Organic I – Fall 2010 – Exam #3

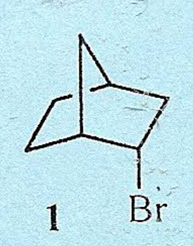
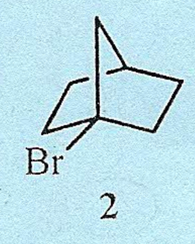
Name:_____

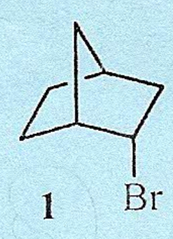
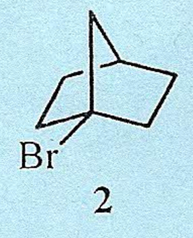
1. Consider the pairs of molecules drawn below for each case (a-e) and <u>circle</u> the number that corresponds to the entry that best satisfies the statement.

a) DMSO (1) vs water (2) — **Better solvent for Sn1**

b) LDA (1) vs $HC{\equiv}C^-Na^+$ (2) — **Weaker Base**

c) Acetylene (1) vs Ethanol (2) — **Less acidic**

d)  (1) vs  (2) — **Less reactive to Sn1 conditions**

e)  (1) vs  (2) — **More reactive to Sn2 conditions**

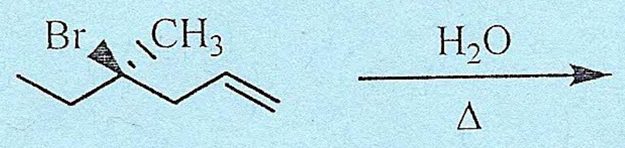
2. Which S_N2 reaction will occur most rapidly?

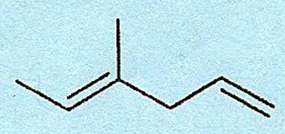
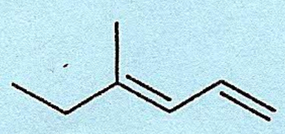
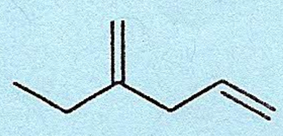
a) $I^- + CH_3OH \rightarrow CH_3I + OH^-$
b) $H_2O + CH_3I \rightarrow CH_3OH + HI$
c) $CH_3S^- + CH_3I \rightarrow CH_3OCH_3 + I^-$
d) $CH_3O^- + CH_3I \rightarrow CH_3SCH_3 + I^-$

3. Considering the E1 reaction, which of the following is true? **Enter all that apply.**

a) Possesses an endothermic intermediate
b) Rate depends only on alkyl halide concentration
c) ΔS is positive
d) All of the above

4. What is the major elimination product for the reaction below?



a)  b)  c)  d) equal amounts of a & b

5. What would be the major elimination product of *trans*-1-bromo-2-methylcyclohexane in the presence of sodium hydroxide?

a)

b) c) d) No E2, only Sn2

6. What is the major substitution product for the reaction below?

a) b) c) d)

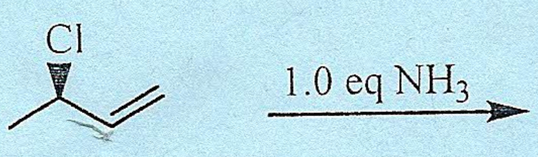
7. Enter "True" or "False" for the following:

a) Free radical chlorination of methane is endothermic in its 1st propagation step as it generates a methyl radical and HCl.
b) The kinetic product and thermodynamic product of cyclopentene with NBS are the same (neglecting stereoisomers).
c) According to the Hammond Postulate transition state structures for exothermic reactions resemble those of the products.
d) Phenolics (such as Vitamin E and BHT) serve as radical initiators.
e) Doubling the concentration of NaOH will quadruple the rate of substitution with 1-bromopropane.

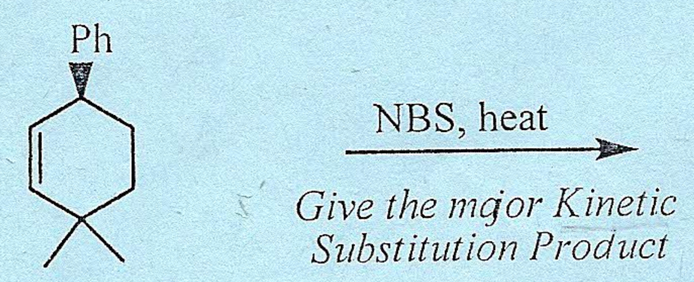
SHORT ANSWER QUESTIONS

8. **Read this carefully**. Give **only** the major organic products, starting materials or conditions for the following reactions. If more than one isomer is possible make sure to clearly indicate both structures. Be sure to indicate the correct stereochemistry of the products (using dashes and wedges or cis/trans) where needed. Write "NR" if no reaction occurs.

