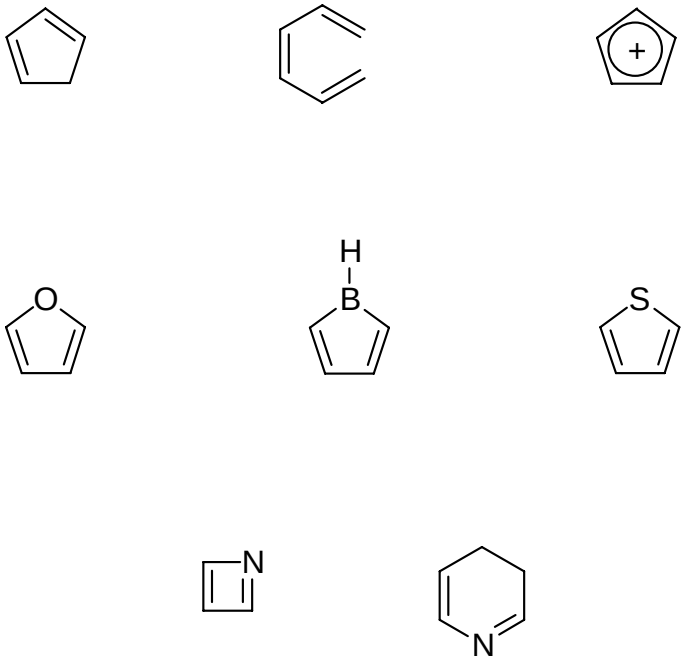
Sp2003 Org II Exam #1 Ch (14-17) (100 points)

NAME: _____

*To **not** have your graded script placed outside my office please check this box* ☐

1) Draw a Lewis structure for a chemical species whose bonding is not accurately described by a Lewis Structure, and draw a more realistic delocalized / hybrid representation of that species. (3pts)

2) Indicate which of the following molecules are aromatic, non-aromatic or anti-aromatic. (Assume all the molecules are planar). (15pts)

