

Scratch paper

Do not write any answers you wish to be graded on this page

CAS CH 203
Exam 2

Organic Chemistry I
4 November 2010, 8:00 A.M.–9:20 A.M.

Name _____

ID Number _____

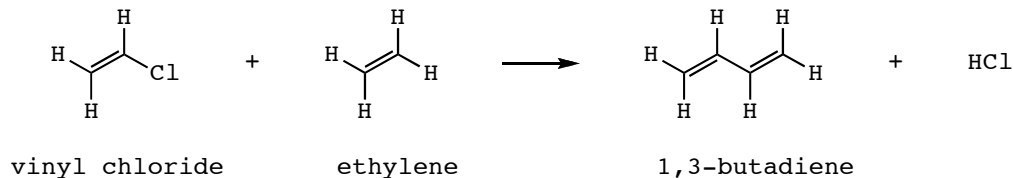
Instructions

- (A) Make sure you have 5 pages with 7 questions.
- (B) Write all answers on the pages provided.
- (C) Only answers written in ink will be considered for regrading.
- (D) Good luck!

I	II	III	IV	V	VI	VII	VIII
H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca	Ga	Ge	As	Se	Br	Kr
Rb	Sr	In	Sn	Sb	Te	I	Xe

Page	Score
1	/14
2	/32
3	/21
4	/21
5	/12
Total	/100

(1a) 1,3-Butadiene can be prepared by the reaction of vinyl chloride with ethylene:

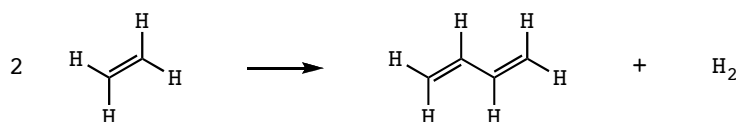


Using data in the table, calculate the standard enthalpy change ΔH° of the reaction. Show your work and write your answer in the space provided. (5 points)

$$\Delta H^\circ = 92 + 112 - 115 - 103 = -14$$

$$\Delta H^\circ = -14 \text{ kcal/mol}$$

(1b) 1,3-Butadiene can also be prepared by the reaction of two ethylene molecules:



Using data in the table, calculate the standard enthalpy change ΔH° of the reaction. Show your work and write your answer in the space provided. (5 points)

