

CHEM 3311 (Richardson) Second Hour Exam – Oct. 24, 2017

Your Name: Key

Student ID: _____

- Recitation (check one) O 1:00 Mon (Zhenhao Chen)
 O 8:00 Tue (Rachel Weintraub) O 11:00 Tue (Patrick Li)
 O 2:00 Tue (Zhenhao Chen) O 1:00 Wed (Zepeng Lei)
 O 3:00 Wed (Rachel Weintraub) O 9:00 Thu (Rachel Weintraub)
 O 12:00 Thu (Patrick Li) O 3:00 Thu (Zepeng Lei)
 O 2:00 Fri (Rachel Weintraub) O 3:00 Fri (Rachel Weintraub)

Question	Score	Out of
1		12
2		10
3		25
4		30
5		15
6		8
7		6 e.c.
Total		100

This is a closed-book exam. The use of notes, calculators, or cell phones will not be allowed during the exam. You may use models sets brought in a clear ziplock bag. Use the backs of the pages for scratch work. If your final answer is not clearly specified, you will lose points. For mechanisms, show all intermediates including correct formal charges, but do not show transition states.

1 H																	2 He	
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	57-70 *	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-102 **	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	114 Uuq					

* Lanthanide series

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb
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** Actinide series

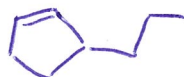
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No
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pKa Values

HI	-10	CH ₃ COOH	4.7	ArOH	10	H ₂	35
HBr	-8	HN ₃	4.7	RSH	10-12	NH ₃	36
HCl	-6	H ₂ S	7.0	H ₂ O	15.7	H ₂ C=CH ₂	45
H ₃ O ⁺	-1.7	NH ₄ ⁺	9.3	ROH (R=alkyl)	16-18	CH ₄	60
HF	3.2	HCN	9.4	HC≡CH	26		

1 pt conc
 ↓
 Average: 74
 St. Dev: 19.2
 Max: 105
 Min: 16

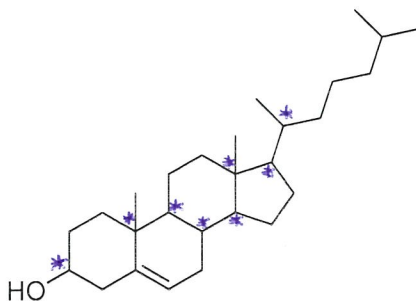
- 1) Show all the possible molecules of formula C_8H_{14} that you could hydrogenate to form propylcyclopentane. Do not repeat any structures. (12 pts)



2 pts each
-1 for each duplicate



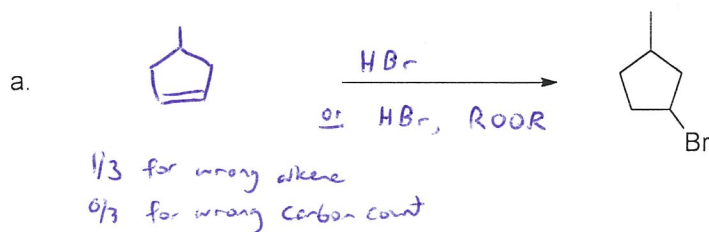
- 2) Label all eight asymmetric carbons in cholesterol, shown below. You do not need to assign R/S descriptors. How many stereoisomers are possible for a molecule with this many asymmetric carbons? (Just write it as an expression – no need to actually solve for the number.) (10 pts)



