

**9:00 SECTION 100**

Student ID \_\_\_\_\_

page points:

2 \_\_\_\_\_ (24)

3 \_\_\_\_\_ (20)

4 \_\_\_\_\_ (20)

5 \_\_\_\_\_ (24)

6 \_\_\_\_\_ (12)

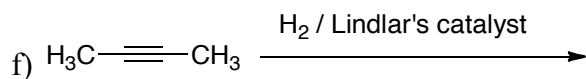
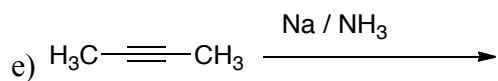
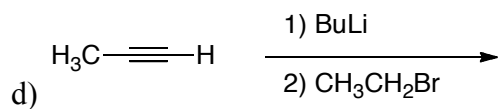
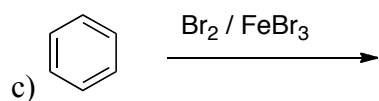
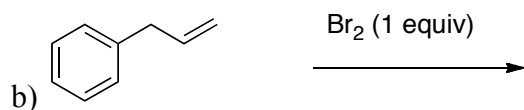
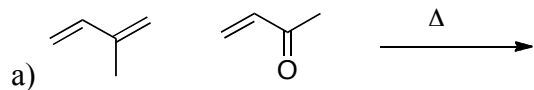
Total \_\_\_\_\_ (100)

## Periodic Table

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Ha	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

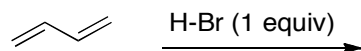
**Please sit with an empty seat between you and your neighbors.****Unless specifically asked, you do not have to draw mechanisms for reactions.****Feel free to ask questions about the questions, but please don't ask questions about your answers, it distracts your neighbors.**

1 Provide the products of the following reactions. If a reaction would produce stereoisomers, draw the isomers and indicate if they will be produced in equal or unequal amounts (4 pts each).

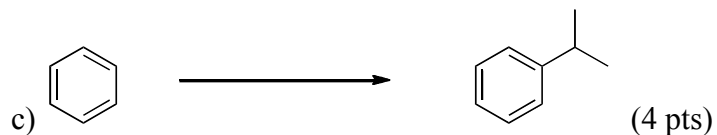
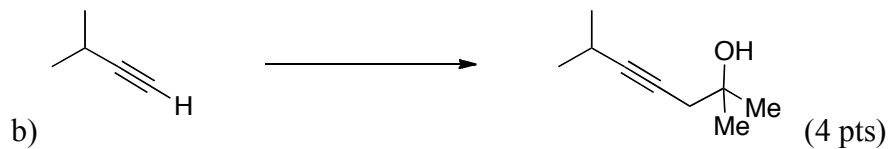
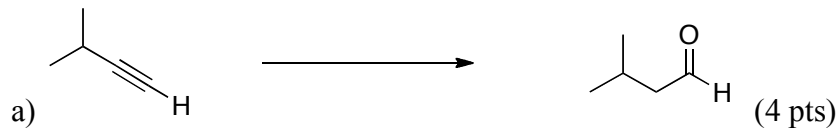


2a) Provide the major and minor products expected from the reaction shown below and indicate which is major and which is minor (6 points):

b) Is this reaction under kinetic or thermodynamic control (2 points)?

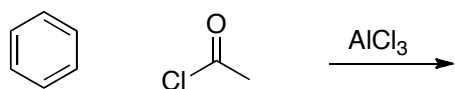


3) Complete the following syntheses using any organic molecule of 4 carbons or less and any reagents you need. You do not have to show the synthesis of the 4-carbon or less molecule you use. If your synthesis requires more than one step, provide the product after each step. All chiral products are racemic mixtures.





3) Provide the products and mechanisms for the following reactions. Show every intermediate with the proper charges and all the arrows required for each step of the reaction (4 pts for product, 8 pts for mechanism)

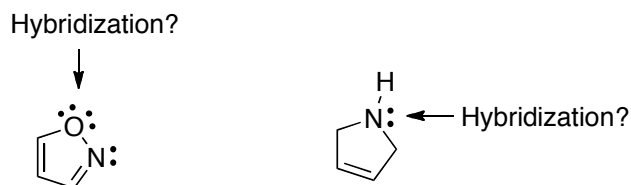


3a) What is the approximate pKa of acetylene? (2 pts)

b) For the conjugate base of acetylene (shown below), what is the hybridization of the orbital containing the lone pair (circle one)? (2 pts)



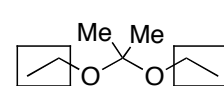
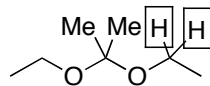
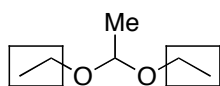
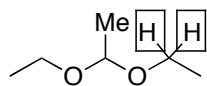
4a) Provide the hybridization of the **atoms** indicate with an arrow below (not the lone pair orbitals, but the atoms). (2 pts each)



b) Are the following molecules aromatic, anti aromatic, or does this designation not apply? (2 pts each)



5) Label the boxed groups as homotopic, enantiotopic, diastereotopic or does not apply. (2 pts each)



6) Butadiene has four  $\pi$ -orbitals called  $\pi_1$   $\pi_2$   $\pi_3$  and  $\pi_4$ .  $\pi_1$  is lowest in energy and  $\pi_4$  highest. The p orbital systems for  $\pi_2$  and  $\pi_3$  are shown below but without the phase designations ( $\pi_1$  and  $\pi_4$  are not shown). Provide the phase (+ or -) for each lobe (2 pts each)