$$\Delta H^\circ = (2 \times 112) - 115 - 104 = +5$$

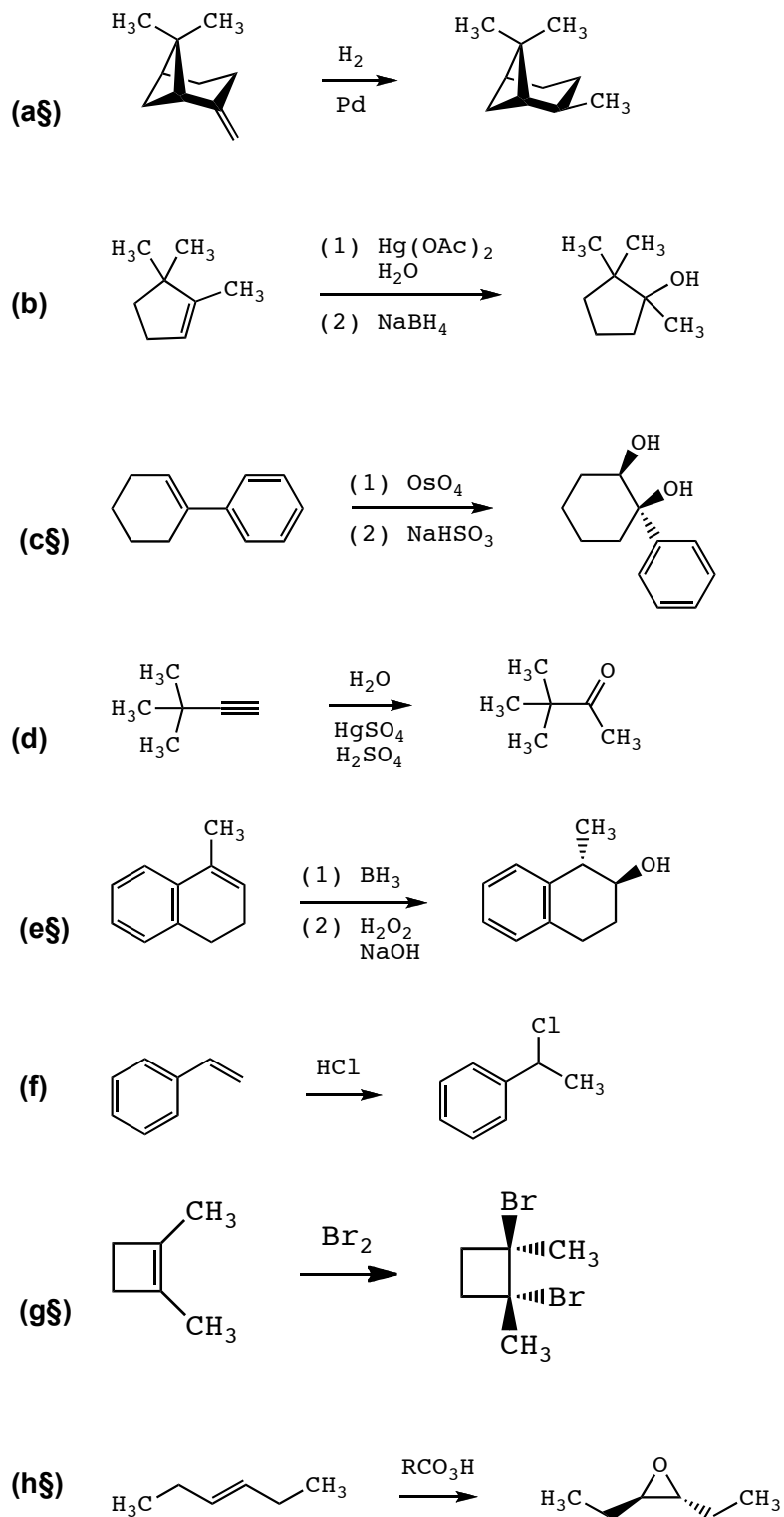
$$\Delta H^\circ = +5 \text{ kcal/mol}$$

(1c) Which reaction is more thermodynamically favorable, that in (1a) or (1b)? Briefly explain the reason(s) for your choice. (4 points)

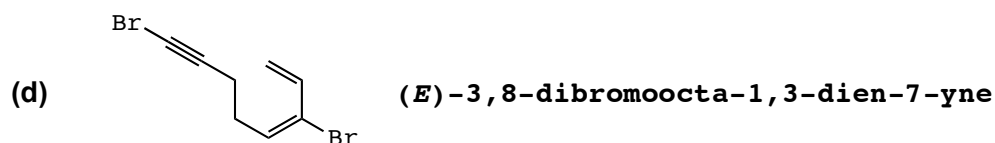
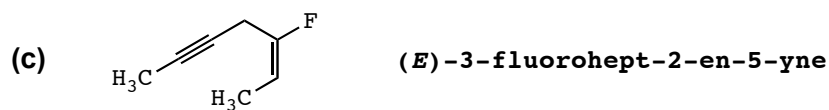
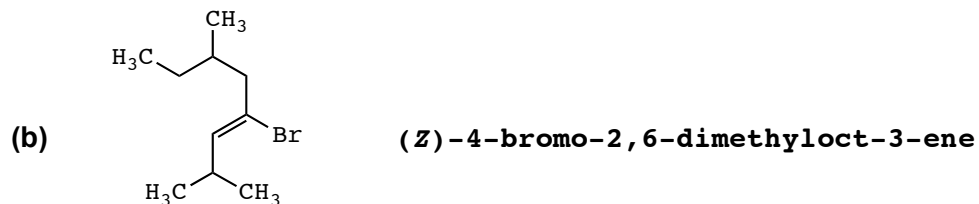
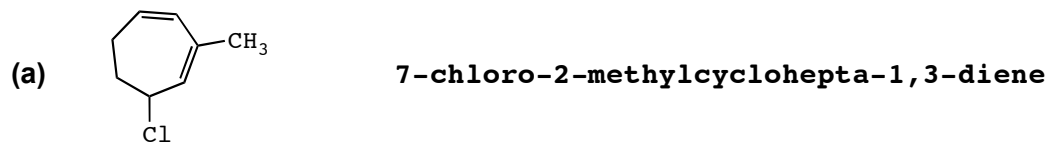
(1a) is more favorable because its ΔH° is more negative.

