E5 practice ii

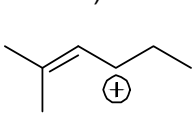
1. (32 points) Circle the letter *on the right* which corresponds to the answer to each question. There is only one correct answer for each question.

(i) Which of the following dienes undergoes the least exothermic hydrogenation upon treatment with H_2/Pt?

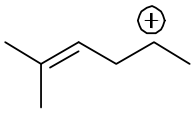
A. (*E*,*E*) $CH_3CH{=}CHCH{=}CHCH_3$ **B.** (*E*) $CH_2{=}CHCH{=}CHCH_2CH_3$
C. (*Z*) $CH_3CH{=}CHCH_2CH{=}CH_2$ **D.** $CH_2{=}CHCH_2CH_2CH{=}CH_2$

A **B** **C** **D**

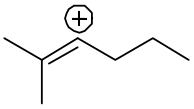
(ii) Which of the following carbocations is most stable (remember to take resonance structures into account)?



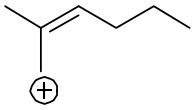
E



F



G



H

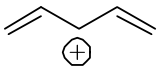
E **F** **G** **H**

(iii) How many electrons does the allyl *cation* have in p-orbitals?

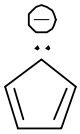
I. 2 **J.** 3 **K.** 4 **L.** 5

I **J** **K** **L**

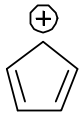
(iv) Which of the following ions is aromatic?



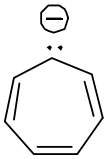
M



N



O



P

M **N** **O** **P**

(v) Which type of reactive intermediate is involved in the treatment of toluene, Ph-CH_3, with *N*-bromosuccinimide?

Q. cation **R.** anion **S.** radical **T.** dienophile

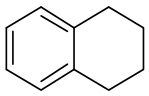
Q **R** **S** **T**

(vi) Which of the following undergoes the most rapid bromination with *N*-bromosuccinimide?

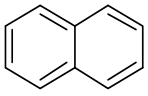
U. pentane **V.** 1-pentene **W.** 2-pentene **X.** 1,4-pentadiene

U **V** **W** **X**

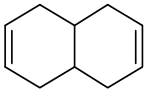
(vii) Which of the following molecules is **not** aromatic?



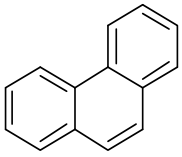
Y.



Z.



AA.



BB.

Y **Z** **AA** **BB**

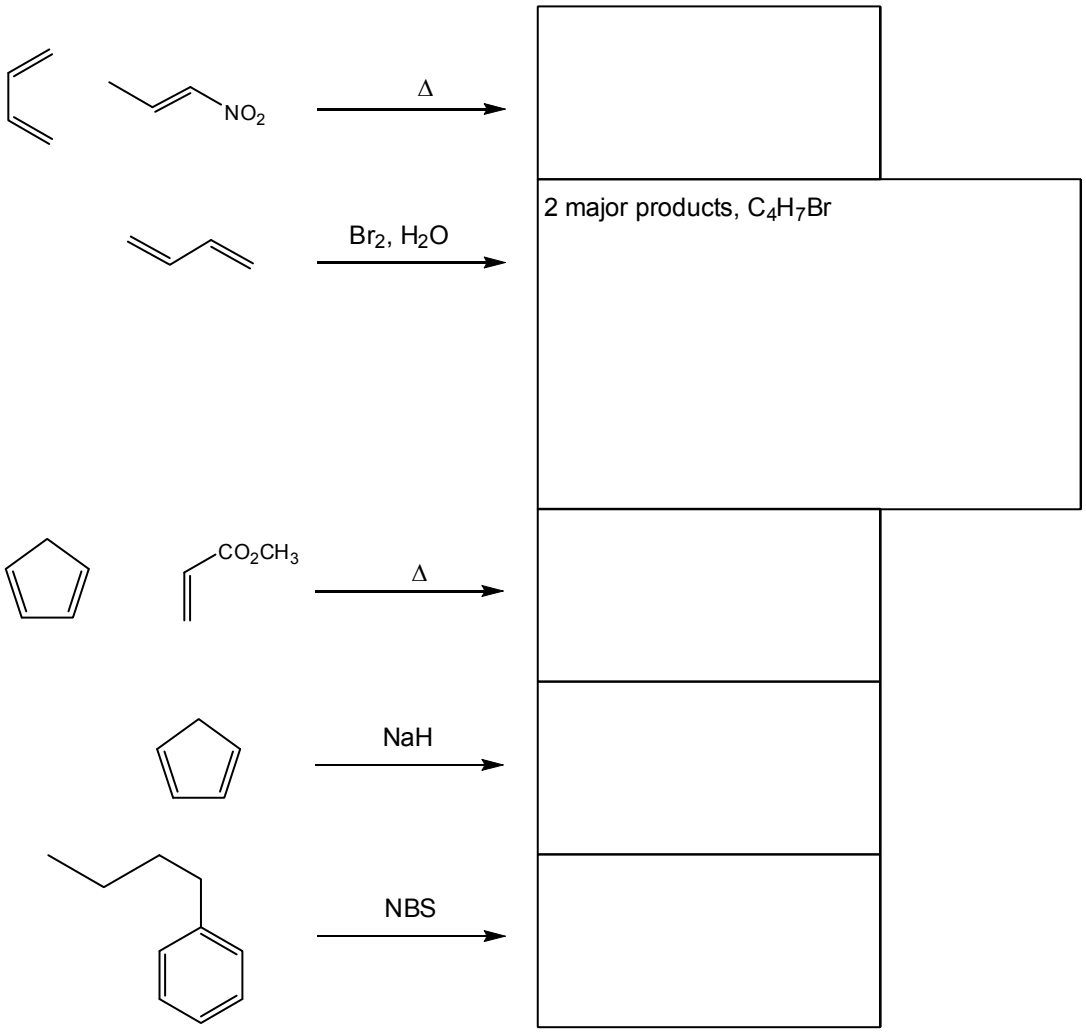
(viii) Which of the following is the thermodynamic product obtained upon treatment of 1,3-butadiene with Br_2?