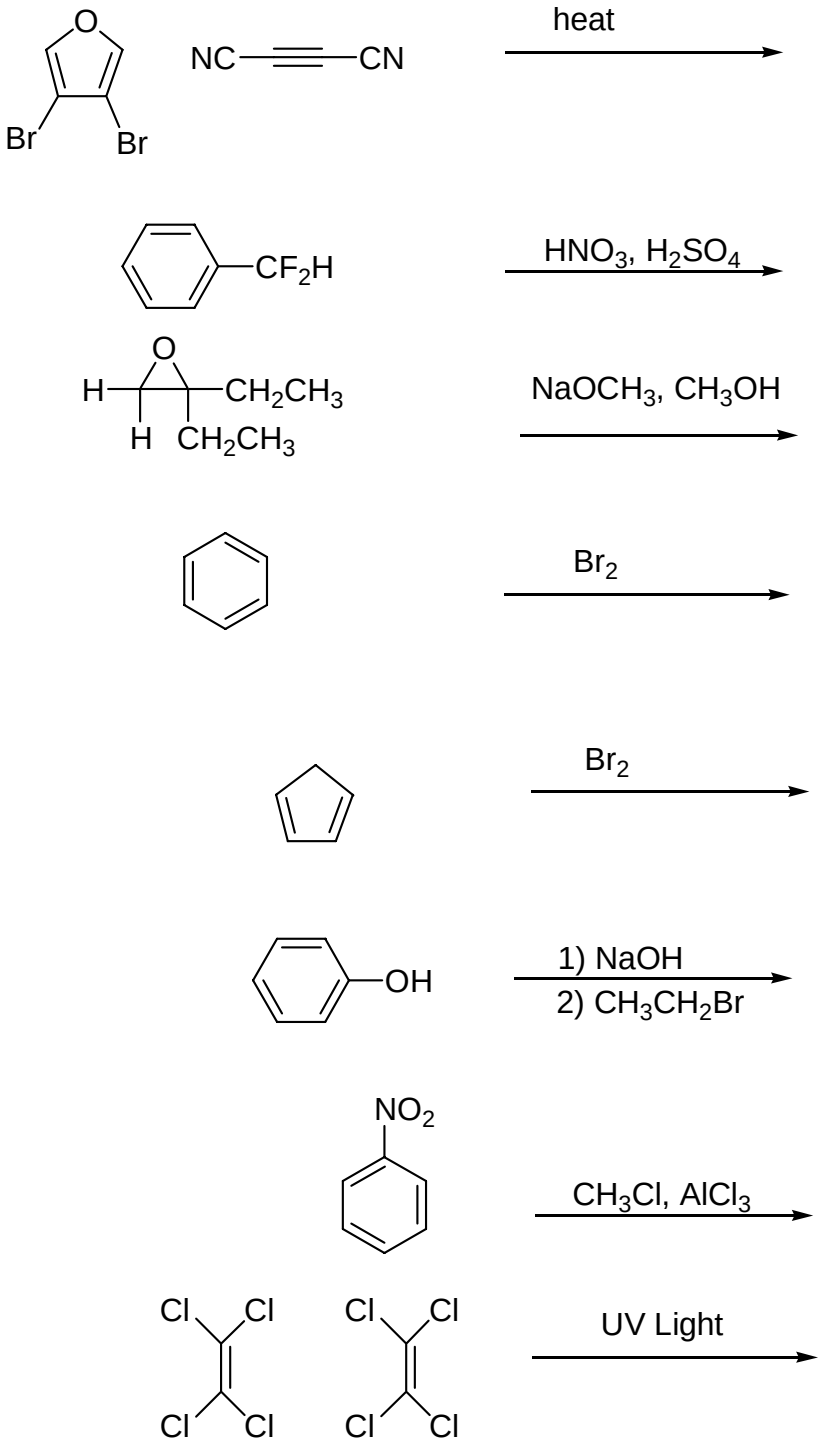


3) Draw (Z)-1,3-hexadiene in its s-trans conformation. (4pts)

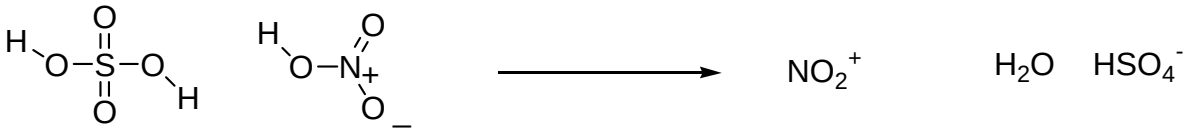
4) By applying the polygon rule to the below cyclic hydrocarbon:

a) draw out the MO energy level diagram
b) label the MO's using $\pi_1 \ldots . \pi_4^*$
c) circle one pair of degenerate orbitals
d) draw in the electrons and explain whether this compound is predicted to be aromatic or antiaromatic. (8pts)

5) Predict the products in the following reactions (if you believe no reaction will occur, indicate this!), paying attention to regio/stereochemistry where applicable. (21pts)

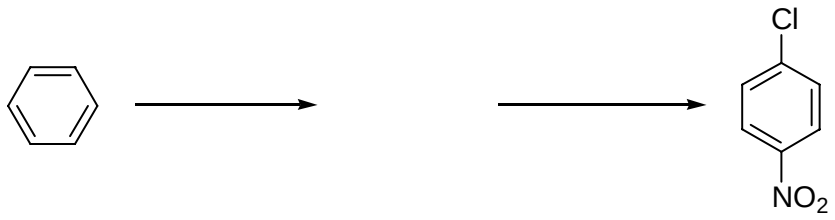


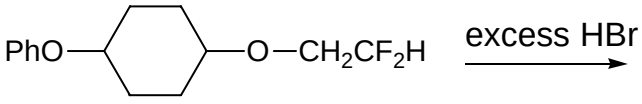
6) The nitronium ion NO_2^+ is the active electrophile in nitration EAS reactions.
It is formed when nitric and sulphuric acid react via an acid promoted dehydration.

