conform to the 1963 values of the Commission on Atomic Weights.

The group designations used here are the former Chemical Abstract Service numbers.

✳ Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97

† Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)