CC. $BrCH_2CHBrCH{=}CH_2$ **DD.** *(E)* $BrCH_2CH{=}CHCH_2Br$
EE. *(Z)* $BrCH_2CH{=}CHCH_2Br$ **FF.** *(E)* $BrCH_2CH{=}CBrCH_3$

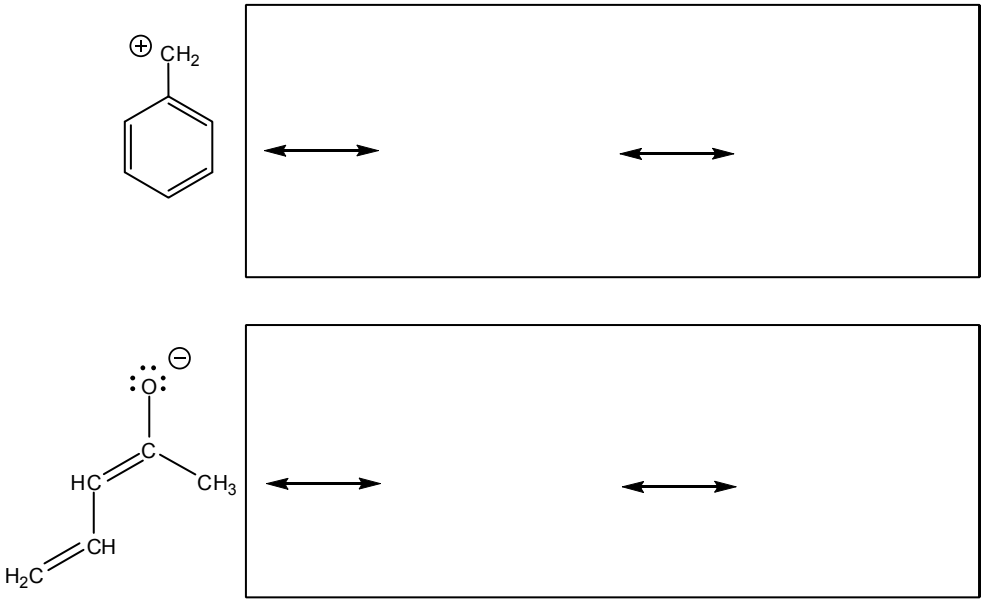
CC **DD** **EE** **FF**

2. (38 points)

(a) Provide the structure of the major organic products of the following reactions.



(b) Draw two *low energy* resonance structures for each of the following species (there may be more than two possible answers)



3. 3. (30 points) The following transformations cannot be completed in a single step. Provide a sequence of reactions to perform each transformation, showing the reagents and structures of *all isolated synthetic intermediates*. The synthesis must use the given starting materials; you may also use any other starting materials with *3 or fewer* carbon atoms. You may use any reagents. Do *not* show mechanisms or the structures of reactive intermediates. Shorter, more efficient syntheses are preferred; overly long or inefficient sequences will lose some credit.