1. Circle the correct answer: (40 pts)

(1) Benzyl bromide can undergo:

a. S_N1 reaction more easily than S_N2 reaction.

b. S_N2 reaction more easily than S_N1 reaction.

c. either S_N1 or S_N2 reaction depending on the reaction condition.

d. neither S_N1 nor S_N2 reaction under any conditions.

(2) A Diels-Alder reaction leads to the formation of

a. one new σ bond.

b. two new σ bonds

c. three new σ bond.

d. four new σ bonds

(3) In a Lewis structure, two double bonds or triple bonds are said to be in conjugation when they are separated by

a. no other bonds.

b. a single bond.

c. a double bond.

d. a triple bond.

(4) The electrophilic addition of H-X to a conjugated diene involves an intermediate that is

a. a secondary carbocation.

b. a tertiary carbocation

c. a resonance stabilized allylic cation.

d. a radical.

(5) Which of the following is an INCORRECT description of benzene?

a. All the bond angles are equal to 120°.

b. The molecule is always planar.

c. The molecule is a 6-membered ring containing alternating single and double carbon-carbon bonds.

d. The molecule is aromatic

(6) Aromatic molecules contain at least_____π electrons.

a. 0 b. 1 c. 2

d. 3 e. 4

(7) The -NO_2 group deactivates the benzene ring of nitrobenzene toward electrophilic aromatic substitution by

a. changing the distribution of π electrons. b. polarizing the benzene ring.

c. only activating the *meta* positions. d. deactivating all positions on the ring.

(8) In an electrophilic aromatic substitution reaction, the sigma complex is stabilized when a _____is attached to the aromatic ring.

a. a hydrogen atom A. a nitrogen atom

c. an electron-donating group d. an electron-withdrawing group

(9) Halogens direct electrophiles to the *ortho* and *para* positions of a halobenzene because of

a. donation of nonbonding electrons to the ring through resonance.

b. removal of ring electrons through resonance.

c. removal of ring electrons because of halogen's electronegativity.

d. inductive effect.

(10) In Friedel-Crafts alkylation, the resultant alkylbenzene product is

a. less reactive than benzene.

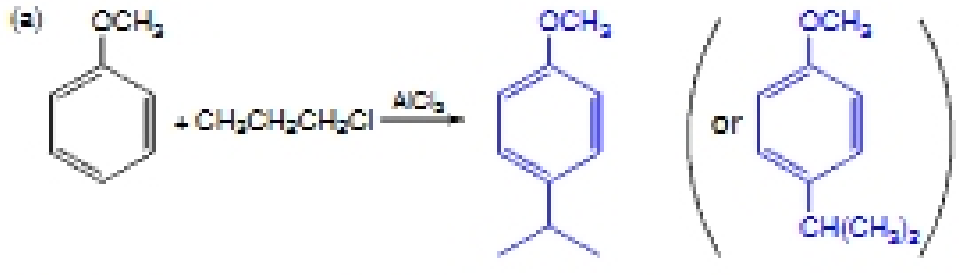
b. more reactive than benzene.

c. as reactive as benzene.

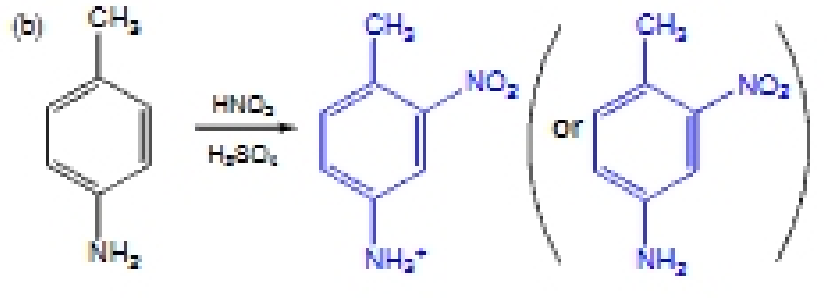
d. completely deactivated.

2. Provide the structure of the major (or only) product in each of the reactions shown below.(12 pts. 3pts/each)

(a)

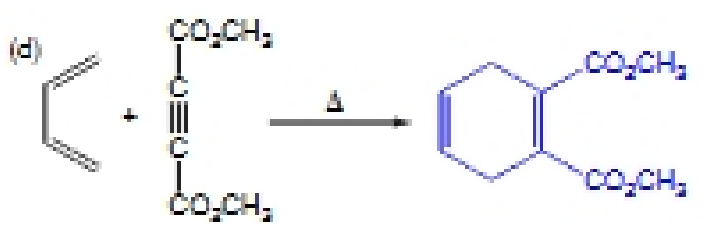


(b)

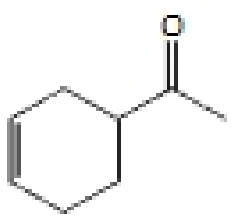
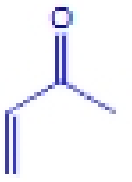
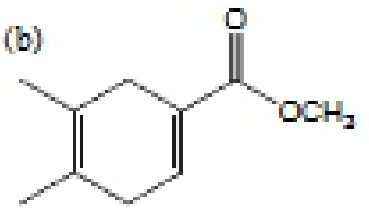
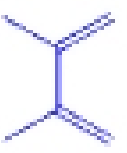
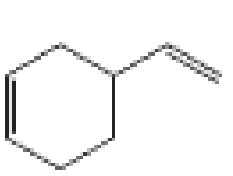


(c)

(d)



3. What dienes and denophiles would react to give the products below? (12 pts)

	Structure of diene	Structure of dienophile
(a)		 
(b)		 
(c)		 
(d)