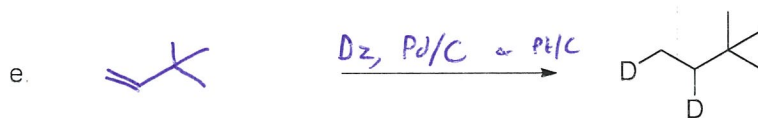
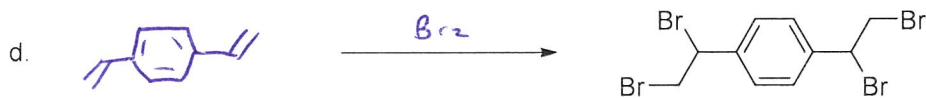
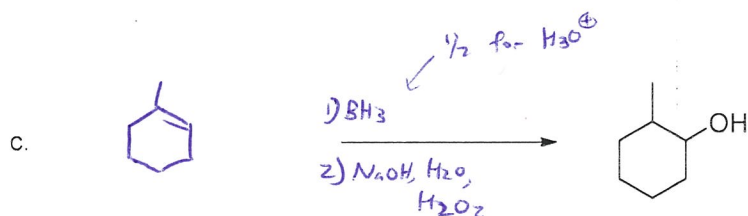
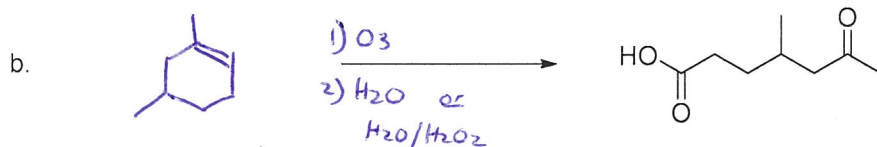
No meso forms possible, so
28

1 pt each, 2 pts for correct # of isomers

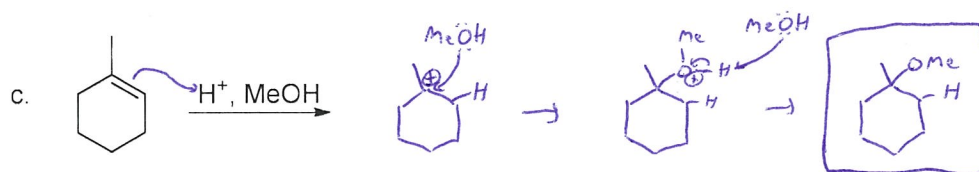
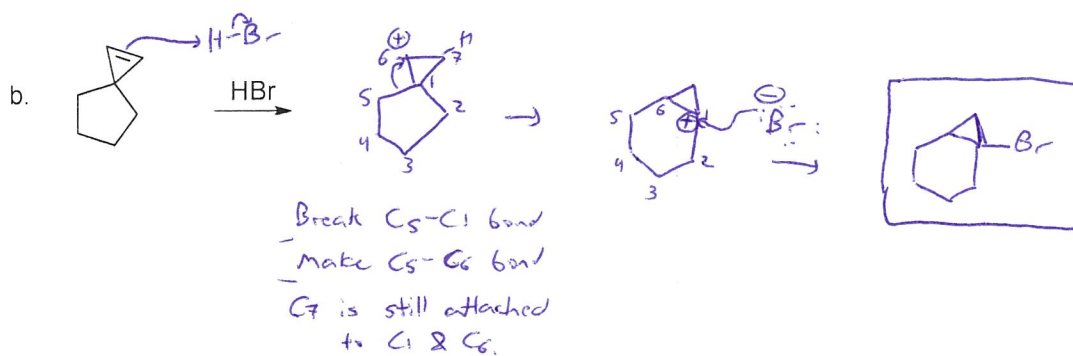
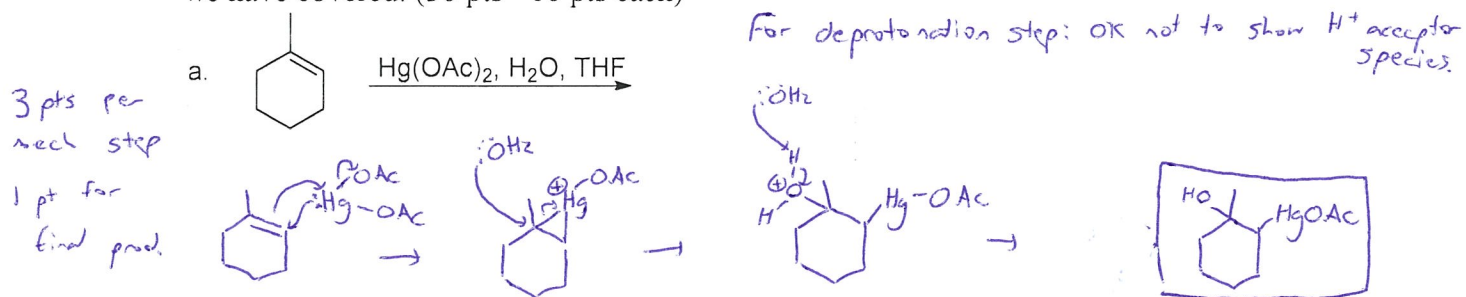
- 3) Using any reactions that have been covered so far in class, show how you would create the products shown, starting with any hydrocarbon (consisting of C and H only) that has the same number of carbon atoms as the product. Write your starting material before the arrow, and the other reagents above or below the arrow. Make sure that each reaction gives the desired structure as the only major product. Hint: D is an isotope of H and reacts the same way. (25 pts - 5 pts each)