Bond	Bond Dissociation Energy, D [kcal/mol]
CH ₂ CH—Cl	92
H—Cl	103
H—H	104
CH ₂ CH—H	112
CH ₂ CH—CHCH ₂	115

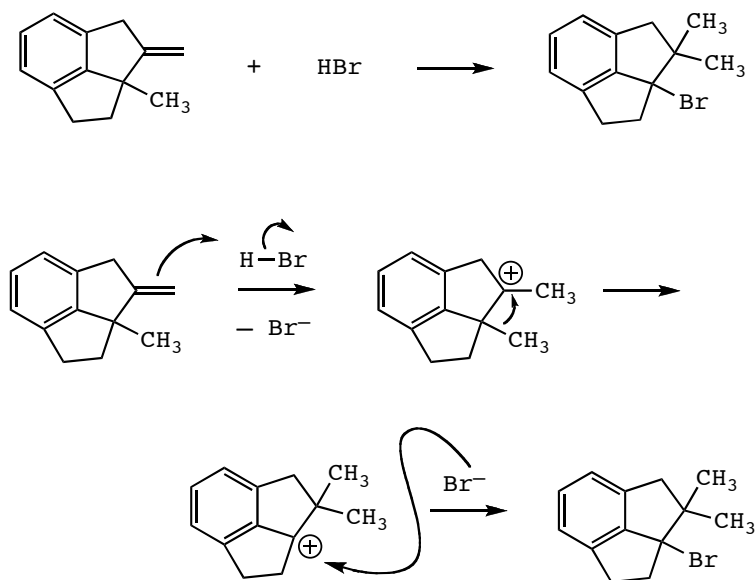
(2) Draw the structure of the major organic product of these reactions and reaction sequences. In those reactions marked §, clearly indicate the stereochemistry of the product. Do not present mechanisms. (32 points)



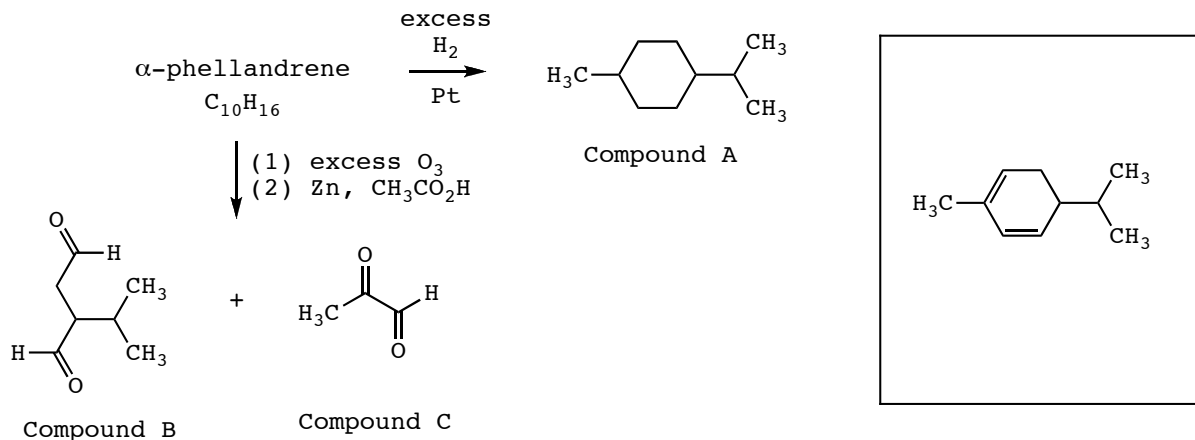
(3) Write the systematic name of these compounds, including stereochemical designations where appropriate. (12 points)