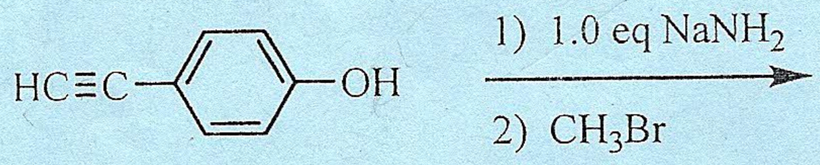
a)



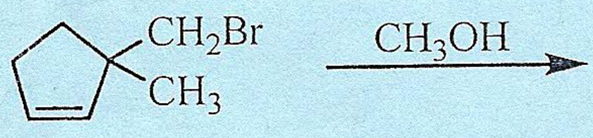
b)



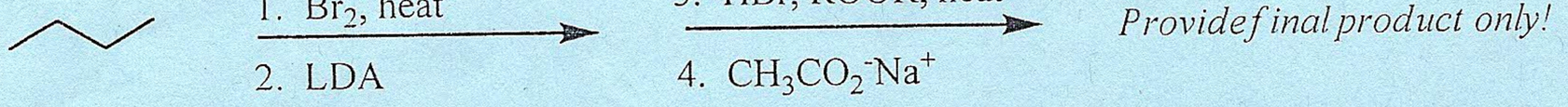
c)



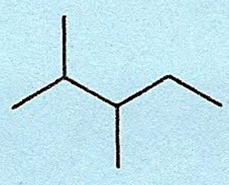
d)



9. Give the major product for the multistep reaction below:

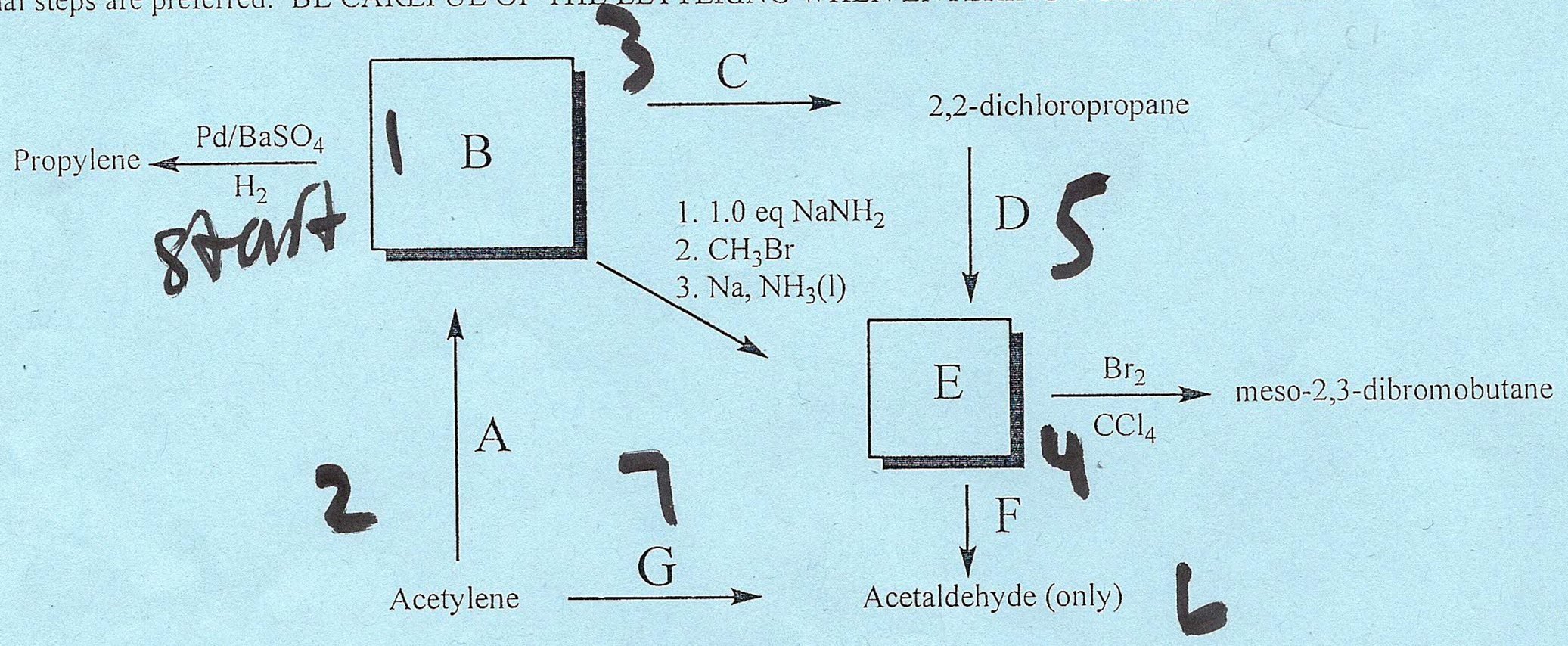


10. Consider the monochlorination of the molecule below and answer the following. The relative reactivity ratios for hydrogen atom abstraction via chlorination are as follows: 3° H = 5, 2° H = 4, 1°H = 1.0



a) Provide the structure of the major product?
b) How many total products are obtained (ignoring stereoisomers)?
c) How many total products are obtained (including stereoisomers)?
d) How many products are NOT chiral?
e) What percentage (NOT A FRACTION) of the mixture would contain 1-chloro-3,4-dimethylpentane?

11. Provide the missing conditions or products for the roadmap problem below. No reagent box should contain more than 3 steps but minimal steps are preferred. BE CAREFUL OF THE LETTERING WHEN ENTERING YOUR ANSWERS!



12. **Extra Credit…Multistep Synthesis**…Propose a step-by-step synthesis for the transformation below. Show all reactant conditions and all intermediate products after each step. Choose conditions to maximize the product formed after each step. DO NOT SHOW MECHANISMS.