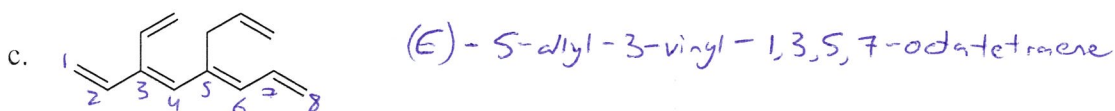
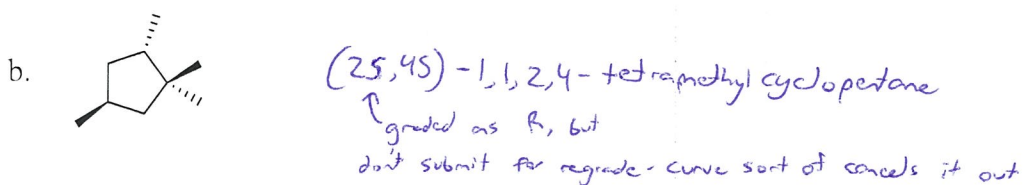
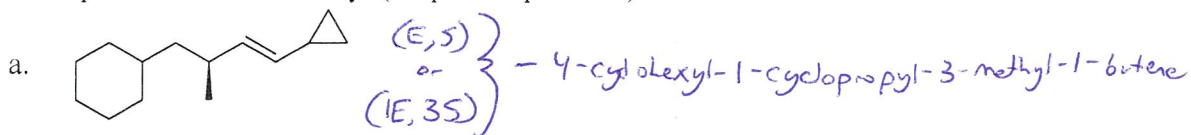
3 pts for starting material
 2 pts for reagents



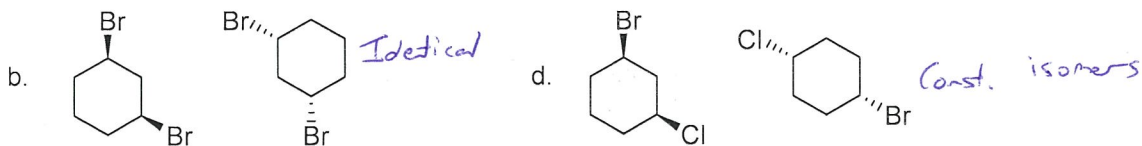
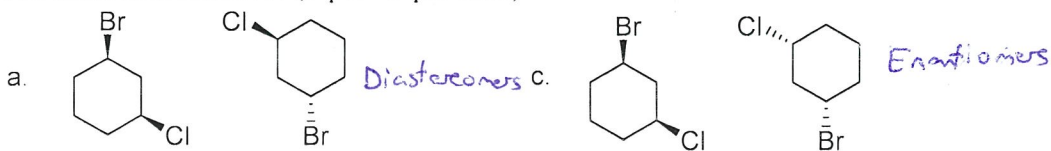
- 4) Show a mechanism for each reaction, and draw a box around the final product. Hint: one of these reactions hasn't been covered in class, but the mechanism is identical to a reaction that we have covered. (30 pts - 10 pts each)



5) Give complete IUPAC names for the following compounds, including E/Z and R/S descriptors where necessary. (15 pts – 3 pts each)



6) For each of the following pairs of molecules, are they identical, enantiomers, diastereomers, or constitutional isomers? (8 pts - 2 pts each)



7) Extra credit! When the molecule below reacts with I_2 in DCM, it forms a cyclic product. Show the structure of this product. (6 pts extra credit)

(No pts for mech)