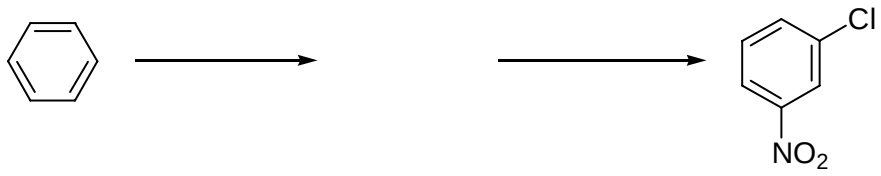


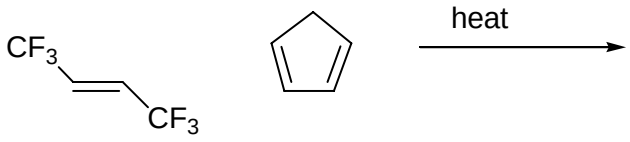
Draw a correct Lewis structure for the nitronium cation, and mechanistically show how it is formed.
(10pts)

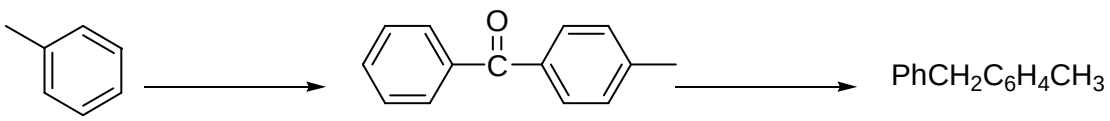
7) Please fill in the blanks. (18pts)



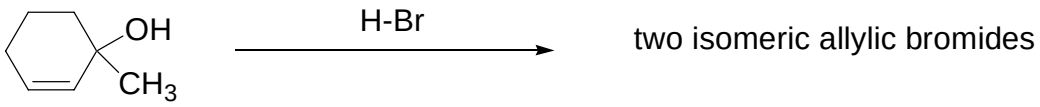






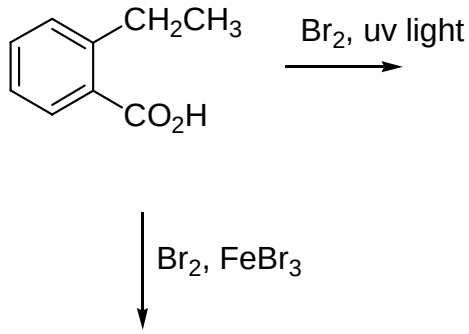


8) When the below allylic alcohol is treated with H-Br, two isomeric allylic bromides are formed.



Draw the two products and provide a step-by-step mechanism which explains the generation of both products. (9pts)

9) For both below substitution reactions (i) draw the expected product, and (ii) explain **<u>why</u>** the bromine substitutes at that specific site for each reaction. (10pts)



10) What is the definition of a *Pericyclic reaction?* (2pts)

***Bonus question* (up to 2pts)**
Show how the carbon p orbitals overlap to form the LUMO of the allyl anion.

Sp2003 Org II Exam #1 Ch (14-17) **(100 points)**

NAME: R.U. JOE KING

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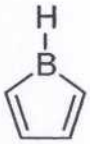
NON

NON

ANTI

AROMATIC



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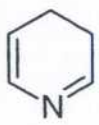

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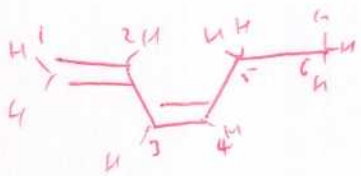

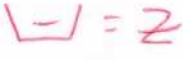

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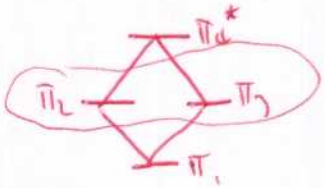