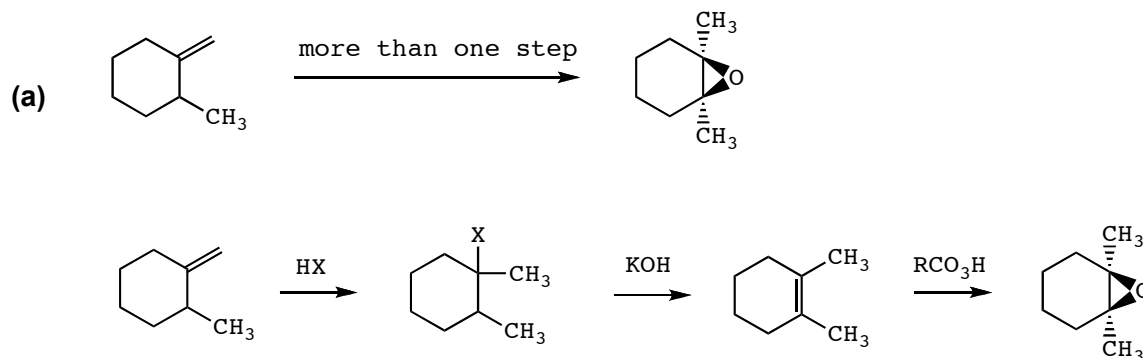
(4) Propose a detailed mechanism for this reaction; use curved arrows to show the movement of electrons. (9 points)



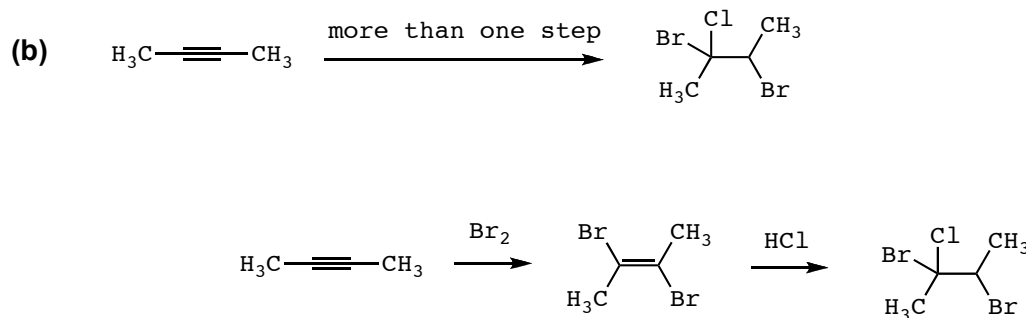
(5) α -Phellandrene ($C_{10}H_{16}$), the sex-attractant of the Caribbean fruit fly *Anastrepha suspensa*, reacts with excess H_2 in the presence of a Pt catalyst to produce Compound A; reaction with excess O_3 followed by work-up with Zn and CH_3CO_2H produces Compounds B and C. Draw the structure of α -phellandrene in the box. (6 points)



(6) Propose a short sequence of reactions for transforming the indicated starting material to the target molecule. Draw the structure of the product formed after each reaction; do not write mechanisms. (15 points)



H_3O^+ addition, dehydration, then epoxidation also acceptable



HCl addition first, then Br_2 also acceptable

(7) Propose a detailed mechanism for these reactions; use curved arrows to show the movement of electrons. (12 points)