$4\pi\ e^-$ + + +

UNPAIRED ELECTRONS = ANTI AROMATIC

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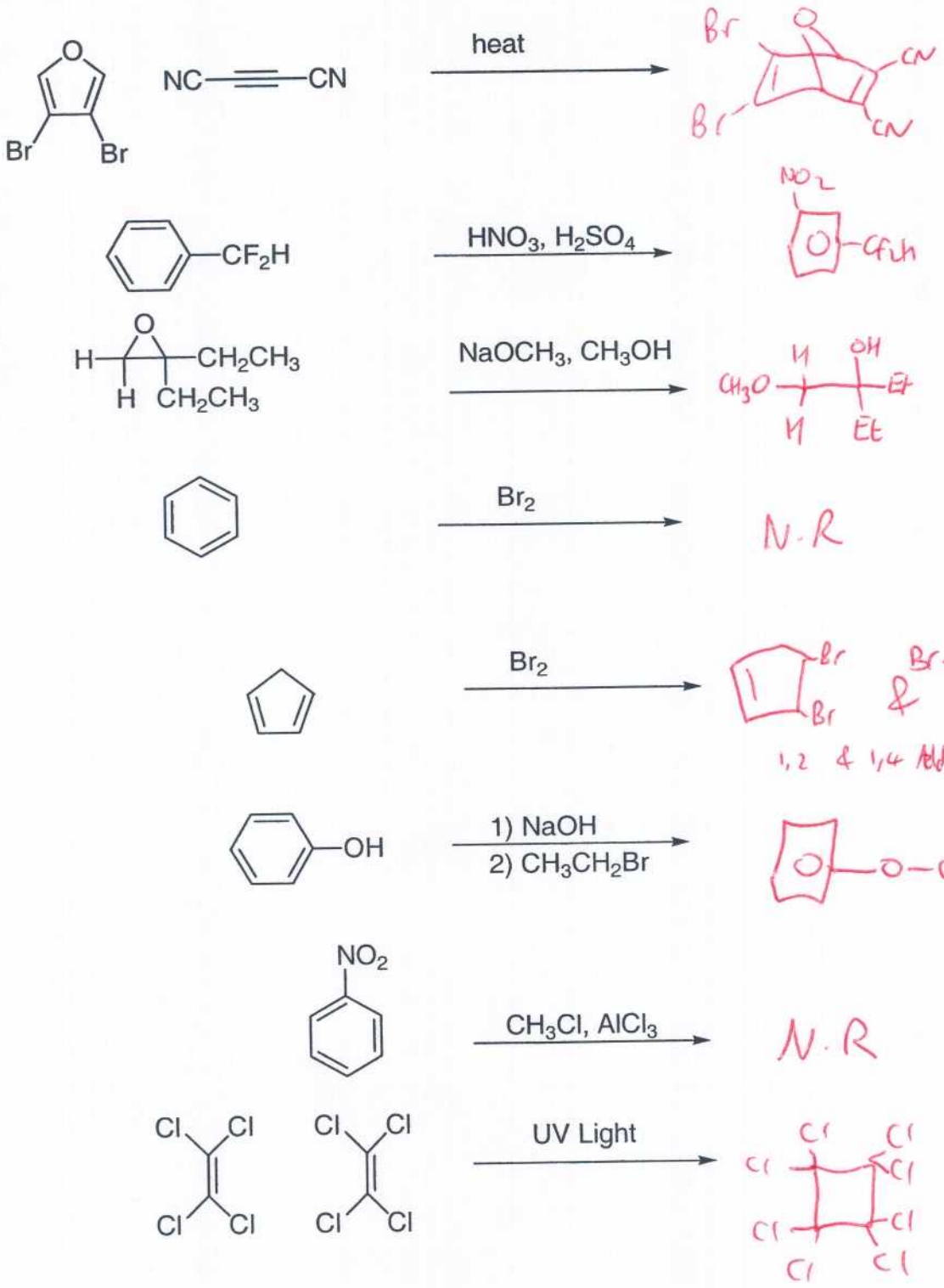

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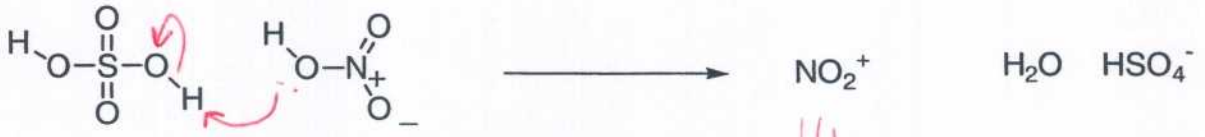

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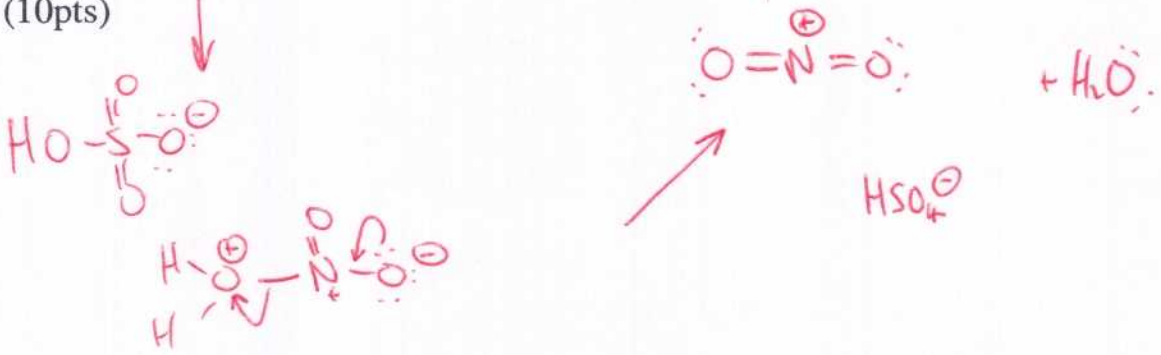

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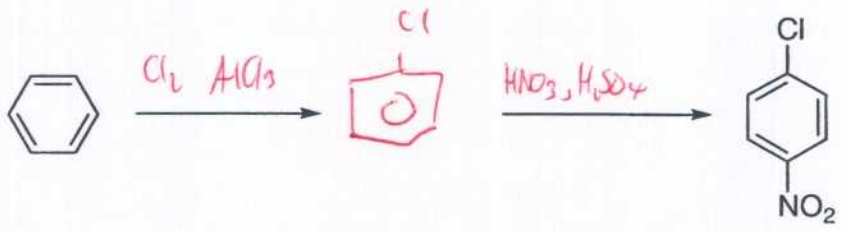

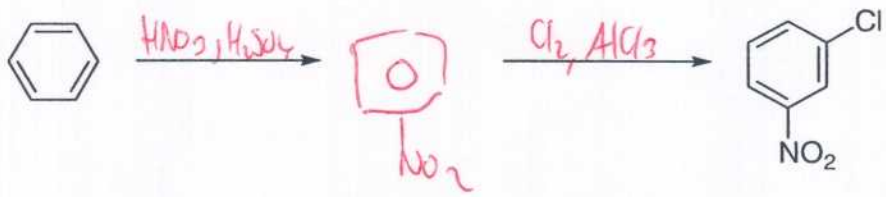

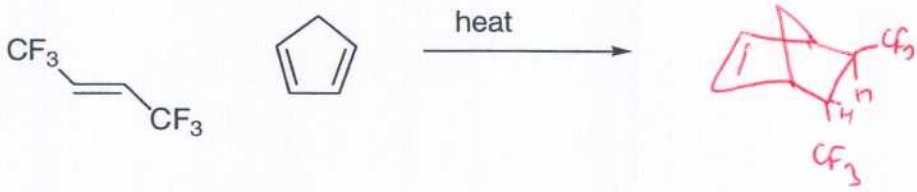

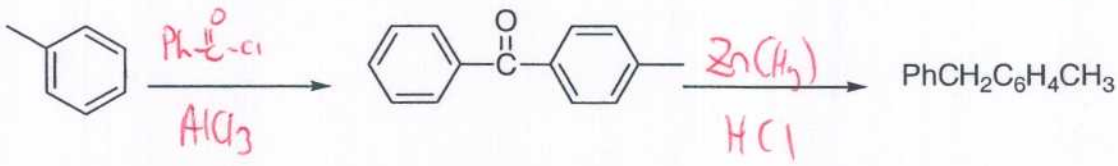

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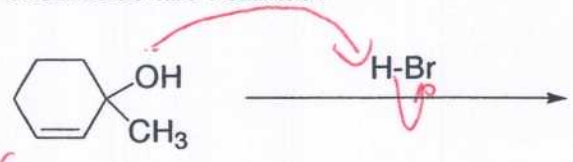

two isomeric allylic bromides

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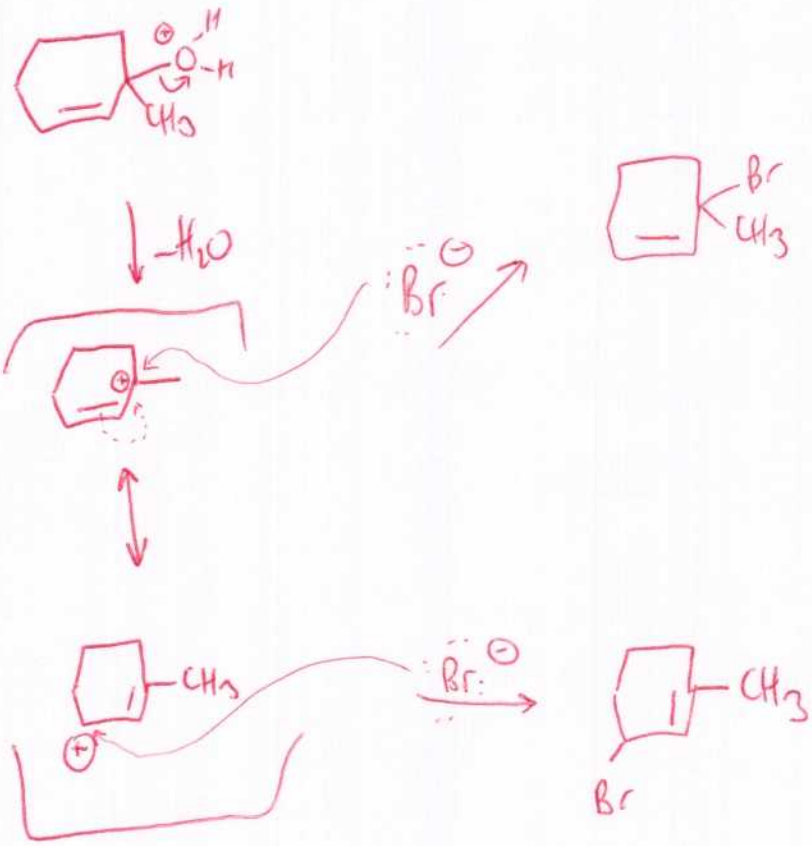

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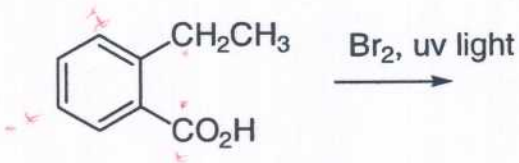

This is free radical substitution

$Br_2 \xrightarrow{uv} 2Br\cdot$

This $Br\cdot$ selectively abstracts the BENZYLIC hydrogen to give a resonance stabilized radical

This radical reacts with Br_2 to give the product and a $Br\cdot$ to carry on the chain

This is E.A.S.

Ethyl is o/p directing and -COOH is meta directing.

There is double reinforcement para & ortho to the ethyl.

Sterics favour the para attack

10) What is the definition of a *Pericyclic reaction?* (2pts)

A reaction that involves a closed loop of interacting orbitals

***Bonus question* (up to 2pts)**
Show how the carbon p orbitals overlap to form the LUMO of the allyl anion.

Allyl Anion :  = 4 πe^-s

Allyl MO's = π_3^*  —

π_2  ↑↓

π_1  ↑↓

LUMO = Lowest Unoccupied MO = π_3^* =